WULCA

A LIFE CYCLE INITIATIVE PROJECT

Life Cycle Initiative

UNEP

SETAC

**SETAC Europe – Glasgow- 12.05.2013**

*Anne-Marie Boulay, PhD Candidate*

# Quantitative method comparison

# OUTLINE

- **Project description**
- **Paper A: Methodology overview**
- **Paper A: Selected results**
- **Paper B: Methodology overview**
- **Paper B: Selected results**

***Presented as the case study in one hour…***

- **Outcome and conclusion**

# Project description

**Water Use in LCA (WULCA)**
**UNEP/SETAC Life Cycle Initiative group**

UNEP SETAC Life Cycle Initiative

*Masaharu Motoshita, Stephan Pfister*

**Case study application**
**Quantis**
**Unilever**

Quantis Sustainability counts

Unilever

*Ivan Munoz, Helen Franceschini, (Jean-Baptiste Bayart)*

**Thesis Project**
**Anne-Marie Boulay**

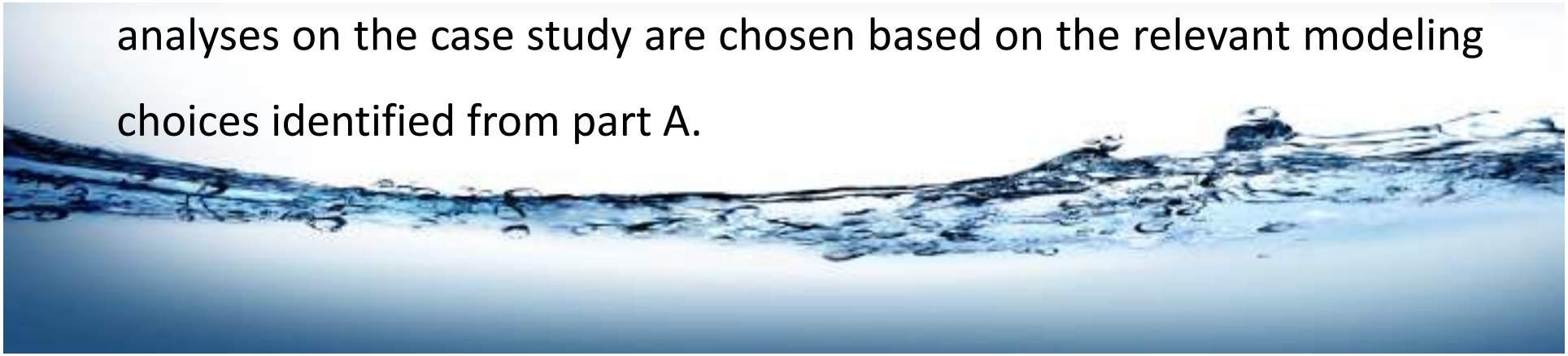
CIRAIG

ÉCOLE POLYTECHNIQUE MONTRÉAL

*Cécile Bulle, Manuele Margni*

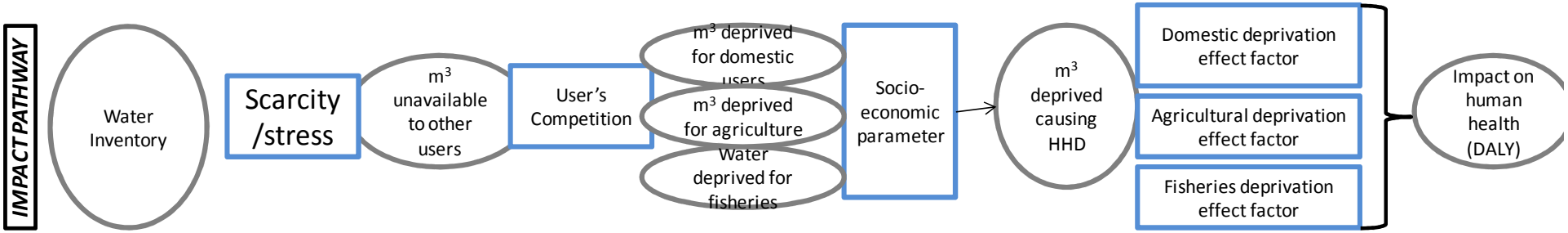
# Project Description- 2 papers

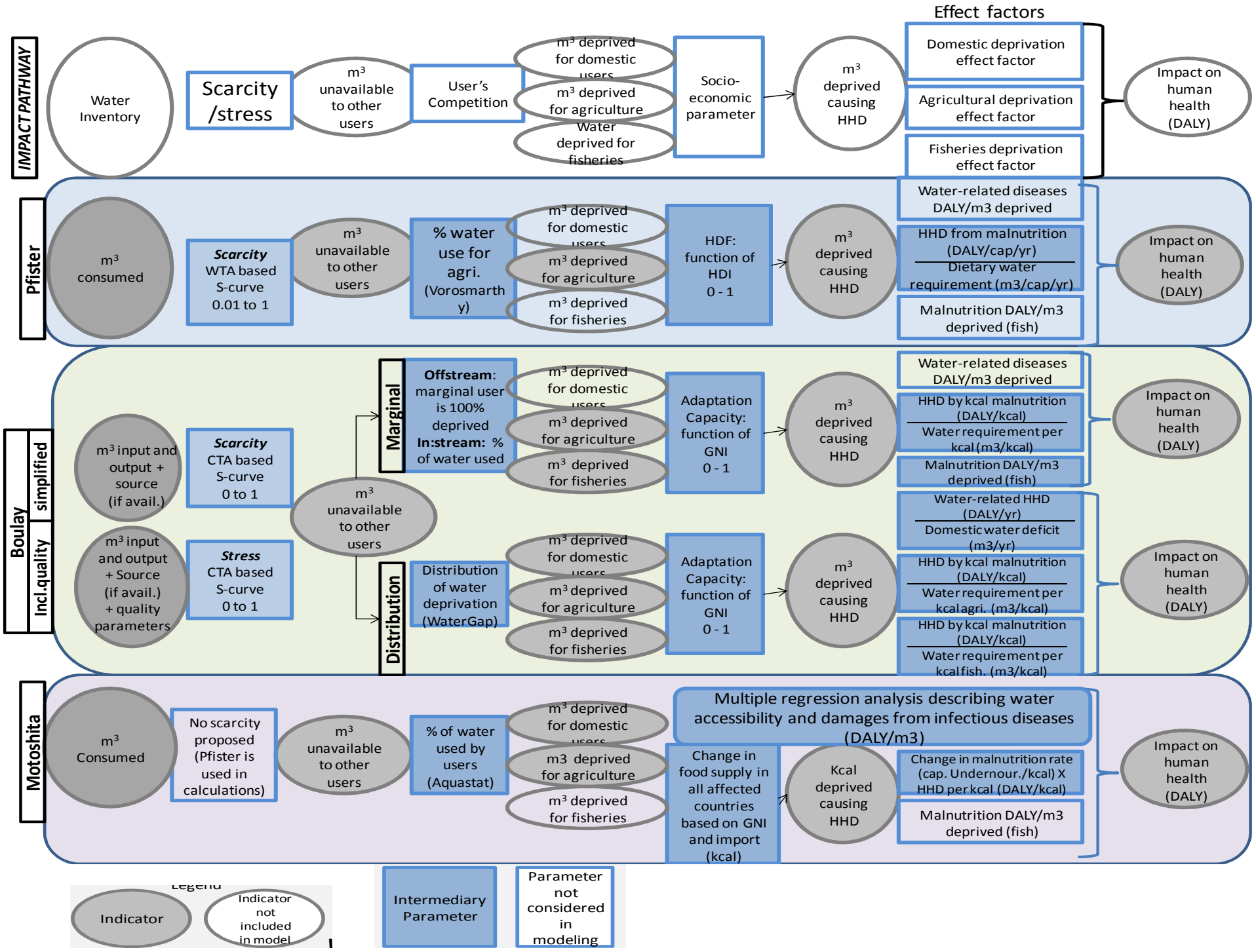
- **Part A:** identification of the relevant modeling choices analyzing the main differences between water impact assessment methods (scarcity, stress and impacts on human health), and assessing of their overall spatial variability and model uncertainty
- **Part B:** illustration of applicability of water footprint methods through a case study on a load of laundry and discussion of methods consistency, reliability and limitations for decision making. Sensitivity analyses on the case study are chosen based on the relevant modeling choices identified from part A.



