WULCA

A LIFE CYCLE INITIATIVE PROJECT

ANNUAL WULCA Meeting

May 11th, 2017

SETAC Europe 2017, Brussels (Belgium)

WULCA at a glance

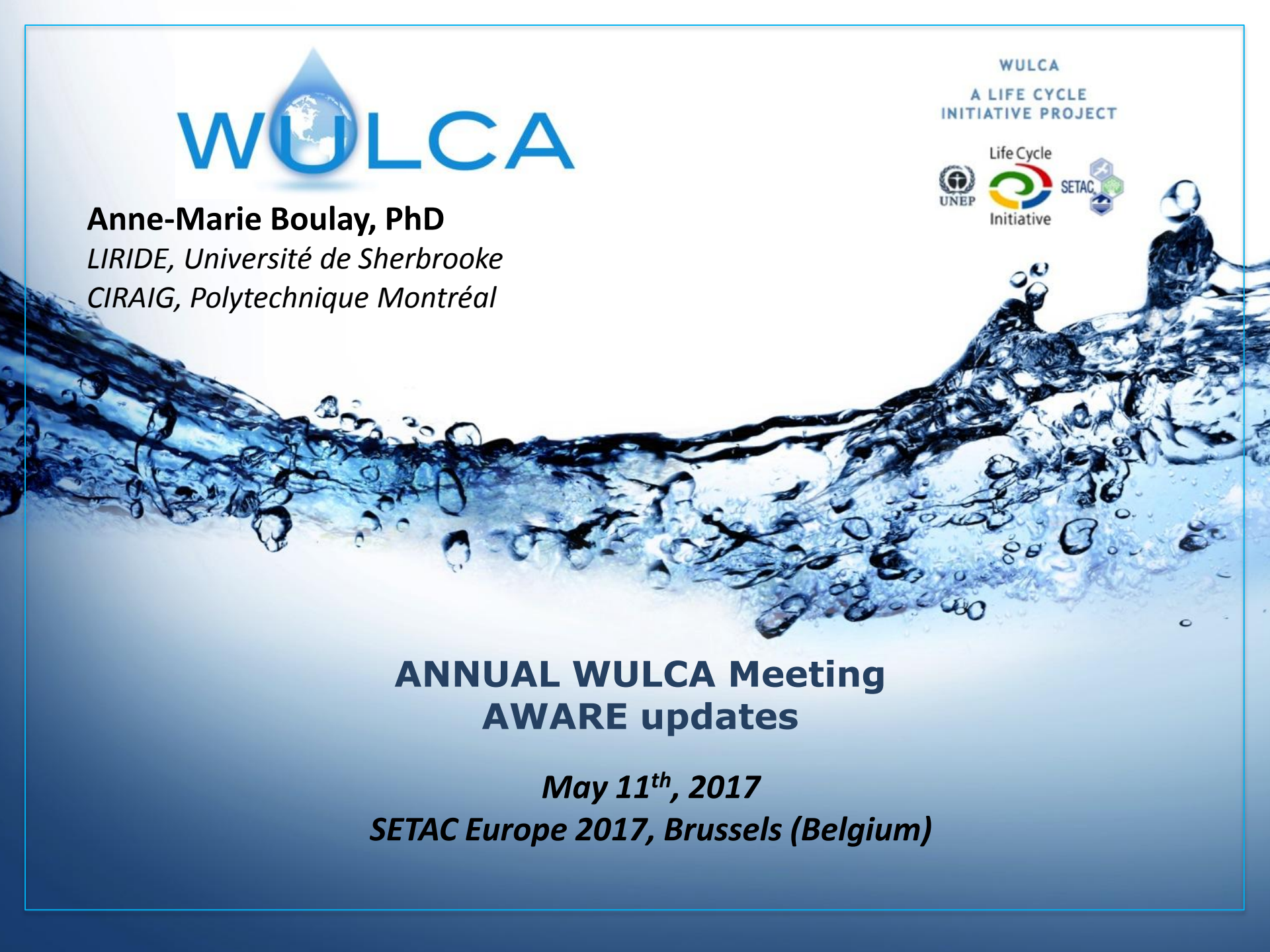
- Founded in 2007 under Life Cycle Initiative
- Main Deliverables (plus other “side papers”):
  - Framework Paper (Bayart et al, 2010)
  - Qualitative comparison (Kounina et al, 2013)
  - Quantitative comparison and case study (Boulay et al, 2015 a and b)
  - Consensus-based scarcity indicator (Boulay et al, 2017)
- Four subgroups: Scarcity, Human Health, Ecosystems, Resources
- ~ 20 active members, > 100 “followers/experts”
- Six Sponsors 2016-2018

  (for AWARE Dissemination: travels and 30% of my time)

Hydro Québec L'ORÉAL ENGIE DANONE VEOLIA cotton Cotton Incorporated

Agenda

- Presentations
- AWARE Update (Anne-Marie Boulay) 20 min
- Ecosystem update (Stephan Pfister) 20 min
- Human Health Update (Masaharu Motoshita) 15 min
- Resource – new group! (Charlotte Pradinaud) 15 min
- Questions, discussion 15 min



Anne-Marie Boulay, PhD
LIRIDE, Université de Sherbrooke
CIRAIG, Polytechnique Montréal

ANNUAL WULCA Meeting
AWARE updates

May 11th, 2017
SETAC Europe 2017, Brussels (Belgium)

Background

- Mandated in 2013 to build consensus on one method, with final recommendation emerging from Pellston Workshop (Valencia, Spain, January 2016)
- Part of the Flagship Project on Global Guidance on LCIA Indicators

Life Cycle Initiative

A joint organisation of UNEP & SETAC

AWARE Development

- ***14 members:***

Jane Bare, USEPA, USA
Anne-Marie Boulay, CIRAIG, Montreal
Lorenzo Benini, JRC, European Commission
Markus Berger, DTU Berlin
Michael J. Lathuillière, UBC Vancouver
Alessandro Manzardo, Univ.Padova
Manuele Margni, CIRAIG, Montreal
Masaharu Motoshita, NIAIST, Japan
Montserrat Núñez, IRSTEA, Montpellier
Amandine Valerie Pastor, IAASA, Austria
Stephan Pfister, ETH Zurich
Bradley Ridoutt, CSIRO, Australia
Taikan Oki, Tokyo University
Sebastian Worbe, Veolia, Paris

- 2+ year work process
- > 100 hours of meeting
- 48 experts consulted in workshops
- 33 experts and stakeholders surveyed
- 3 publications

Presentation of AWARE?

Updates

- Case studies

➔ Recommendation was to be considered interim until 10 case studies are performed to prove applicability and interpretation of method. Status : done and available online (except two not yet public outside WULCA group: Basket of Product, Benini et al and Braskem, Tirado et al)

➔ Other publications in preparation:

- Caldeira et al. (Biofuel)
- Abysar et al. (shale gas), submitted (ES&T)

Case studies

Comparison of Water Scarcity Methods: Meat & vegetarian Burger Case Study

Application of AWARE for the quantification of the Water Scarcity Footprint of a pure Malt Beer produced by Birra Castello

Biofuel - Caldeira et al

Cement - Puerto - long version and short version

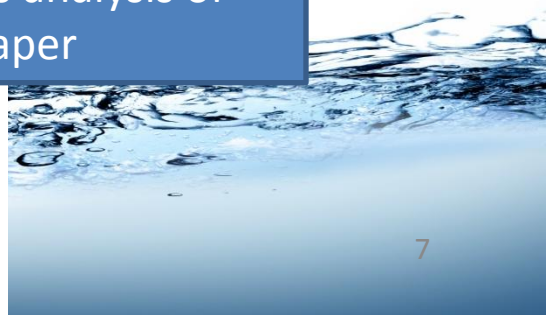
Danone Beverages - Bayart

Flow Regulator - Berger et al

Rice case study - Frischknecht et al

Volkswagen - Berger et al

Plan for a cross analysis of case studies paper



Updates

- Recommended by JRC in current draft for PEF methodology updates

  http://ec.europa.eu/environment/eussd/smgp/pdf/JRC_DRAFT_EFLCIA_resources_water_landuse.pdf

5.8 Recommended default method for mid-point

Based on the evaluation reported in table 5.4, the recommended model for mid-point LCIA is AWARE (Boulay et al., 2016, submitted). This model was developed in the context of a dedicated effort by LCA water experts, with the aim of overcoming the main limitations affecting others LCIA models assessing water scarcity and the resulting characterization factors reflects the novelty of this approach. Coherently with all models evaluated, the recommended approach to the quantification of impacts associated to water scarcity is to characterize consumptive uses.

Beside this, in the context of the PEF/OEF it is recommended to provide an indicator of net blue water consumption (i.e. net freshwater balance) under additional environmental information.

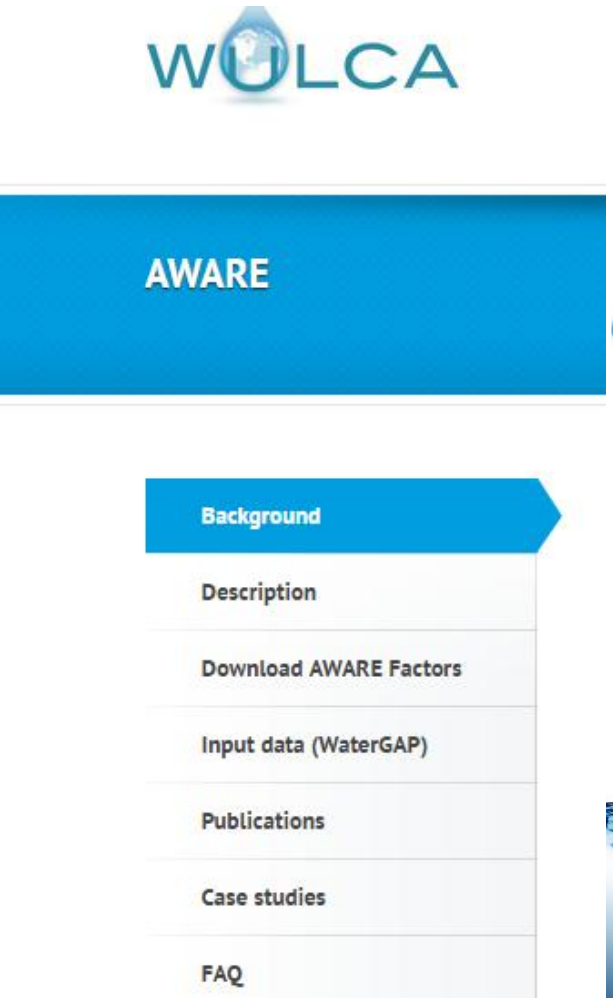
Updates

- Paper under review, International JLCA (Boulay et al, 2017)

  STATUS: ...Accepted!!

