Conceptual Frameworks and the Cascade Model

Marion Potschin[1] and Roy Haines-Young

(Fabis Consulting Ltd., UK)

Introduction and State-of-the-Art

The creation of a conceptual framework (CF) has been a key initial step in many recent Ecosystem Service (ES) initiatives. Such efforts have been stimulated in part by the success of the iconic Millennium Ecosystem Assessment (MA) diagram linking services and well-being, but also by the need to communicate and flag up the particular perspective being taken within each initiative. The CF for *The Economics of Ecosystems and Biodiversity* (TEEB), for example, was set out in Chapter 1 of its 'Ecological and Economic Foundations' Report (De Groot et al., 2010); discussions of conceptual frameworks also played a prominent underpinning role in the report from the UK National Ecosystem Assessment (UK NEA, 2011). Most recently the need for some overarching CF has been part of the preliminary discussions for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IBPES, 2013).

Although they differ in detail and complexity, most conceptual frameworks attempt to illustrate in some way the transdisciplinary nature of the 'ES paradigm', by using the service concept to link representations of biophysical structures and processes to human values, benefits and ultimately peoples' well-being. There is also, often an explicit attempt to show how decision making processes operate within the frameworks.

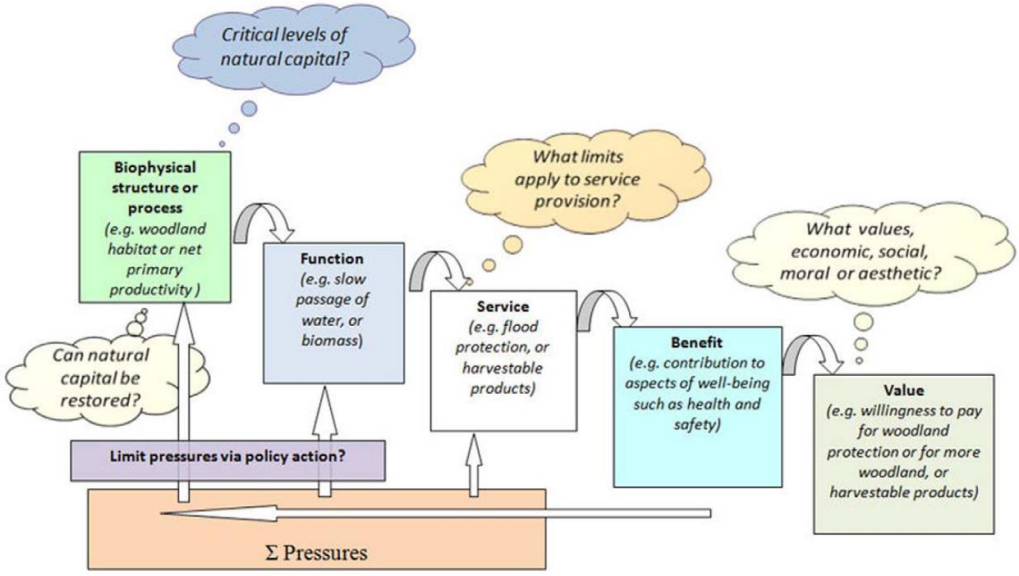
According to IPBES (2012) conceptual frameworks can do many things, namely:

- Be Tools to make complex systems as simple s they need to be for their intended purpose;
- Provide support to structure and prioritize work;
- Help clarify and focus thinking about complex relationships, supporting communication across disciplines, knowledge systems and between science and policy; and'
- Allow buy-in from a variety of stakeholders, by involving them in the development of the framework, and thus increase policy relevance.

The 'Cascade Model' (Fig. 1) (Potschin and Haines-Young, 2011) which was used to describe the OpenNESS' 'take' on to respond to the European Commission 'requirements' (call text), is now, in fact one of the simpler representations of the current paradigm. It includes some of the thinking generated by TEEB e.g. separation of benefits and value concepts, and attempts to highlight some of the important questions that the new framework might address.