# Part A: Methodology overview

- **Methods compared:**
  - **Scarcity:** Swiss Ecoscarcity, Pfister et al WSI, Boulay et al (simplfied), WFN Blue water scarcity
  - **Stress:** Veolia Water Impact Index, Boulay et al.
  - **Human health:** Boulay et al (marginal and distribution), Motoshita et al (domestic and agriculture), Pfister et al.


IMPACT PATHWAY
Water Inventory
Scarcity /stress
m3 unavailable to other users
User's Competition
m3 deprived for domestic users
m3 deprived for agriculture
Water deprived for fisheries
Socio-economic parameter
m3 deprived causing HHD
Domestic deprivation effect factor
Agricultural deprivation effect factor
Fisheries deprivation effect factor
Impact on human health (DALY)


IMPACT PATHWAY
Water Inventory
Scarcity /stress
m³ unavailable to other users
User's Competition
m³ deprived for domestic users
m³ deprived for agriculture
Water deprived for fisheries
Socio-economic parameter
m³ deprived causing HHD
Effect factors
Domestic deprivation effect factor
Agricultural deprivation effect factor
Fisheries deprivation effect factor
Impact on human health (DALY)
Pfister
m³ consumed
Scarcity WTA based S-curve 0.01 to 1
m³ unavailable to other users
% water use for agri. (Vorosmarthy)
m³ deprived for domestic users
m³ deprived for agriculture
m³ deprived for fisheries
HDF: function of HDI 0 - 1
m³ deprived causing HHD
Water-related diseases DALY/m3 deprived
HHD from malnutrition (DALY/cap/yr) / Dietary water requirement (m3/cap/yr)
Malnutrition DALY/m3 deprived (fish)
Impact on human health (DALY)
Boulay
simplified
Incl.quality
m³ input and output + source (if avail.)
m³ input and output + Source (if avail.) + quality parameters
Scarcity CTA based S-curve 0 to 1
Stress CTA based S-curve 0 to 1
m³ unavailable to other users
Marginal
Distribution
Offstream: marginal user is 100% deprived In:stream: % of water used
Distribution of water deprivation (WaterGap)
m³ deprived for domestic users
m³ deprived for agriculture
m³ deprived for fisheries
Adaptation Capacity: function of GNI 0 - 1
m³ deprived causing HHD
Water-related diseases DALY/m3 deprived
HHD by kcal malnutrition (DALY/kcal) / Water requirement per kcal (m3/kcal)
Malnutrition DALY/m3 deprived (fish)
Water-related HHD (DALY/yr) / Domestic water deficit (m3/yr)
HHD by kcal malnutrition (DALY/kcal) / Water requirement per kcal agri. (m3/kcal)
HHD by kcal malnutrition (DALY/kcal) / Water requirement per kcal fish. (m3/kcal)
Impact on human health (DALY)
Motoshita
m³ Consumed
No scarcity proposed (Pfister is used in calculations)
m³ unavailable to other users
% of water used by users (Aquastat)
m³ deprived for domestic users
m3 deprived for agriculture
m³ deprived for fisheries
Multiple regression analysis describing water accessibility and damages from infectious diseases (DALY/m3)
Change in food supply in all affected countries based on GNI and import (kcal)
Kcal deprived causing HHD
Change in malnutrition rate (cap. Undernour./kcal) X HHD per kcal (DALY/kcal)
Malnutrition DALY/m3 deprived (fish)
Impact on human health (DALY)
Legend
Indicator
Indicator not included in model
Intermediary Parameter
Parameter not considered in modeling

# Part A: Methodology overview

**Direct model comparisons- complete CF and individual components comparison for:**

- **Scarcity**
- **Stress**
- **Domestic HH impacts- socio economic and effect factors**
- **Agriculture HH impacts- socio economic and effect factors**