  → Sponsorship will provide for Open Access

- New AWARE section on website: http://wulca-waterlca.org/aware.html



Presentations

- Score LCA (Paris, France)
- LCA Case Study Symposium (Montpellier, France)
- Cycle 2016 (Montreal, Canada)
- LCA Food 2016 (Dublin, Ireland)
- Ecobalance 2016 (Kyoto, Japan)
- FSLCI (online webinar)
- Americana 2017 (Montreal, Canada)
- SETAC 2017 (Brussels, Belgium)
- **Upcoming**
  - Barcelona, CETAQUA (May 2017)
  - ISIE, Chicago (June 2017)
  - LCM Luxembourg (September 2017)
  - LCAXVII (TBC, October 2017)

Foreseen work

- Case studies analysis paper – SUMMER/FALL 2017
- AWARE non-marginal
  - Presentation SETAC
  - Paper pending - SUMMER/FALL 2017
- Uncertainty and comparison with previous methods
  - Uncertainty: to be discussed
  - Comparison: RCC and MDC
  - WINTER 2018
- Calculation of CF at different scales or for different sectors
  - Calculation support welcome

WULCA

A LIFE CYCLE INITIATIVE PROJECT

Questions?

Anne-Marie Boulay, Ph.D.

Project Manager WULCA (Water Use in LCA)

LIRIDE- Sherbrooke University

CIRAIG - Polytechnic Montreal

anne-marie.boulay@polymtl.ca

WULCA

SETAC Europe meeting, Brussels May 11, 2017

WULCA
A LIFE CYCLE INITIATIVE PROJECT

UNEP Life Cycle Initiative SETAC

Ecosystem Quality: integrating the hydrological cycle in a multimedia assessment framework

List of active contributors

Montse Nunez (Irstea, ELSA-PACT)

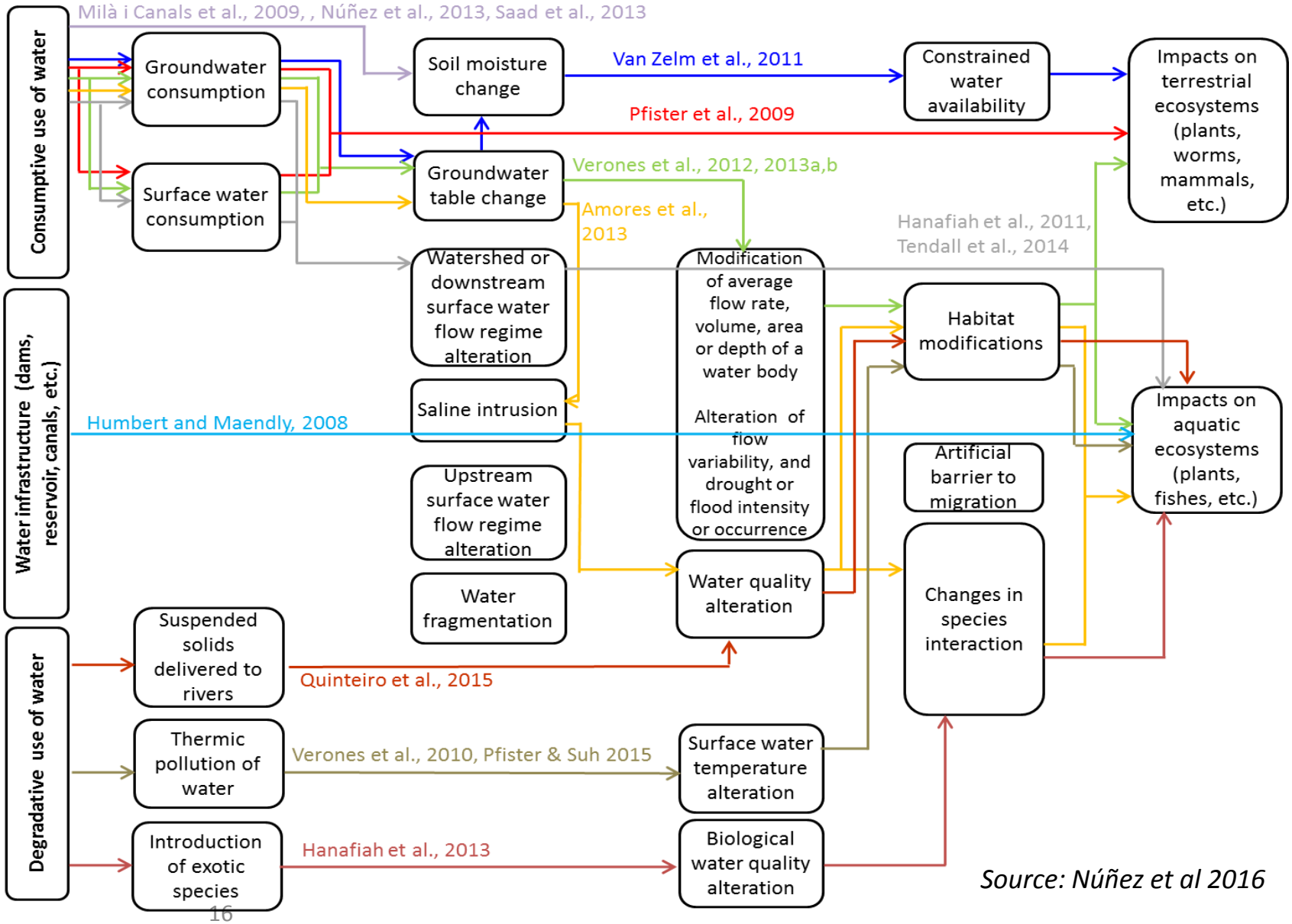
Stephan Pfister, (ETH Zurich, ESD);
Phillippe Roux (Irstea, ELSA-PACT);
Michael J. Lathuillière (University of British Columbia);
Paula Quinteiro, (University of Aveiro);
Laura Scherer, CML Leiden;
Francesca Verones, NTNU Trondheim
Andrew D. Henderson, (US EPA);
Jane C. Bare, (US EPA);
Manuele Margni, (CIRAIG Montréal);
Gabrielle. Trottier, (Polytechnique Montreal);
Shooka Karimpour (CIRAIG Montréal)
Anne-Marie Boulay, (CIRAIG Montréal / LIRIDE Sherbrooke)
Ralph K. Rosenbaum, (Irstea, ELSA-PACT);

Background

Evolution of water consumption EQ indicators in LCA:

- Before 2010. EWR-based indicators, conceptual methods (e.g. Mila I Canals et al. 2009, Pfister et al 2009)
- 2nd generation: some mechanistic models such as for groundwater in Netherlands (van Zelm et al. 2011) and wetlands (Verones et al. 2013/2016)
- Additionally Interactions with land use etc.

Many LCIA methods



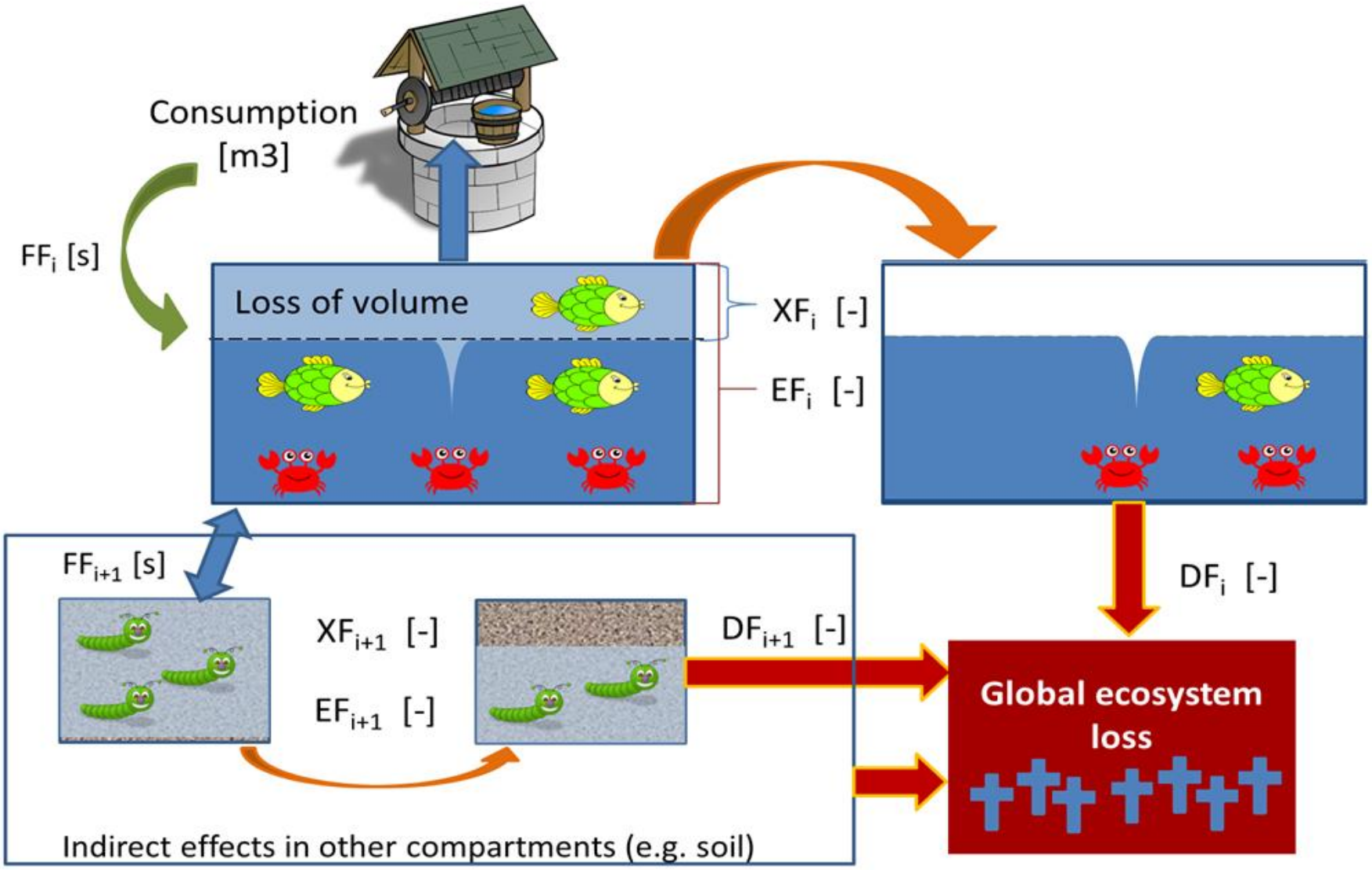
Source: Núñez et al 2016

Problem statement and goal

- available methods cannot or can only partially be compared and combined within a consistent framework (Núñez et al., 2016).