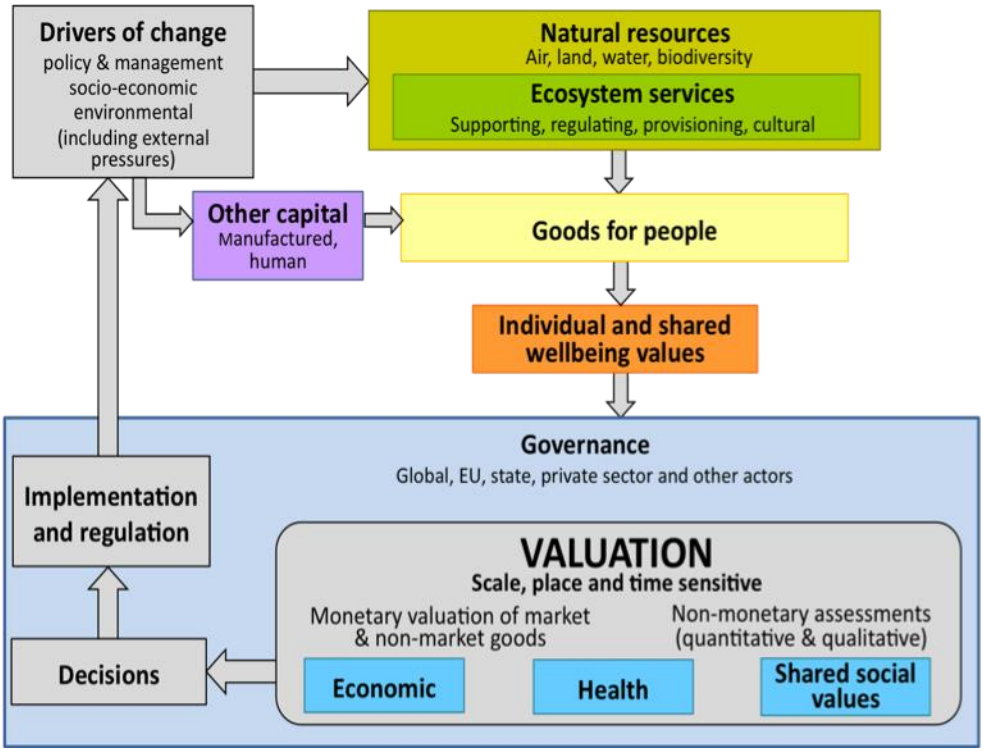
[1] Email contact: Marion.Potschnin@fabisconsulting.com

Fig. 1: Cascade model (Potschin and Haines-Young, 2011)



By contrast, more complex frameworks such as the one being used in the UK in the Valuating Nature Network (VNN) seek to unpack the valuation process and isolate it more firmly in the sphere of governance and decision making (Fig. 2). The VNN framework developed in the first phase of the UK NEA, and is consistent with the model being used in the follow-up phase (Mace et al., 2011).

Fig. 2: Valuing Nature Network Conceptual Framework (www.valuing-nature.net/).



Other frameworks proposed include that of the 'MAES Working Group' (2013) (MAES = Mapping and Assessment of Ecosystems and their Services), which partly seeks to link thinking to other frameworks such as DPSIR (an issue also discussed at the ESP Meeting in 2012), and the outcomes of the expert workshop on the development of a conceptual framework for IPBES (2013).

It is clear from a comparison of those that they all a have a slightly different focus within the ES paradigm.

Significance to OpenNESS and specific Work Packages[2]

While there is probably no single conceptual framework that captures all aspects of the ecosystem service paradigm, it is clear that they have an important role to play in trans-disciplinary work. They help capture some of the shared understanding of the problems being addressed, and the approaches that are being used to solve them. For the individual Work Packages within OpenNESS we suggest:

- From our discussions in **WP1 (Key challenges and conceptual frameworks)** we concluded that the conceptual framework(s) used in OpenNESS need to be tailored to help people articulate the four challenges, assess the specific tasks given in the case studies, and identify how different outputs link together to address them. We therefore conclude that to be used effectively, conceptual models like the cascade may need to be supported by other materials that help users read it in different, outward looking ways. We also need to find mechanisms for capturing this experience so that it can be shared with others (see Potschin-Young et al., submitted a)
- For **WP2 (Regulatory frameworks and drivers of change)** there is a need to identify where regulatory frameworks map onto the cascade.
- In terms of **WP3 (Biophysical control of ecosystem services**), the sustainable management of land and ecosystem services will probably require further work on characterising ecological functions and the capacity of ecosystems to meet societal demands for particular services.
- Similarly, in **WP4 (Valuation of the demand for ecosystem services)** notions of value can be built around different kinds of benefit, and expanded in the model.
- The cascade could also be a useful way of capturing the issues across the case studies in **WP5 (Place-based exploration of ES and NC concepts)**, or how they are framing the problems, and so might be used as an organising tool for ideas.

