Evaluation of global water quality - the potential of a data- and model-driven analysis

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WWQA

A. Background

The water quality challenge:

· Implementation of MDGs & SDGs => sewerage connections increasing => wastewater production expected to at least double by 2050

· If wastewater treatment is not keeping pace => more untreated wastewater into rivers and lakes

· Possible consequences: (i) Risk to human health when in contact with contaminated surface waters while washing, cleaning, drinking, (ii) Risk to inland fisheries and food security through reduced fish consumption and livelihood, if fish stock affected

B. Objectives

· Identify current "hotspots" of deteriorating water quality, sources of water pollution and potential impacts

· Identify main water quality data and information gaps

· Develop and test assessment methodology

C. Approach

The pre-study (2013-2015) for a World Water Quality Assessment:

· Combined data- and model-driven analysis

· Global coverage, with focus on developing countries

· Focus on freshwaters (running waters and lakes)

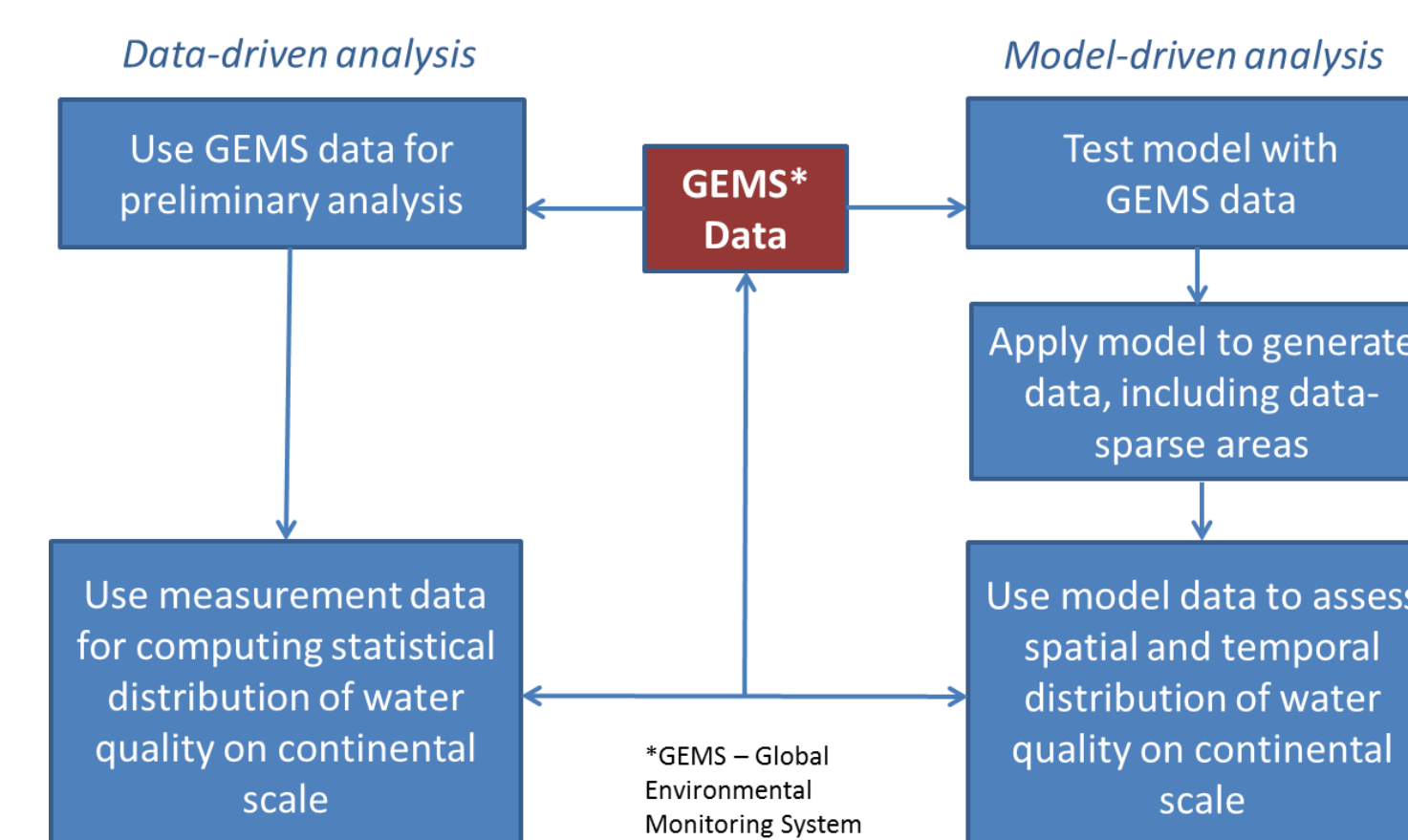· Core set of indicators: BOD, FC, TDS, TN and TP

Figure 1. The pre-study approach.