- To overcome such compatibility problems, a comprehensive framework that should result in consensus-based guidelines is needed

Structure of the model

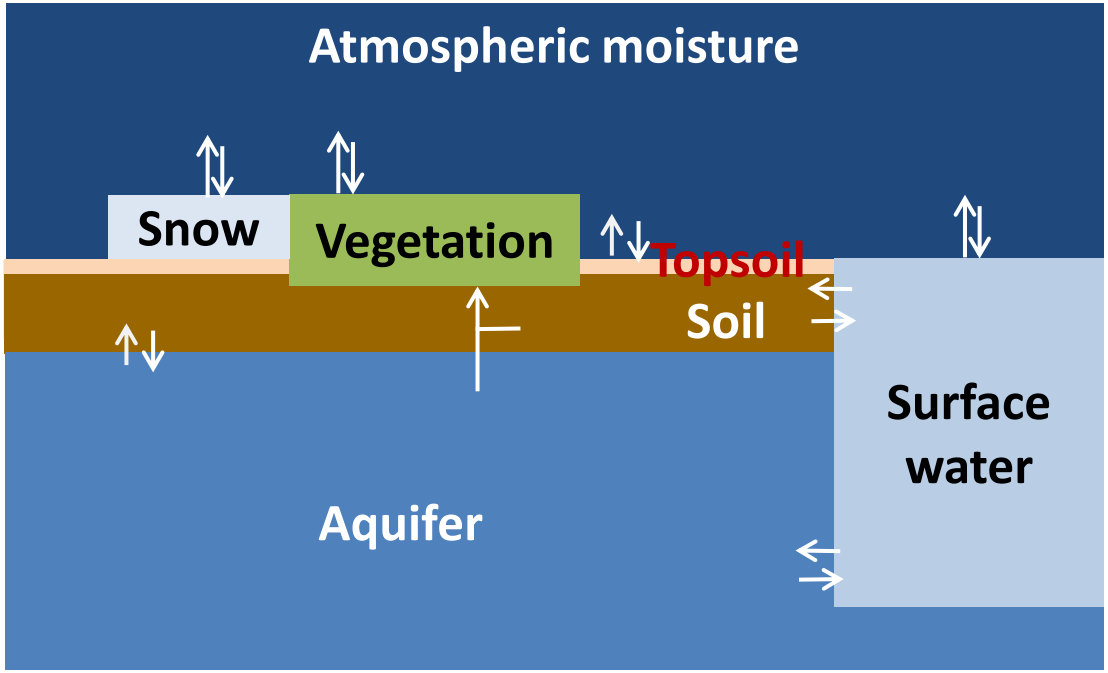


Mechanistic multimedia model

Build indicators based on a unique framework that allow for integration of all methods:

- **Multimedia**: representation of the hydrological cycle

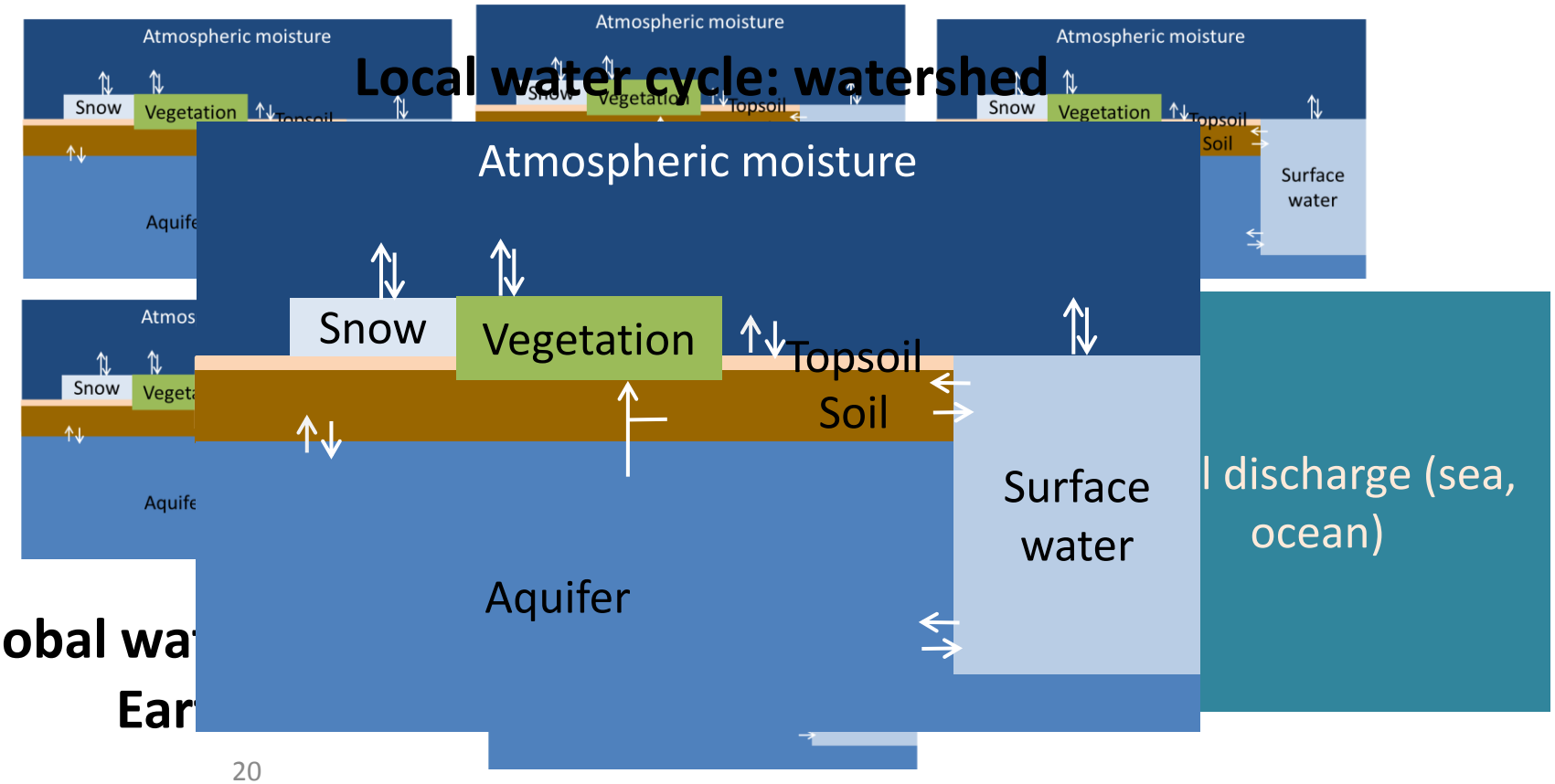
Local water cycle: watershed



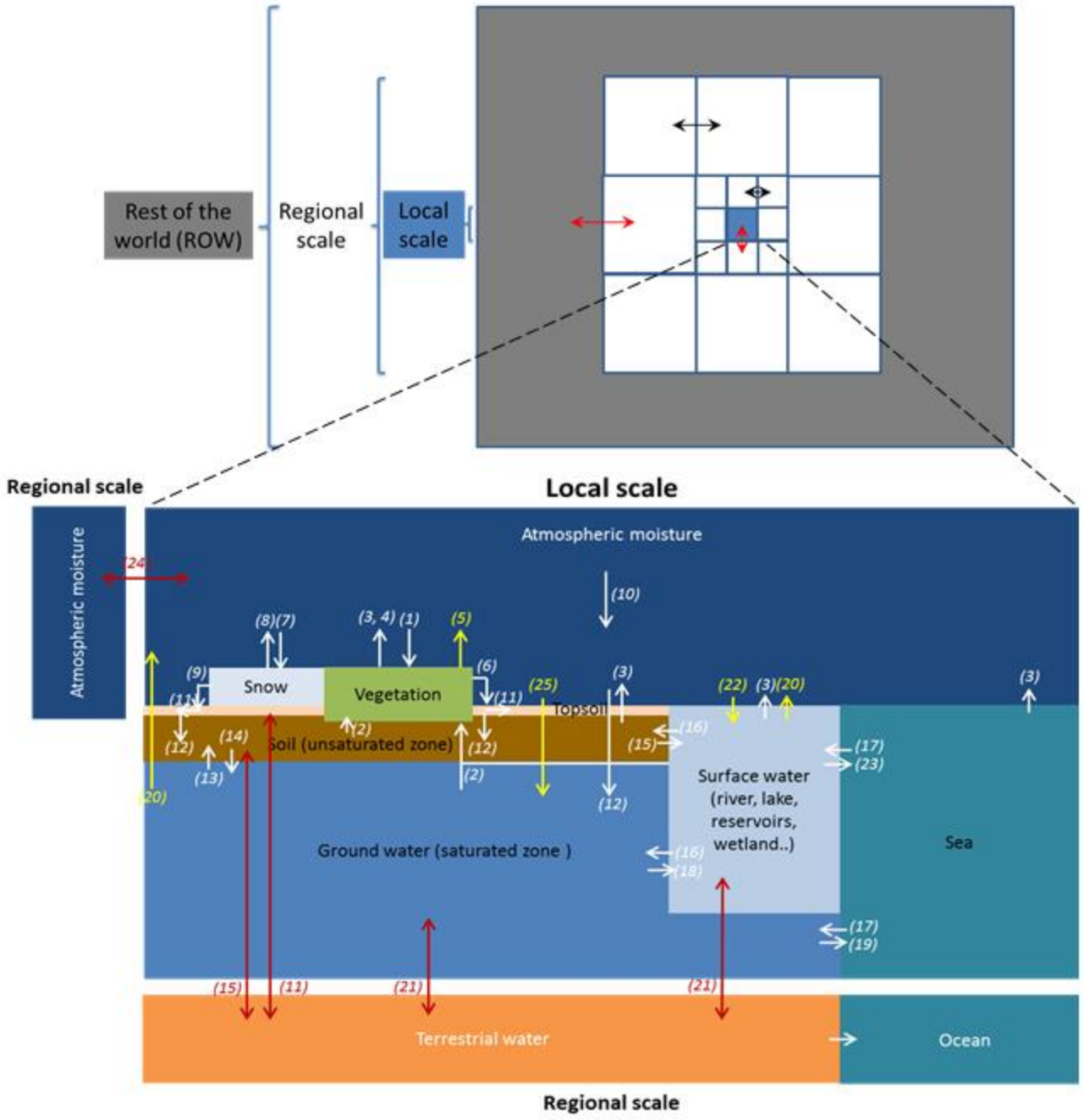
Mechanistic multimedia model

Build indicators based on a unique framework that overcome all the limitations that 1st and 2nd generation have:

- **Multimedia**: representation of the hydrological cycle



Current draft concept



Conclusion / Outlook

- The suggested framework helps method developers set up fate models that are compatible with each other.
- The flexibility in covering different levels of geographic scales (Fig 2) helps to combine methods of different spatial detail.
- Many open questions are still discussed in the working group and input is very welcome