**Specific modeling choices:**

- **Temporal resolution scale**
- **Water source (ground, surface or not specified)**
- **Regional resolution scale**
- **Quality aspect**
- **Scarcity modeling choices (WTA vs CTA, model algorithm and data source)**
- **Human user deprived (fisheries, domestic, source of data)**
- **Inclusion of trade effect**

**Uncertainty associated with choice of model**

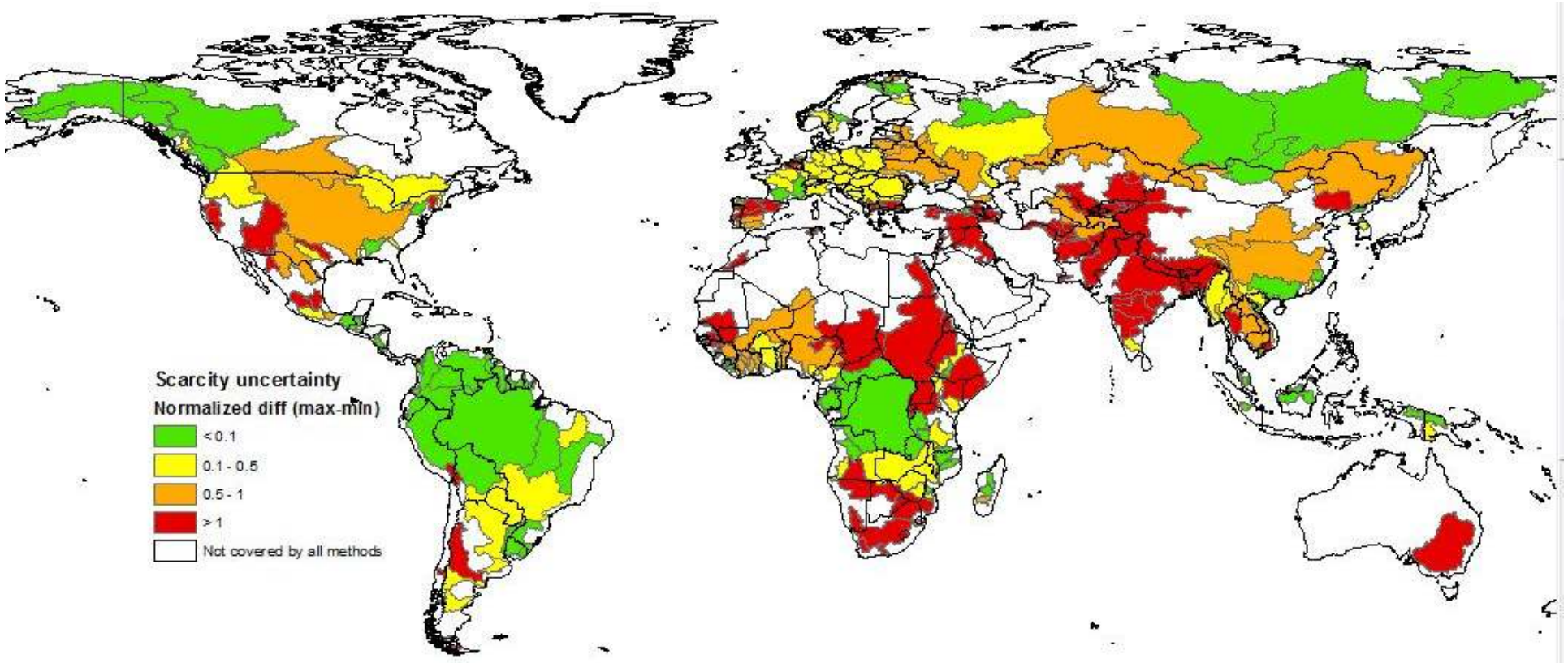
# Part A: Methodology overview

**Analysis – for each comparison or choice analyzed:**

- **Difference (mean difference coefficient)**
- **Consistency of model response (Rank Correlation Coefficient)**
- **Geographical difference (Maps with difference)**