Open issues to be further discussed

The two frameworks illustrated here do not exhaust the set of those that are currently 'on the market'. Thus, before we develop anything new it would perhaps be wise to ask:

1. What role do these conceptual frameworks play in projects such as OpenNESS, IPBES? Are they mainly a ***communications*** tools, a '***logo***', or do they capture some important ***methodological*** or ***theoretical*** insights?
2. As the VNN model illustrates, conceptual frameworks can be used to represent analytical or methodological approaches as well as describing how the world seems to work. Given that OpenNESS is about operationalising the ES concept, should the framework(s) developed in WP1 mainly be about methods and their use, or should they try to be richer in a theoretical sense?
3. If conceptual frameworks try to capture important theoretical insights what are the novel features of the thinking that OpenNESS seeks to stimulate; what are they and how do we present them? Can the conceptual framework represent anything that is fundamentally testable?

Definitions

Whatever the role of CF in discussions they should certainly explain, illustrate and be consistent with underlying definitions. The WP1 brainstorming workshop discussed definitions in some depth and identified five key terms were agreed through a consultation process within the OpenNESS consortium and finally were published in a glossary (see OpenNESS Glossary [edited by Potschin, M.; Haines-Young, R.; Heink, U. and K. Jax], 2016). These are:

- **Ecosystem functions,** *are defined as the subset of the interactions between biophysical structures, biodiversity and ecosystem processes that underpin the capacity of an ecosystem to provide ecosystem services*.
  - This is consistent with the usage in TEEB and the cascade model, above.
  - The relationship of functions to the concepts of 'Service Providing Units' and 'Ecosystem Service Providers' will be expanded in future elaborations.

[2] For a brief description of the OpenNESS Work Packages see: http://openness-project.eu/about/work-packages

- **Ecosystem services** *are defined as the contributions that ecosystems (whether natural or semi-natural) make to human well-being; their fundamental characteristic is that they retain the link to underlying ecosystem functions, processes and structures***.**
  - Again consistent with TEEB and the cascade model.
  - To emphasise that they are the interface between the ecological and social-economic parts of the overall socio-ecological system these can be called *final ecosystem services* – to distinguish them from functions, which some call *supporting or intermediate services*. We recommend that the terms 'supporting service' and 'intermediate service' is avoided, and 'functions' used instead (see also Potschin-Young et al. submitted b)
  - We note the ambiguity of the term 'functions' for some audiences (being sometimes also used to mean "processes" or "purposes").
  - The extent to which ecosystem services are outputs dependent on living processes or also include outputs based only on abiotic natural processes (such as wind) is to be resolved – the issue can be addressed by means of an appropriate classification typology (see section 3)
- **Ecosystem benefits are the direct and indirect outputs from ecosystems that have been** *turned into products or experiences that are no longer functionally connected to the systems from which they were derived. Benefits are things that can be valued either in monetary or social terms.*
  - This definition seeks to clarify the distinction between services and benefits – that is often confused in the literature and classification systems. Benefits are fundamentally satisfiers of well-being.
  - Benefits can be referred to collectively as 'products'; we note that some groups use 'goods' as a term that is synonymous with products – but recommend that this is avoided given that others use the terms 'services' and 'goods' as equivalents.
- **Values** *are the criteria by which people assign/justify importance to/of things***.**
  - Values can be individual or collective, and can be qualitative or quantitative.
  - The definition recognises that ecosystem services can embrace different types of values that cannot be reduced to one (monetary) type (i.e. the problem of incommensurability must be recognised).
- **Human well-being** *is that which arises from adequate access to the basic materials for a good life, that are needed to sustain freedom of choice and action, health, good social relations and security.*
  - The state of well-being is dependent on the aggregated output of ecosystem benefits, and is thus distinct from individual benefits.