WULCA

A LIFE CYCLE INITIATIVE PROJECT

THANK YOU FOR YOUR PARTICIPATION

WULCA

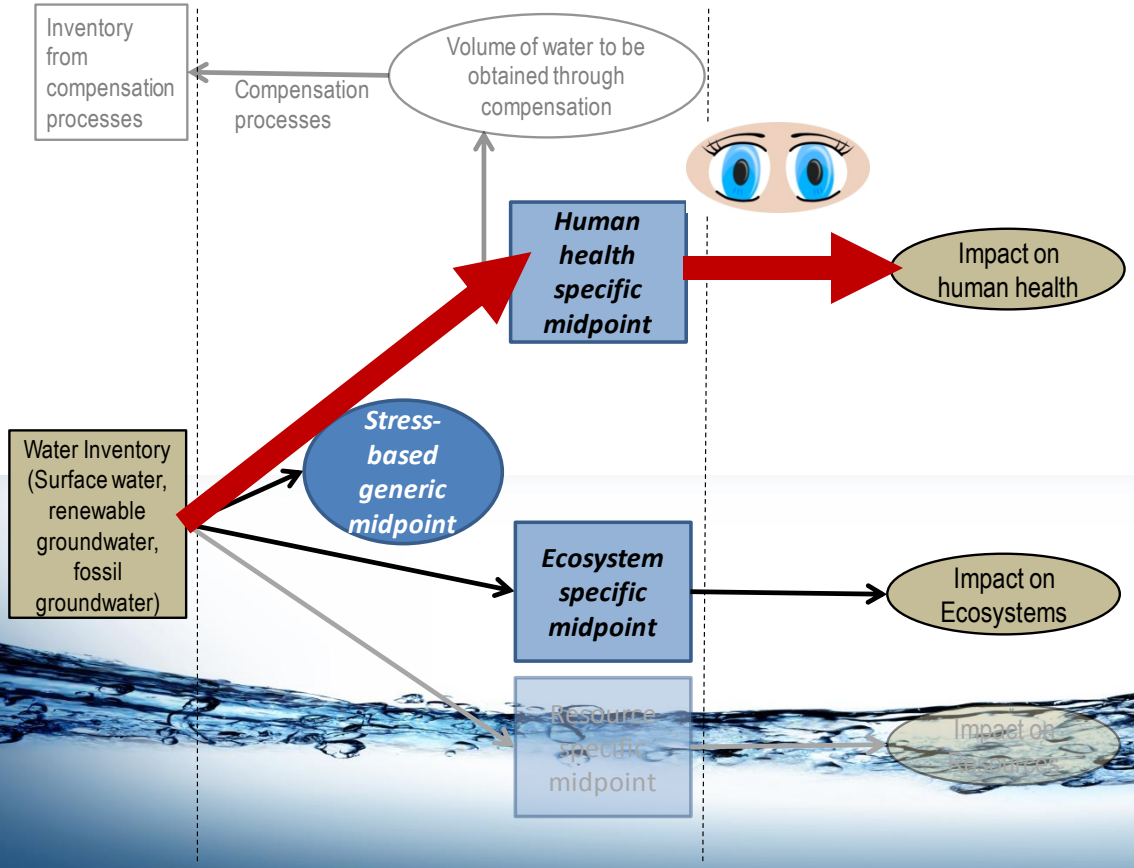
A LIFE CYCLE INITIATIVE PROJECT

Masaharu Motoshita, Cecile Bulle, Jane Bare, Bradly Ridoutt, Stephan Pfister, Anne-Marie Boulay

WULCA annual meeting, May 2017: Human health subgroup

WULCA: Human Health sub-group

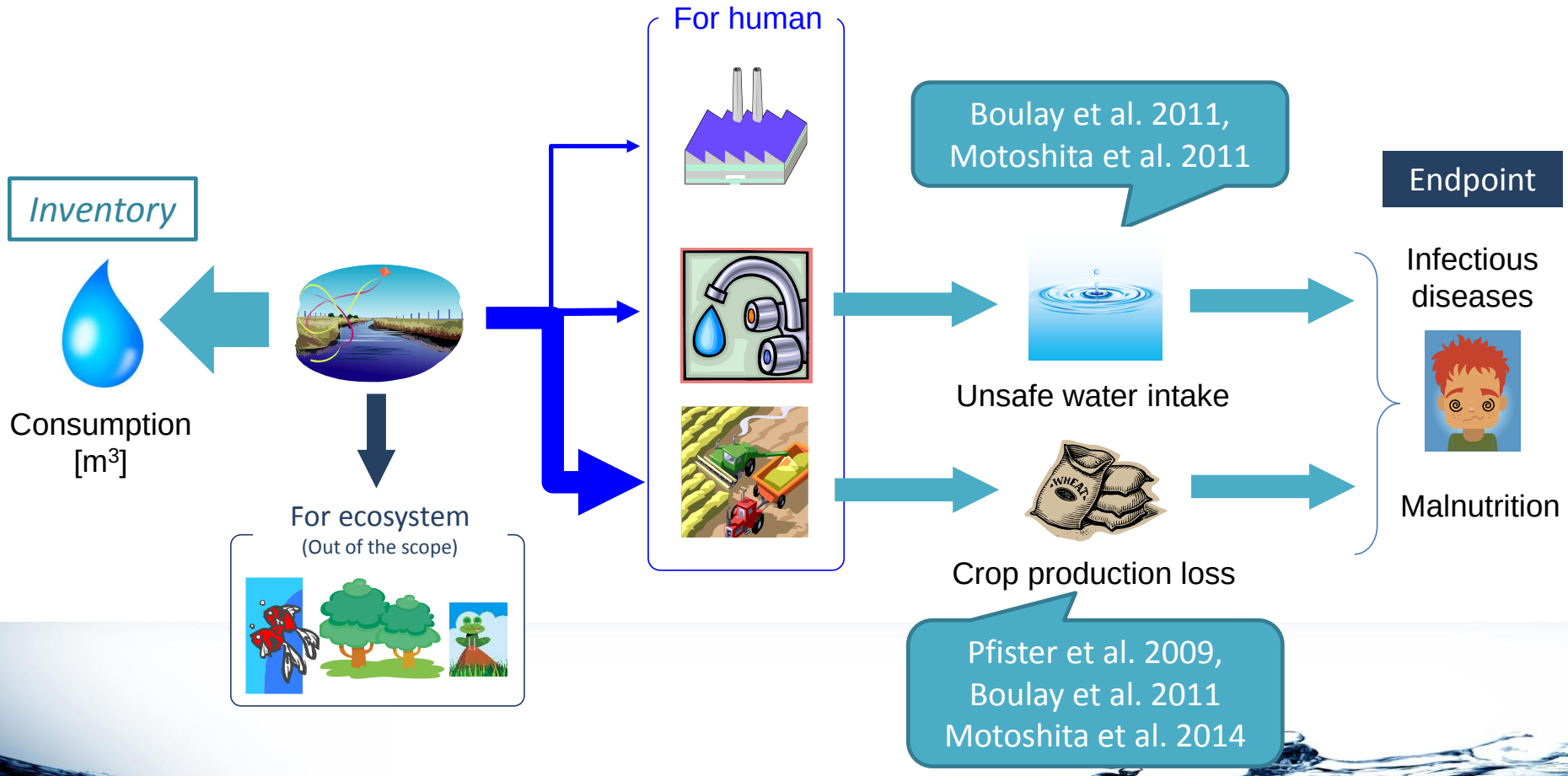
2 year work process
>15 hours of meeting
8 Experts consulted in a workshop (Barcelona 2015)



7 Members:

Jane Bare
Anne-Marie Boulay
Cécile Bulle
Masaharu Motoshita*
Stephan Pfister
Charlotte Pradinaud
Bradley Ridoutt
** Lead*

Previously existing models

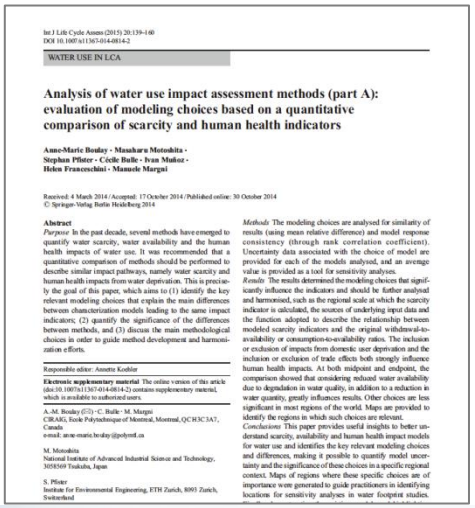


Same impact pathways but *different approaches* (ex. Stress index, Effect factor, w/o food trade effect etc.)

Consensus building process

Analysis for method comparison

~April 2015



Int J Life Cycle Assess (2015) 20:139–160
DOI 10.1007/s11367-014-0814-2

WATER USE IN LCA

Analysis of water use impact assessment methods (part A): evaluation of modeling choices based on a quantitative comparison of scarcity and human health indicators

Anne-Marie Boulay · Masaharu Motoshita · Stephan Pfister · Cécile Bulle · Ivan Muñoz · Helen Franceschini · Manuele Margni

Received: 4 March 2014 / Accepted: 17 October 2014 / Published online: 30 October 2014
© Springer-Verlag Berlin Heidelberg 2014

Abstract

Purpose In the past decade, several methods have emerged to quantify water scarcity, water availability and the human health impacts of water use. It was recommended that a quantitative comparison of methods should be performed to describe similar impact pathways, namely water scarcity and human health impacts from water deprivation. This is precisely the goal of this paper, which aims to (1) identify the key relevant modeling choices that explain the main differences between characterization models leading to the same impact indicators; (2) quantify the significance of the differences between methods, and (3) discuss the main methodological choices in order to guide method development and harmonization efforts.

Methods The modeling choices are analysed for similarity of results (using mean relative difference) and model response consistency (through rank correlation coefficient). Uncertainty data associated with the choice of model are provided for each of the models analysed, and an average value is provided as a tool for sensitivity analyses.

Results The results determined the modeling choices that significantly influence the indicators and should be further analysed and harmonised, such as the regional scale at which the scarcity indicator is calculated, the sources of underlying input data and the function adopted to describe the relationship between modeled scarcity indicators and the original withdrawal-to-availability or consumption-to-availability ratios. The inclusion or exclusion of impacts from domestic user deprivation and the inclusion or exclusion of trade effects both strongly influence human health impacts. At both midpoint and endpoint, the comparison showed that considering reduced water availability due to degradation in water quality, in addition to a reduction in water quantity, greatly influences results. Other choices are less significant in most regions of the world. Maps are provided to identify the regions in which such choices are relevant.

Conclusions This paper provides useful insights to better understand scarcity, availability and human health impact models for water use and identifies the key relevant modeling choices and differences, making it possible to quantify model uncertainty and the significance of these choices in a specific regional context. Maps of regions where these specific choices are of importance were generated to guide practitioners in identifying locations for sensitivity analyses in water footprint studies.