# Part A: Selected results

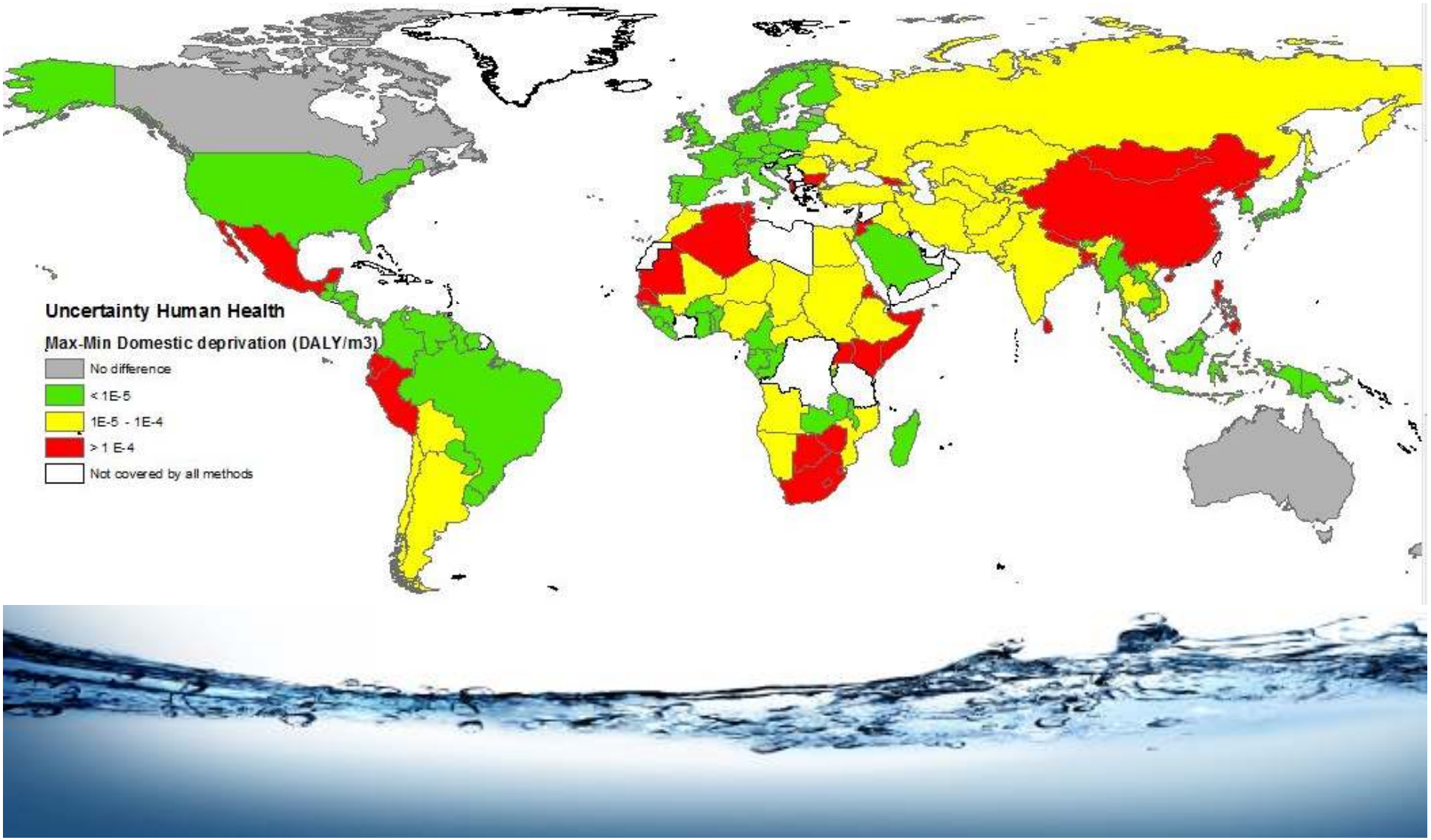
## Difference between scarcity models




***More results on comparison and modeling choice of scarcity indicators presented on Tuesday, 12:10, room Dochart***

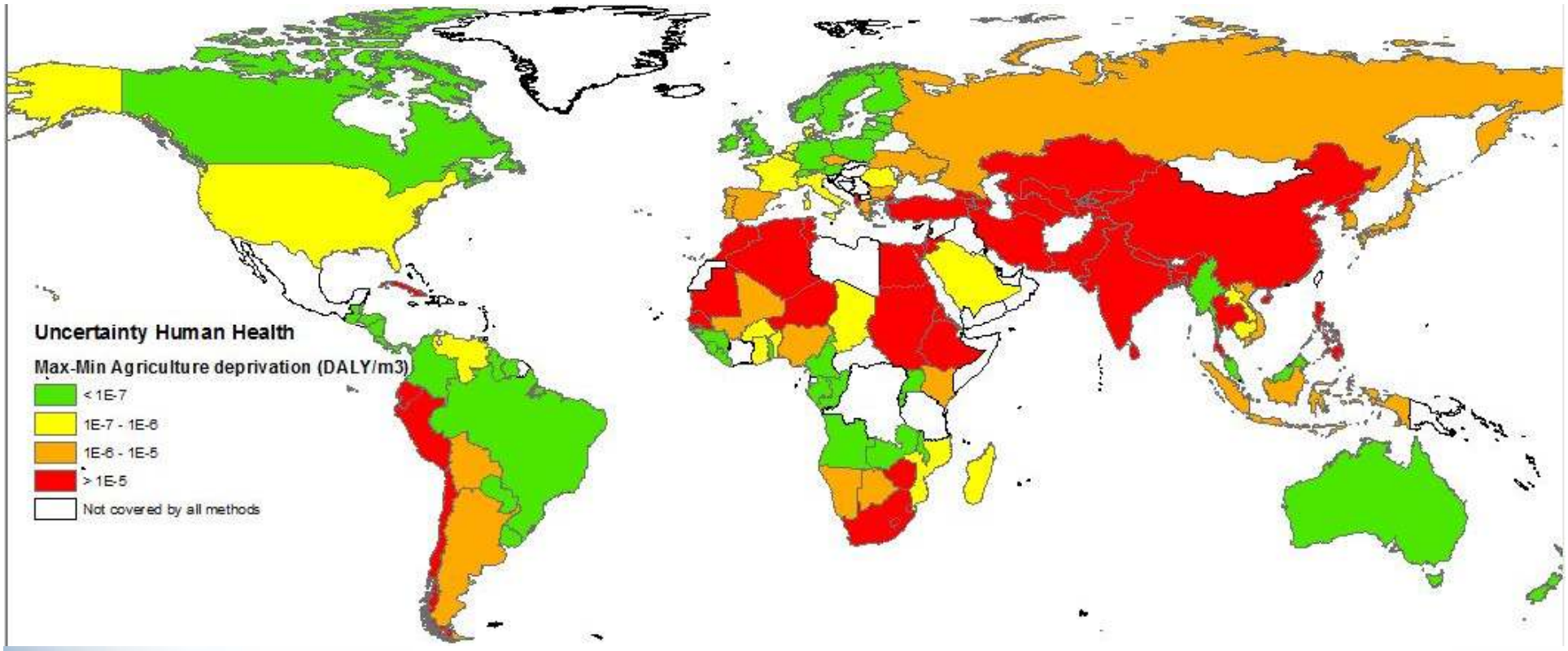
# Part A: Selected results

## Model difference between impacts from domestic deprivation



# Part A: Selected results

## Model difference between impacts from agricultural deprivation

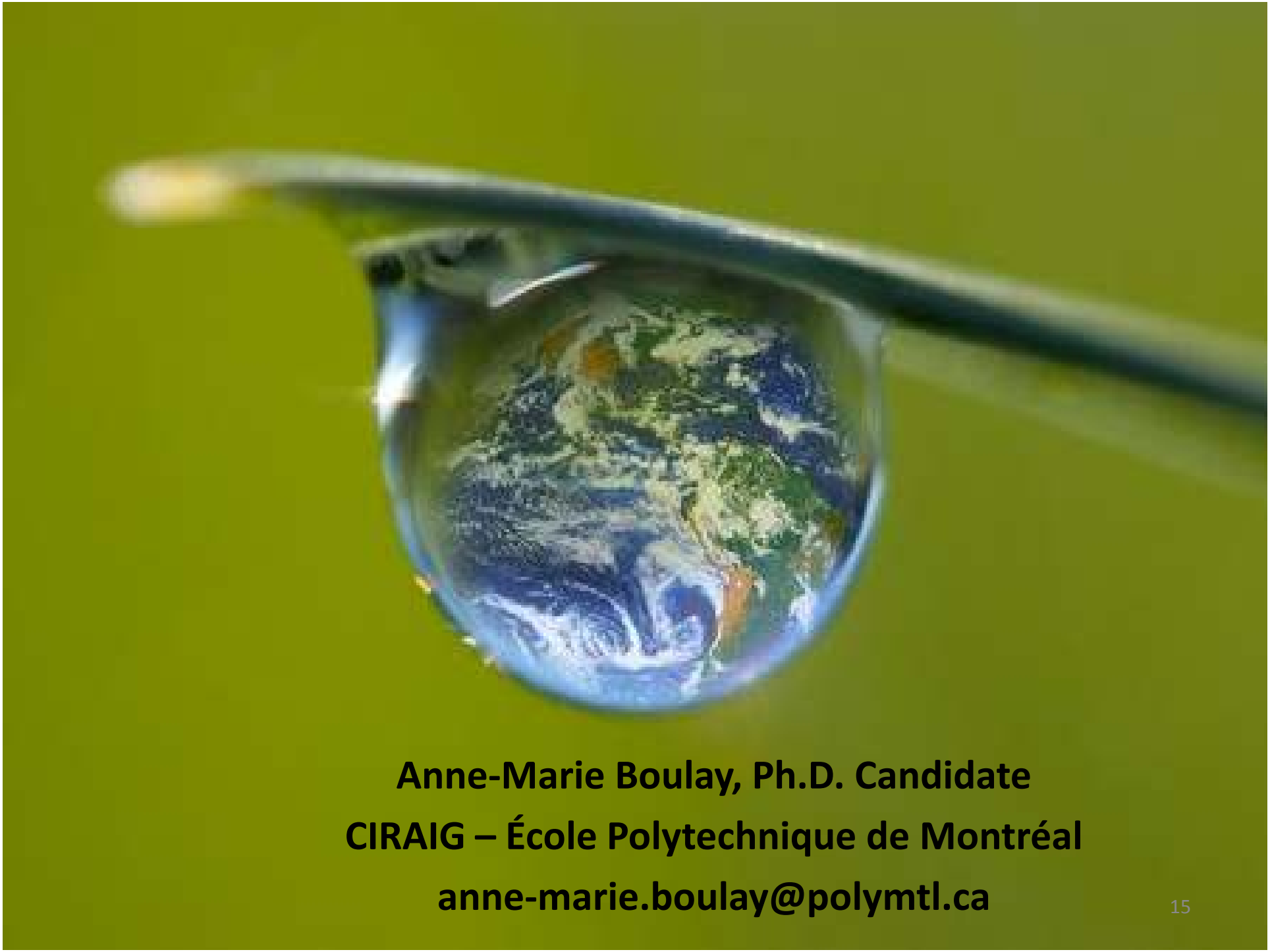



# Part B: Case Study

- Case study performed on one load of laundry
- Goal: illustrate how different water-related methods can be applied within a water footprint study of a laundry detergent and discuss their applicability
- Water footprint profile presented at midpoint and endpoint
- → Details presented in the case study section (in half hour)

# Outcome and conclusion

- Step towards harmonized methodology: understanding of important modeling choices and building blocks of indicators
- Case study in line with current ISO DIS 14046 on Water Footprint and applicability discussion
- Papers submitted on May 6th (timelime limited by PhD)
- WULCA to approve the papers as WULCA papers, and input from remaining model developers to occur during review process



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