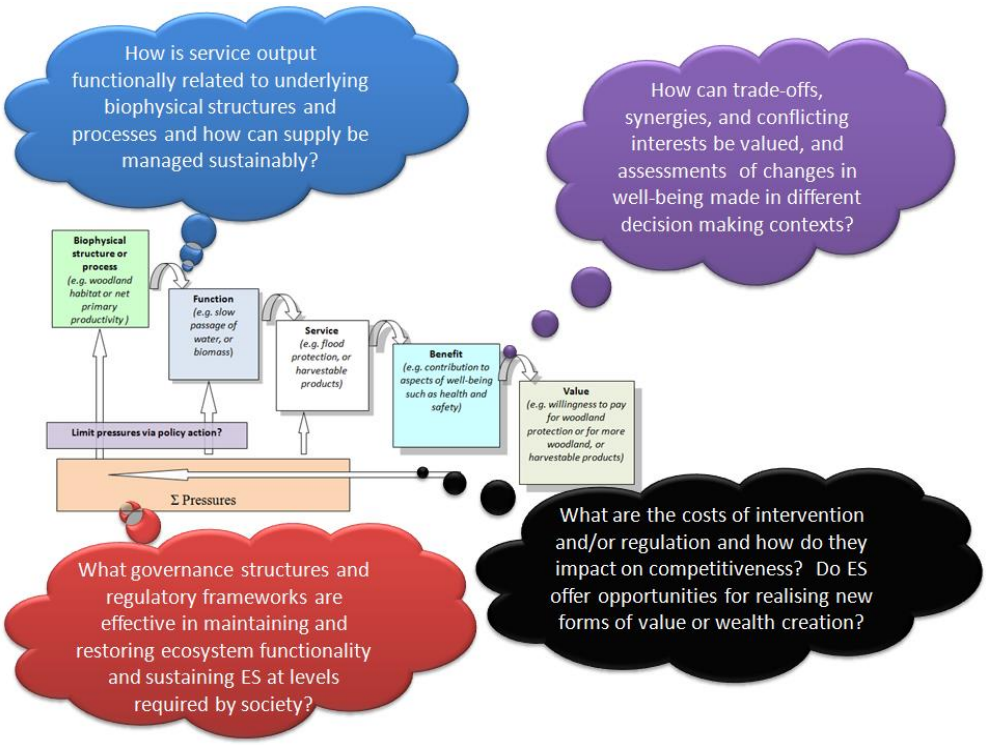
Relationship to four challenges[3]

At the brainstorming workshop for WP1 and followed up in deliverables of WP1, e.g. Del. 1.2 and del. 13.) we located where the focus of the four challenges might sit in relation to the different components of the cascade model and suggest some of the key questions that underpin them (Fig. 3).

Human well-being: How can trade-offs, synergies, and conflicting interested be valued, and assessment of changes in well-being made in different decision making contexts?	**Sustainable Ecosystem Management:** How is service output functionally related to the underlying biophysical structures and processes, and how can supply be managed sustainable?
Governance: What governance structure and regulatory frameworks are effective maintaining and restoring ecosystem functionality and sustaining ES at levels required by society?	**Competiveness:** What are the costs of interventions and/or regulation and how do they impact on competitiveness. Do Ecosystem Services offer opportunities for realising new forms of value or wealth creation?

[3] There are certainly more societal challenges; the reduced number presented here is due to the four major challenges mentioned in the work programme of FP7 to which OpenNESS responded.

Fig 3: The Cascade and the 'Four Challenges' (source OpenNESS Del. 1.3)



Recommendations:

We want to ask you to consider the cascade model mainly as a theoretical device, we do not claim that it contains more than you first wee, but to encourage you to think about the CF that you are developing and the role that they play. While the cascade model is therefore not the final statement on the topic – we recommend that it is taken as a starting point for discussion.

Key Papers

De Groot R.; Fisher, B.; Christie, M.; Aronson, J.; Braat, L.; Gowdy, J.; Haines-Young, R.; Maltby, E.; Neuville, A.; Polasky, S.; Portela, R. and I. Ring (2010): Framework for integrating the ecological and economic dimension in ecosystem service assessment and valuation. In: Kumar, P. (Ed.): The Economics of Ecosystems and Biodiversity (TEEB): Ecological and Economic Foundations. London, Washington: Earthscan, 10-40 pp

EU FP7 OpenNESS Project Deliverable 1.2, Potschin, M.; Haines-Young, R.; Görg, C.; Heink, U.; Jax, K.; Kretsch, C. and C. Schleyer (2016): Final conceptual frameworks for the analysis of ecosystem services and natural capital in relation to the challenges of well-being, sustainable management, governance and competitiveness, and how these issues can be communicated and resolved in difference place based-contexts. European Commission FP7. Available from: http://www.openness-project.eu/library