Responsible editor: Annette Koehler

Electronic supplementary material The online version of this article (doi:10.1007/s11367-014-0814-2) contains supplementary material, which is available to authorized users.

A.-M. Boulay (✉) · C. Bulle · M. Margni
CIRAIG, École Polytechnique of Montreal, Montreal, QC H3C 3A7, Canada
e-mail: anne-marie.boulay@polymtl.ca

M. Motoshita
National Institute of Advanced Industrial Science and Technology, 3058569 Tsukuba, Japan

S. Pfister
Institute for Environmental Engineering, ETH Zurich, 8093 Zurich, Switzerland

Boulay et al. (2015): *Int J Life Cycle Assess,* 20:139–160
DOI 10.1007/s11367-014-0814-2

Understand differences and identify key issues

Consultation with experts from outside WULCA

@May 2015

Expert workshop@BCN

Reasonable modeling choices

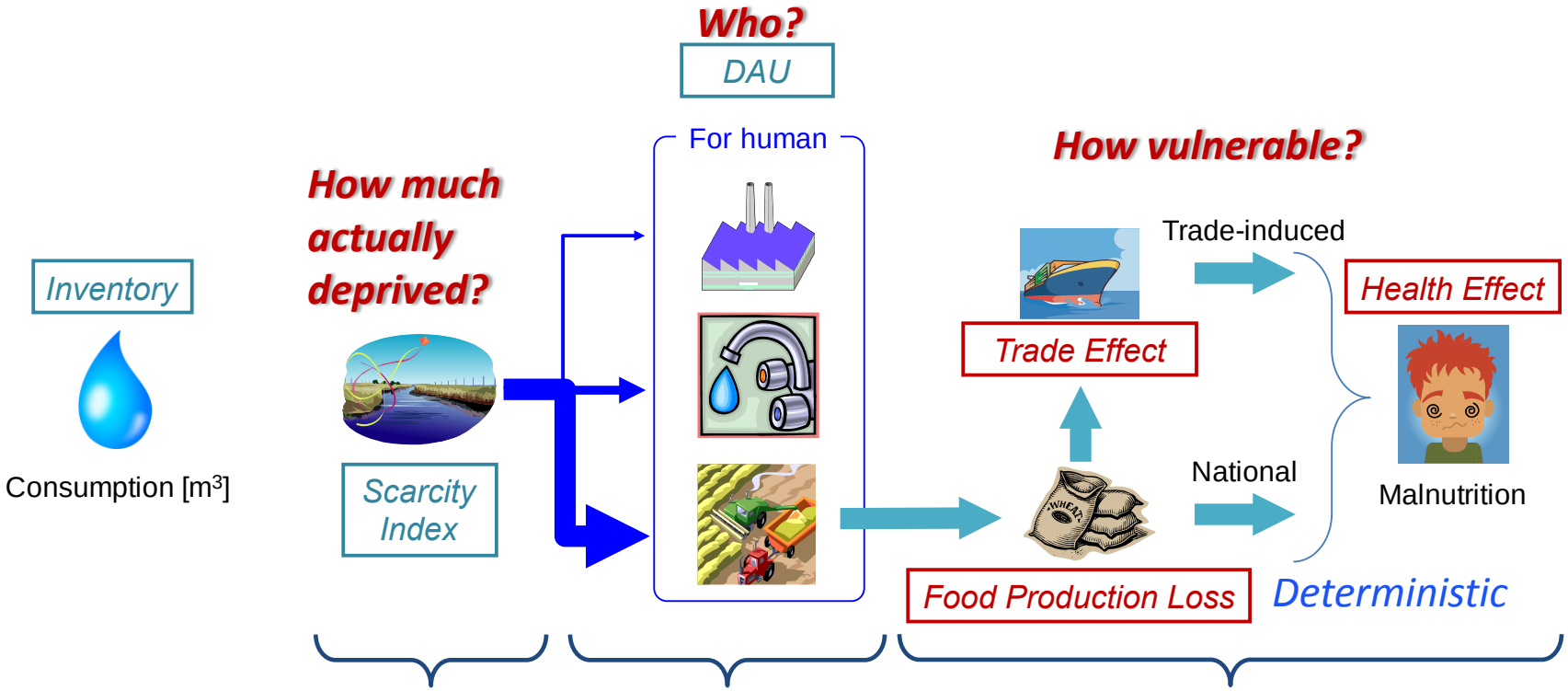
Discussion with experts for making recommendation

@January 2016

Pellston workshop@VLC

Recommendation for application and further improvement in methods

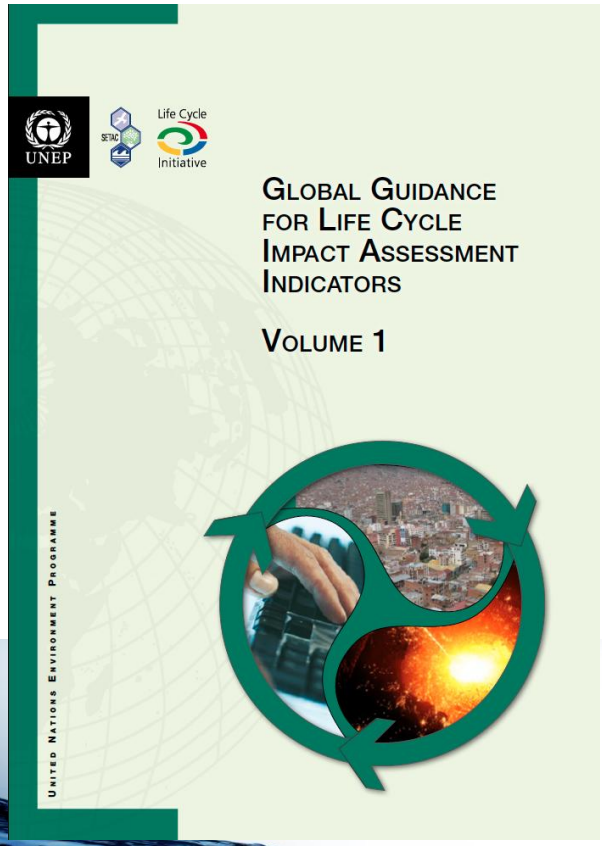
Basic structure of modeling

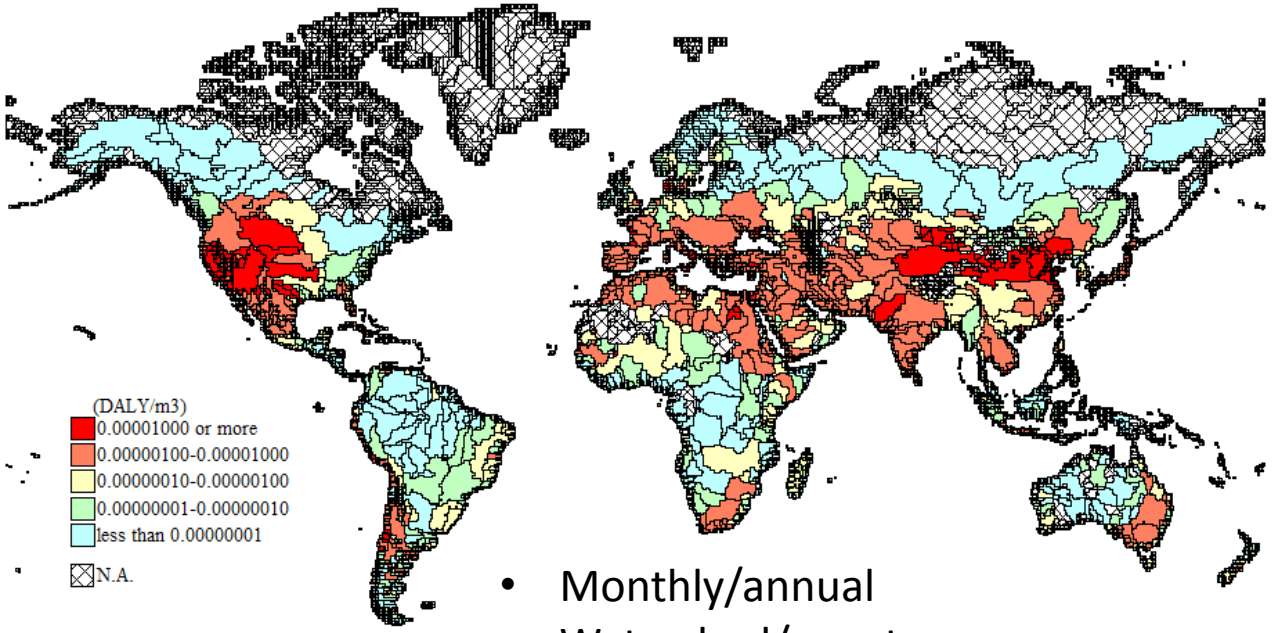


Characterization Factor (CFs)	=	Scarcity Index	×	Distribution to Affected Users	×	Socio-Economic effect factor
[DALYs /m³-consumption]		(m³-deprivation)/ (m³-consumption)		(m³-agri/domestic)/ (m³-deprivation)		DALYs/ (m³-agri/domestic)

Fate factor | **Effect factor**

CFs for agricultural water consumption





- Monthly/annual
- Watershed/country
- Elementary flow (agri/non-agri)

		CFs [DALY/m3]		
		National damage	Trade-induced damage	Total damage
Developed country	Germany	0	7.20E-07	7.20E-07
Middle income country	Columbia	4.49E-08	1.00E-07	1.45E-07
Developing country	Mozambique	4.08E-07	5.34E-07	9.42E-07

Activities in last year

- **The Pellston Workshop** *Jan. 2016*

  Recommendations for application and modeling

  => Finalizing the report of discussion and recommendation

- **SETAC Europe AM 2016 (Nantes, France)** *May 2016*

  Dissemination of final recommendations from Pellston WS

- **EcoBalance 2016 (Kyoto, Japan)** *Oct. 2016*

  Dissemination of final recommendations from Pellston WS

- **Publication of guidance from the Pellston WS** *Jan. 2017*

  Publication of UNEP/SETAC global LCIA indicator guidance volume 1

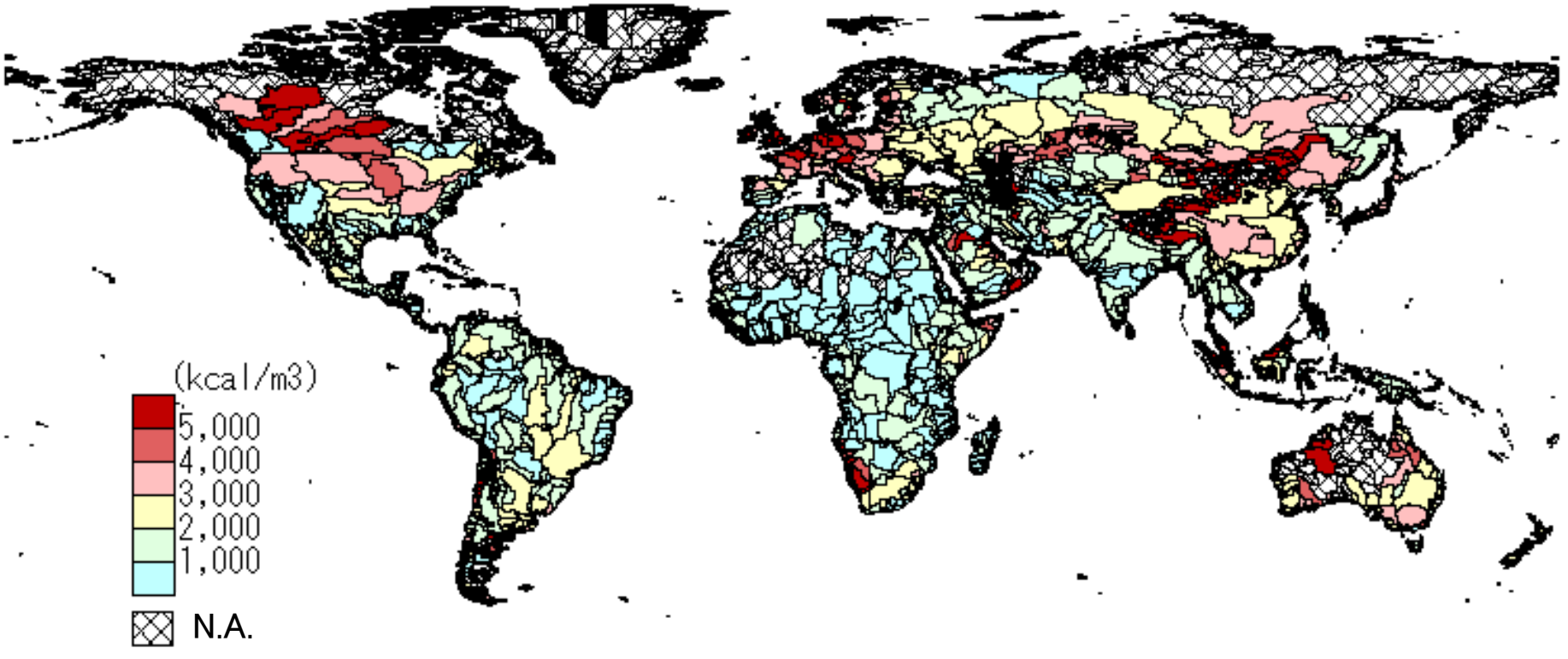
  => Chapter 5: Water use related impacts

Further improvement

- ***Agriculture water scarcity***
  - ❑ **Refinement of geographical resolution**
    - ✓ Food productivity
      => preliminary calculation was done
  - ❑ **Update of trade model data**

- ***Domestic water scarcity***
  - ❑ Additional analysis and discussion on the **impact pathway** **associated with** **domestic water scarcity**

Geographical resolution: Food productivity



QUESTIONS?

Masaharu Motoshita, PhD

National Institute of Advanced Industrial Science & Technology (AIST)

m-motoshita@aist.go.jp

www.wulca-waterlca.org

WULCA

A LIFE CYCLE INITIATIVE PROJECT

“Resource” sub-group

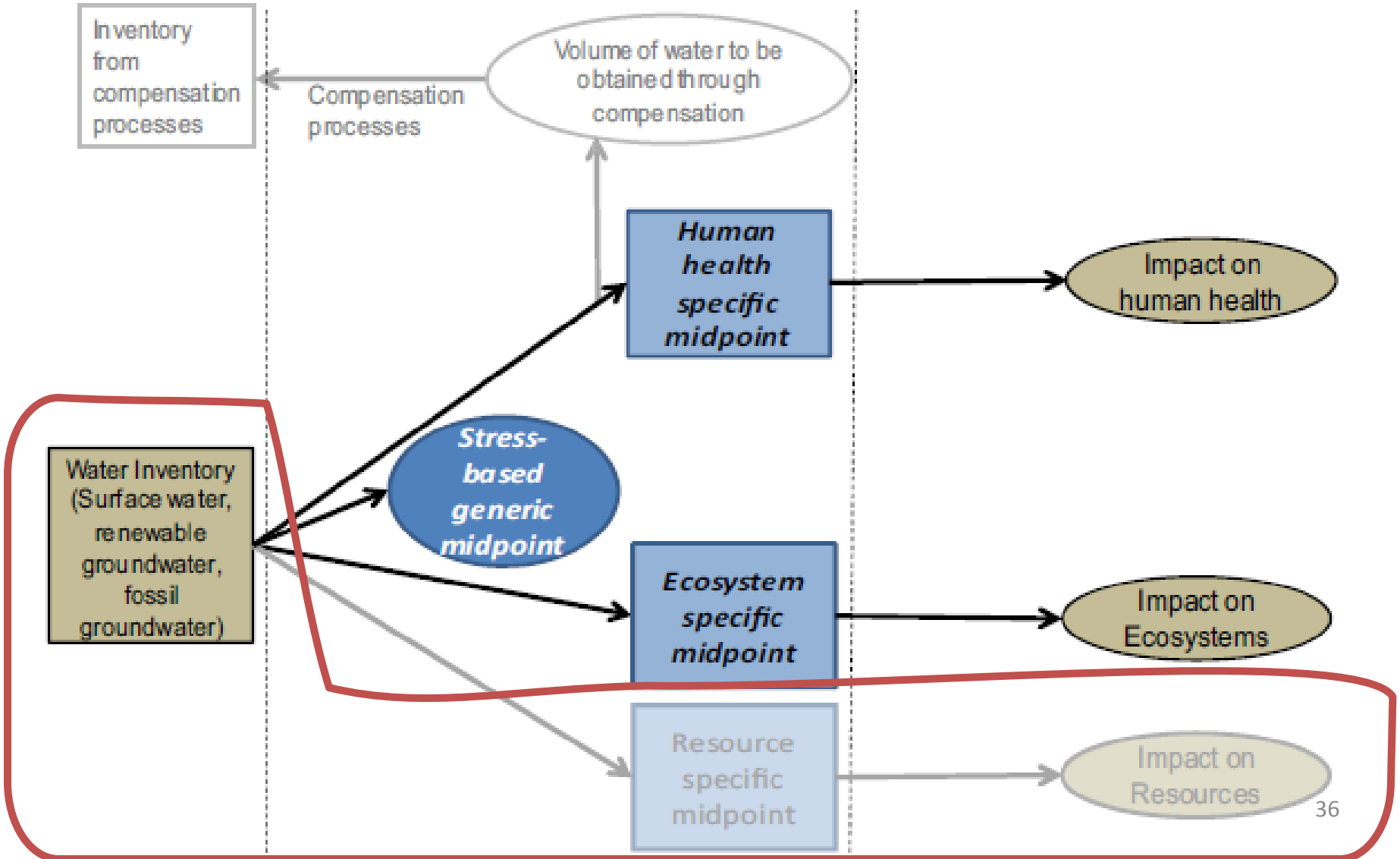
Brussels - May 11th, 2017

Current group members

14 people for now

Anne-Marie Boulay	(CAN)	Academia
Stephen Northey	(AUS)	Academia
Pradinaud Charlotte	(FRA)	Academia
Manuele Margni	(CAN)	Academia
Markus Berger	(DEU)	Academia
Briana Niblick	(US)	Government
Andrew Henderson	(US)	Industry
Jane Bare	(US)	Government
Lorenzo Benini	(ITA)	Government
Michael Lathuilliere	(CAN)	Academia
Nick Santero	(US)	Industry
Ralph Rosenbaum	(FRA)	Academia
Thomas Sonderegger	(CHE)	Academia
Stephan Pfister	(CHE)	Academia

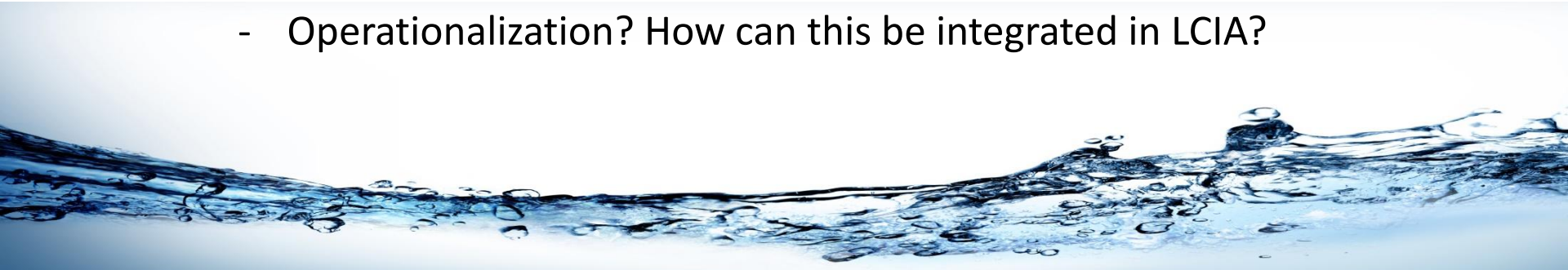
Resource sub-group Scope



Resource sub-group
Why?

- A general consensus : "resources" should be measured as an AoP or damage category.

- Very limited development on :
  - what do we conceptually mean by impacts to “**water resources**“?
  - what do we want to protect?
  - what about **life-supporting resources**?
  - what are relevant impact pathways?
  - how this could be measured?
  - Operationalization? How can this be integrated in LCIA?



Resource sub-group
Why?