EU FP7 OpenNESS Project Deliverable 1.4, Haines-Young, R., Potschin, M.; Jax, K.; Görg, C.; Heink, U.; Kelemen, K. and C. Schleyer (2017): OpenNESS Conceptual Nexus (ONEX). Guidelines for testing the conceptual frameworks in case study areas using methods and data resources developed in WPs 2, 3 and 4. European Commission FP7. 83 pp. Available from: http://www.openness-project.eu/library plus internet application "The ONEX lab" available at: https://trello.com/b/sm1lX0S0/the-onex-lab

IPBES (2012): Outcome of an informal expert workshop on main issues relating to the development of a conceptual framework for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

IPBES (2013): Recommended conceptual framework of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. 19.09.2013 – prepared for the 2nd session in Turkey 9-14 Dec. 2013.

Mace, G.; Bateman, I.; Albon, S.; Balmford, A.; Brown, C.; Church, A.; Haines-Young, R.; Pretty, J.N.; Turner, K.; Vira, B. and J. Winn (2011): Conceptual Framework and Methodology. In: The UK National Ecosystem Assessment Technical Report. UK National Ecosystem Assessment, UNEP-WCMC, Cambridge, 11-26.

MAES Working Group (2012 and on-going discussion): Mapping and Assessment of Ecosystems and their Services: An Analytical framework for ecosystem assessments under Action 5 of the Biodiversity Strategy to 2020.

OpenNESS Glossary [edited by Potschin, M.; Haines-Young, R.; Heink, U. and K. Jax] (2016): OpenNESS Glossary (V3.0), 35 pp. Grant Agreement No 308428. Available from: http://www.openness-project.eu/glossary

Potschin, M. and R. Haines-Young (2011): Ecosystem Services: Exploring a geographical perspective. *Progress in Physical Geography* **35(5)**: 575-594.

Potschin, M. and R. Haines-Young (2016): Frameworks for ecosystem assessments. In: Potschin, M., Haines-Young, R., Fish, R. and Turner, R.K. (eds.) Routledge Handbook of Ecosystem Services. Routledge, London and New York, p. 125-143.

Potschin, M.; R. Haines-Young, R. Fish and K. Turner (eds.) (2016): Routledge Handbook of Ecosystem Services. Routledge, London and New York, 630 pp

http://www.routledge.com/books/details/9781138025080/

Potschin-Young, M.; Haines-Young, R.; Görg, C.; Heink, U.; Jax, K. and C. Schleyer (2017, submitted a): Understanding the role of Conceptual Frameworks: Reading the Ecosystem Service Cascade. *Ecosystem Services. OpenNESS Special issue.*

Potschin-Young, M.; Czucz, B.; Liquete, C.; Maes, J.; Rusch, G. and R. Haines-Young (2017): Intermediate Services: an empty concept. *Ecosystem Services*

Suggested Citation: Potschin, M. and R. Haines-Young (2016): Conceptual Frameworks and the Cascade Model. In: Potschin, M. and K. Jax (eds): OpenNESS Ecosystem Services Reference Book. EC FP7 Grant Agreement no. 308428. Available via: http://www.openness-project.eu/library/reference-book

Acknowledgements: The following OpenNESS partners have contributed to the consultation: Francesc Baró (UAB), Ulrich Heink (UFZ), Christian Schleyer (UFZ), Anders Madsen (HUGIN), Martin Karlsen (HUGIN), Heli Saarikoski (SYKE), Erik Stange (NINA), Graciela Rusch (NINA), Jari Niemelä (UH), David Barton (NINA), Pam Berry (UOXF), Raktima Mukhopadhyay (IBRAD), SB Roy(IBRAD), Angheluta Vadineanu (UB-DSES), Joachim Maes (JRC), Marina García-Llorente (UAM), Francis Turkelboom (INBO), Bálint Czúcz (MTA ÖK), Leon Braat (Alterra), Mette Termansen (DMU), Jiska van Dijk (NINA), Eszter Kelemen (ESSRG), Réka Aszalós (MTA ÖK), David Odee (KEFRI).

Disclaimer: This document is the final version of the Synthesis Paper on the topic within the OpenNESS project. It has been consulted on formally within the consortium in 2014 and updated in 2016.