→ Several pending questions…

- ✓ To improve the visibility of freshwater as a resource in LCA
- ✓ To capture the impacts not covered by the AoP human health and ecosystems

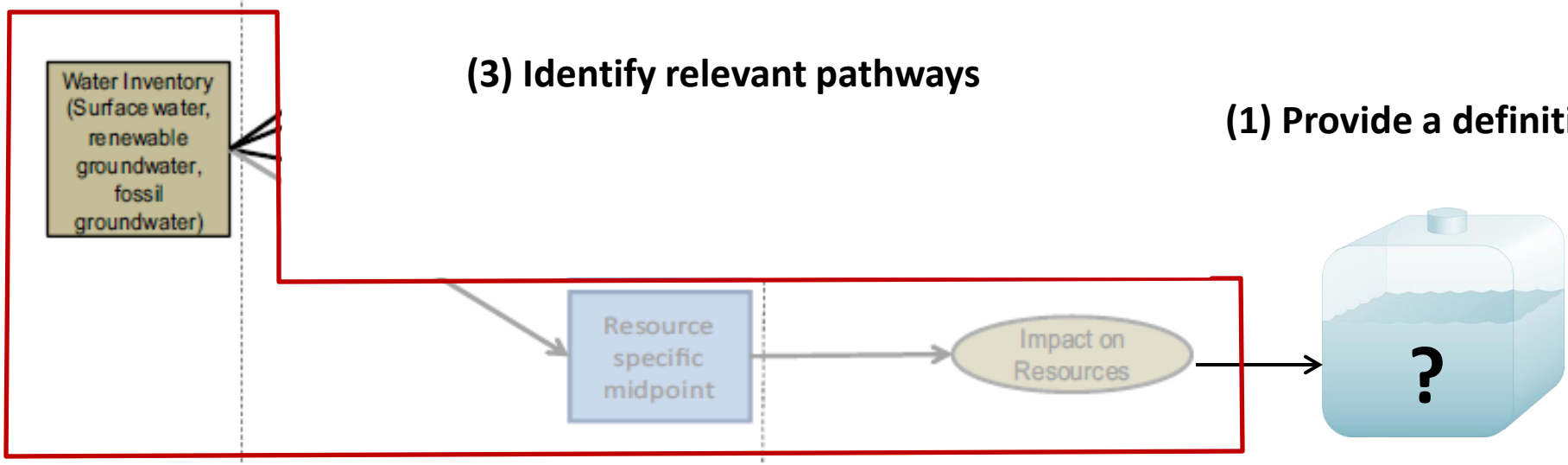
Resource sub-group Goal

To develop the conceptual framing, methodology or recommendations for assessing the **impacts of water use to the AoP resources**

(2) Dvl a framework

(3) Identify relevant pathways

(1) Provide a definition



Resource sub-group
The short story

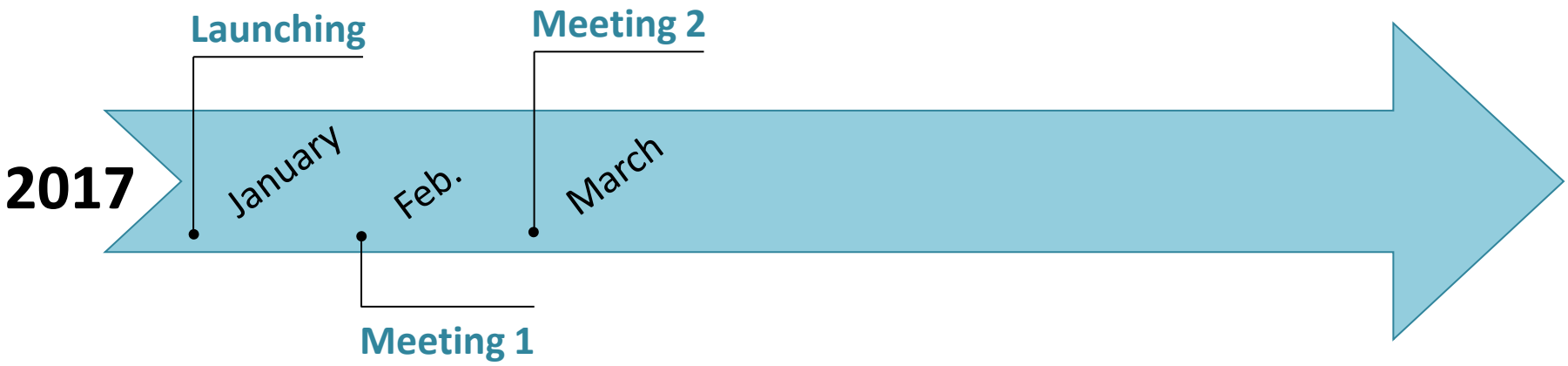
- Stephen N. took the lead of the group
- Compilation of individual ideas, perspectives and background

Resource sub-group
The short story

- The objective is to develop a framework
- The deliverable will be a framework paper, not a characterization method
- Discussion about an ongoing PhD thesis with very similar objectives

Resource sub-group
The short story

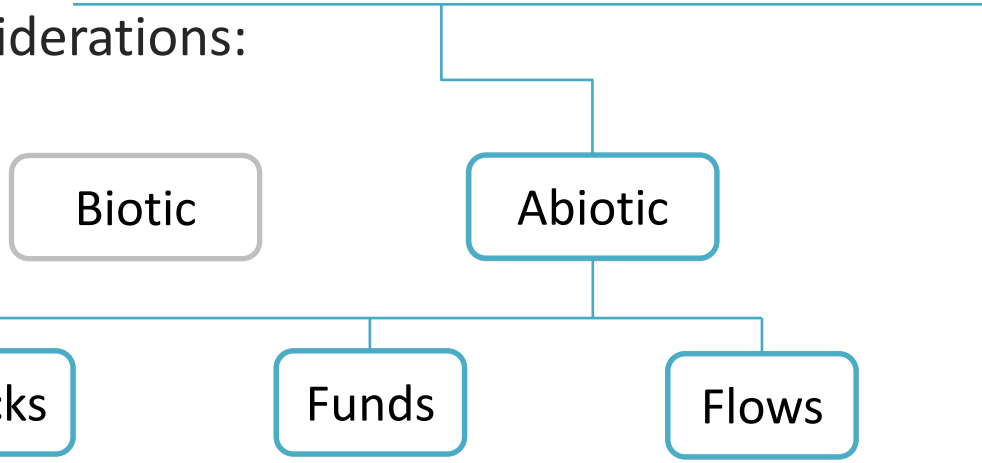
- Presentation of ongoing PhD work as a first input to the group



I. Definition of freshwater as part of the AoP Natural Resources

Some considerations:

Physical considerations



Geological time scale
Isolated groundwater
Fossil groundwater
Ice cap, glaciers

Human lifetimes
Lakes
Wetlands
Reservoirs
Some groundwater

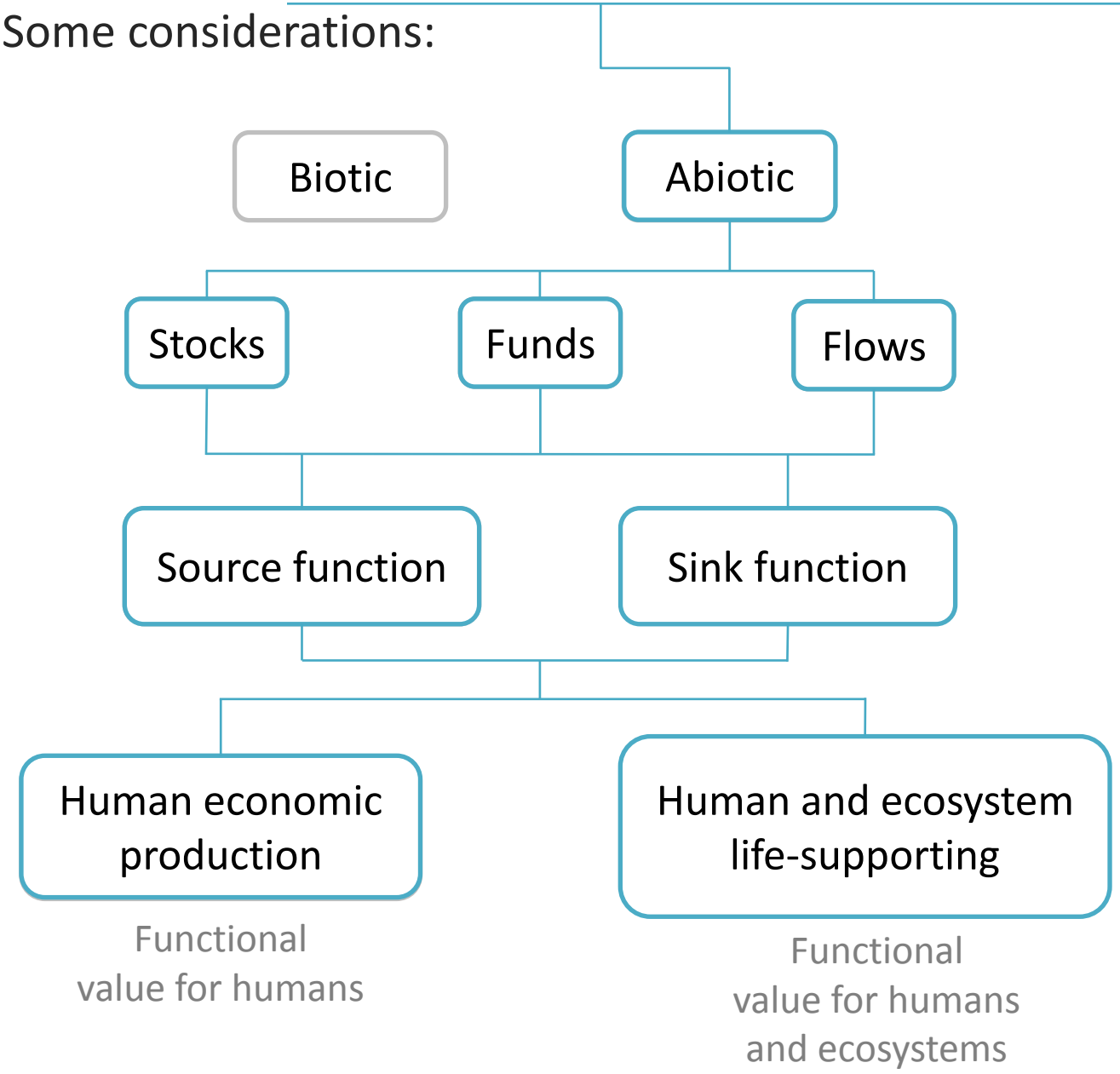
Constantly regenerated
Biospheric water
Atmospheric water
River channels

I. Definition of freshwater as part of the AoP Natural Resources

Some considerations:

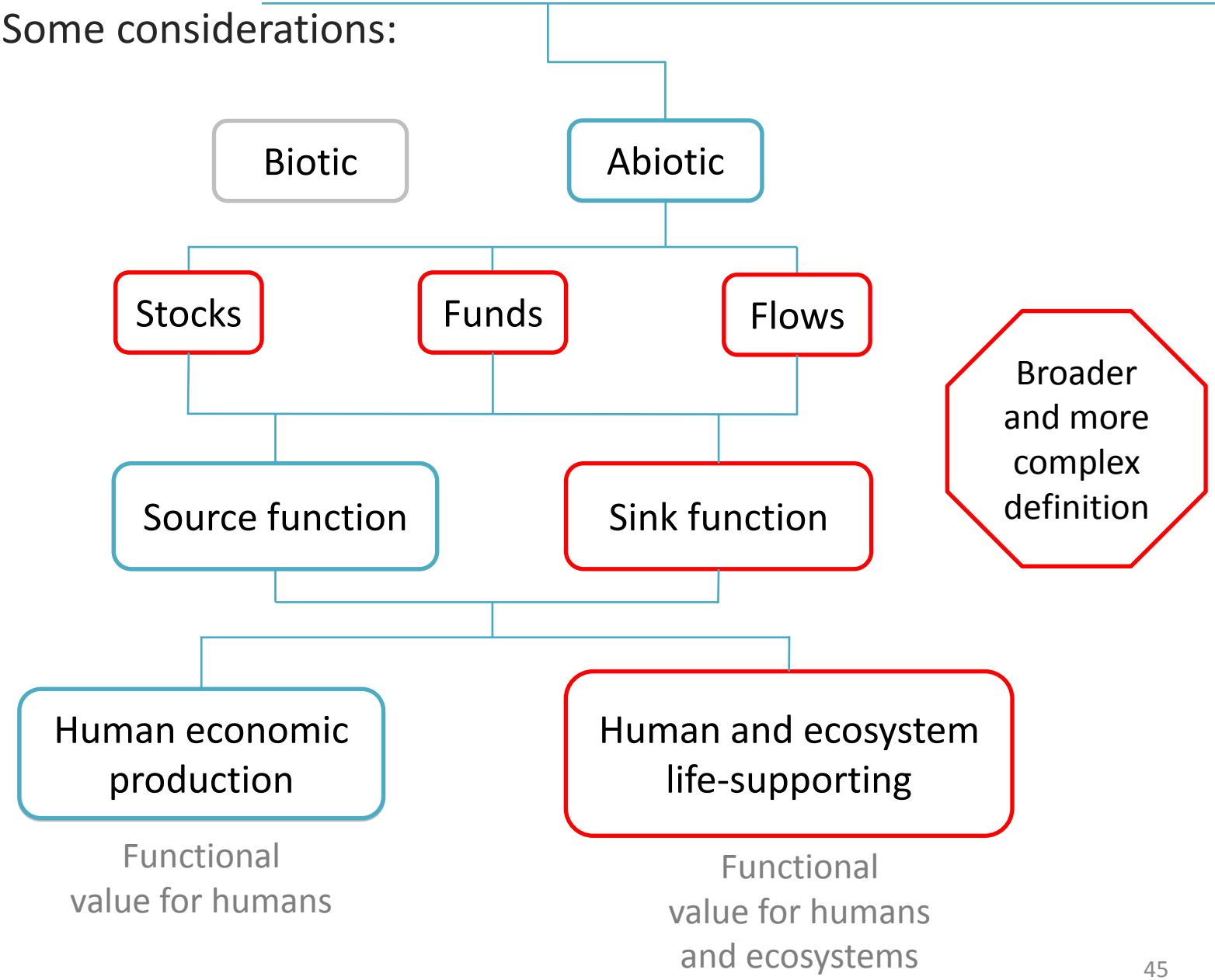
Physical considerations

Functional considerations



I. Definition of freshwater as part of the AoP Natural Resources

Some considerations:



I. Definition of freshwater as part of the AoP Natural Resources

What do we want to protect?

Available methods and frameworks agree to protect the **QUANTITY** of freshwater remaining **for future users /generations**

→ What about the **QUALITY** of freshwater resources remaining?

Definition (starting point)

The **local** freshwater "**reservoir**" for **future users**,
to support all life and human economic activities.

I. Definition of freshwater as part of the AoP Natural Resources

What do we want to protect?

Available methods and frameworks agree to protect the **QUANTITY** of freshwater remaining **for future users /generations**

→ What about the **QUALITY** of freshwater resources remaining?

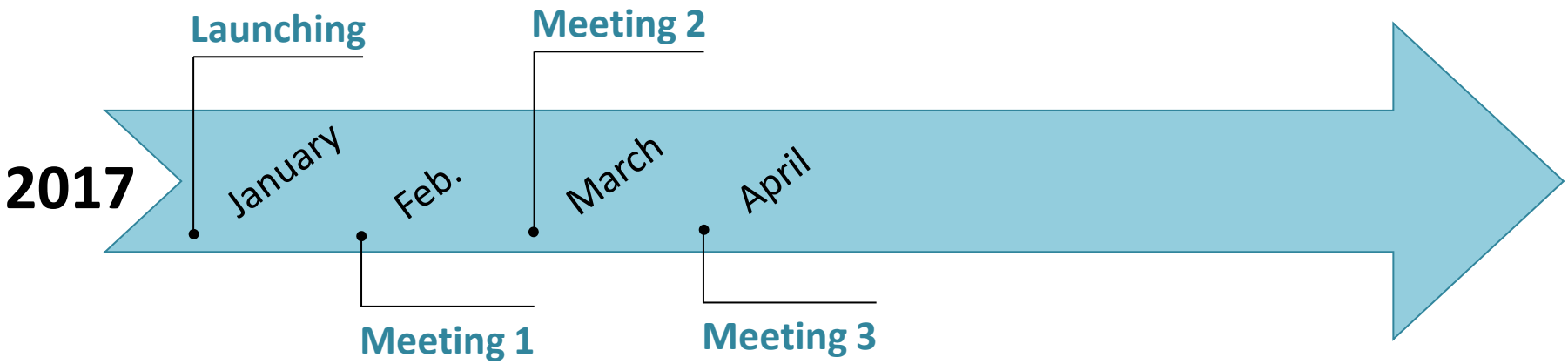
→ What is the relevant **time horizon**?

A freshwater resource damage indicator should the changes in both

- **available quantity**
- **degree of usability (quality)**

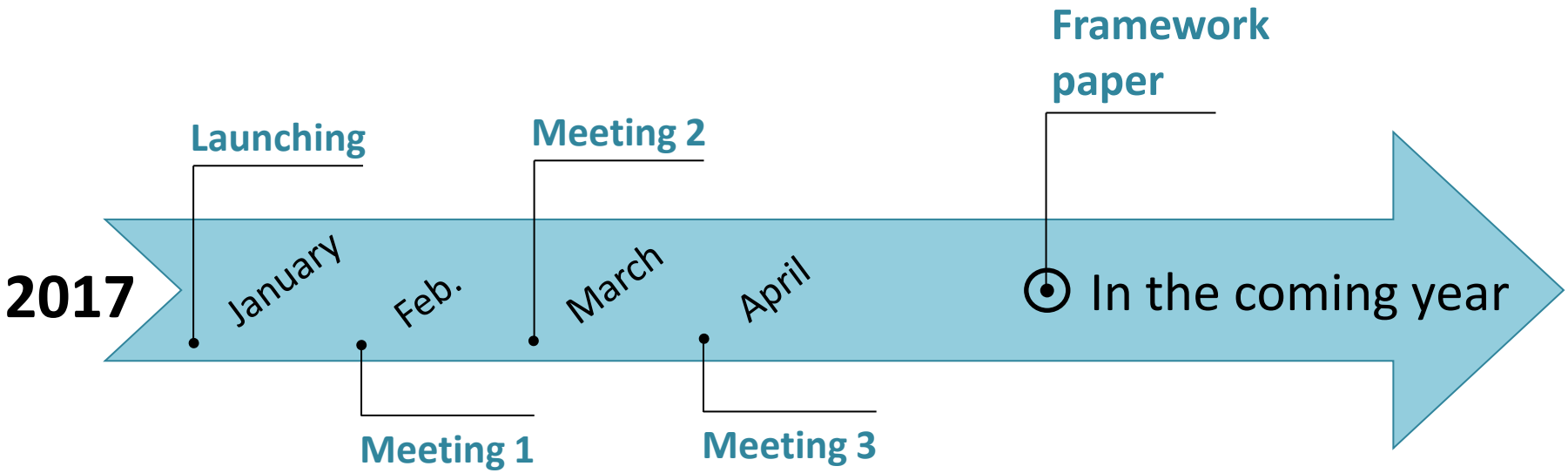
of the freshwater "reservoir" remaining for **future users**"

Resource sub-group
The short story



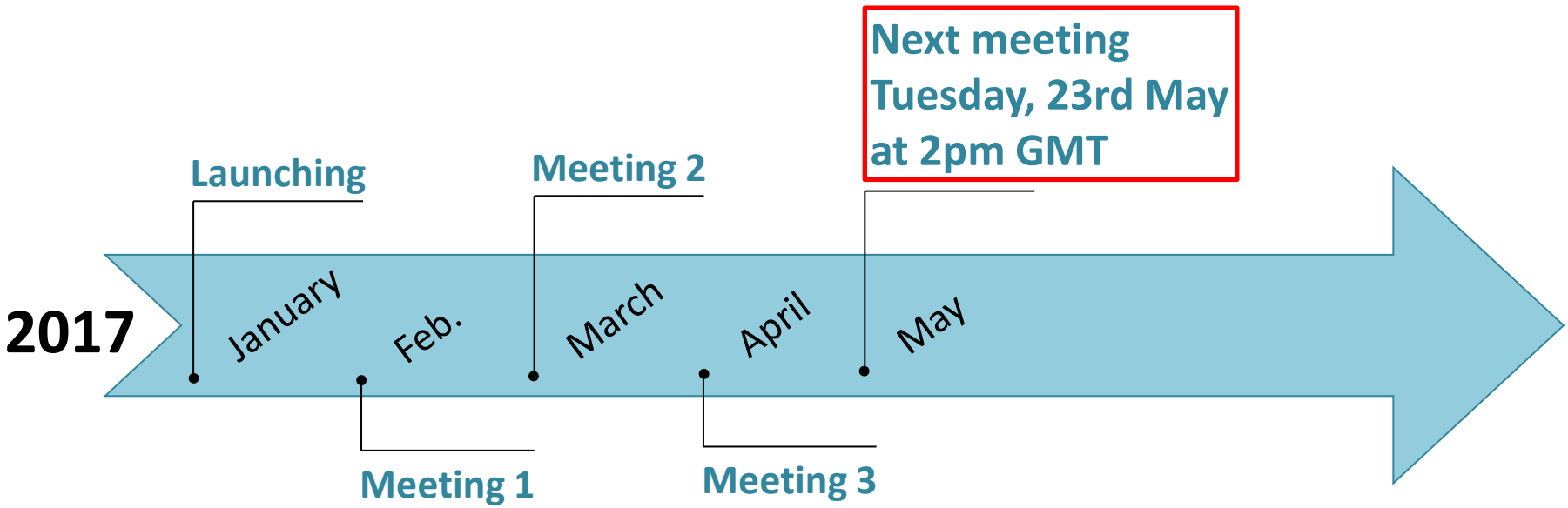
- Start working with a draft manuscript

Resource sub-group
Perspectives



Resource sub-group

→ Call for participation!



Resource sub-group

→ Call for participation!

To join the group, or get informed:

Stephen Northey
stephen.northey@monash.edu

Next meeting
Tuesday, 23rd May
at 2pm GMT

WULCA

A LIFE CYCLE INITIATIVE PROJECT

THANK YOU FOR YOUR ATTENTION