D. Results: data-driven analysis

An overlay of a decreasing trend and a median concentration below a level of concern indicates, here exemplarily for dissolved oxygen, a river basin that is potentially a "hotspot".
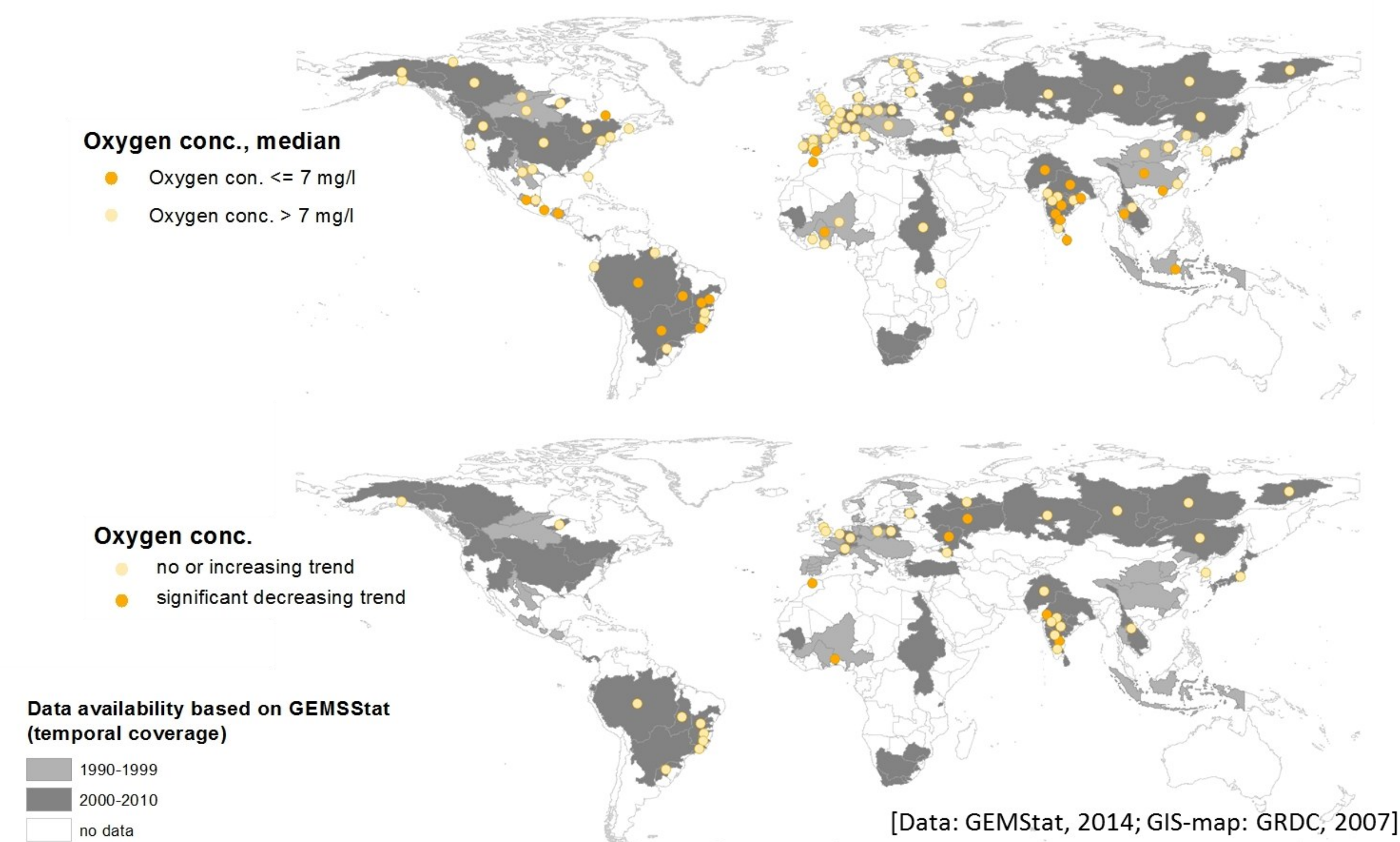

Oxygen conc., median
  ● Oxygen con. <= 7 mg/l
  ○ Oxygen conc. > 7 mg/l

Oxygen conc.
  ○ no or increasing trend
  ● significant decreasing trend

Data availability based on GEMSStat (temporal coverage)
  ▨ 1990-1999
  ▨ 2000-2010
  ▨ no data

[Data: GEMStat, 2014; GIS-map: GRDC, 2007]

Figure 2. Example of risk classification for dissolved oxygen by comparing measured levels with a level of concern (**above**), and decadal trends (**below**) for major river basins.

E. Results: model-driven analysis

River stretches classified as severely polluted indicate, here exemplarily for biochemical oxygen demand (BOD), a potential "hotspot".
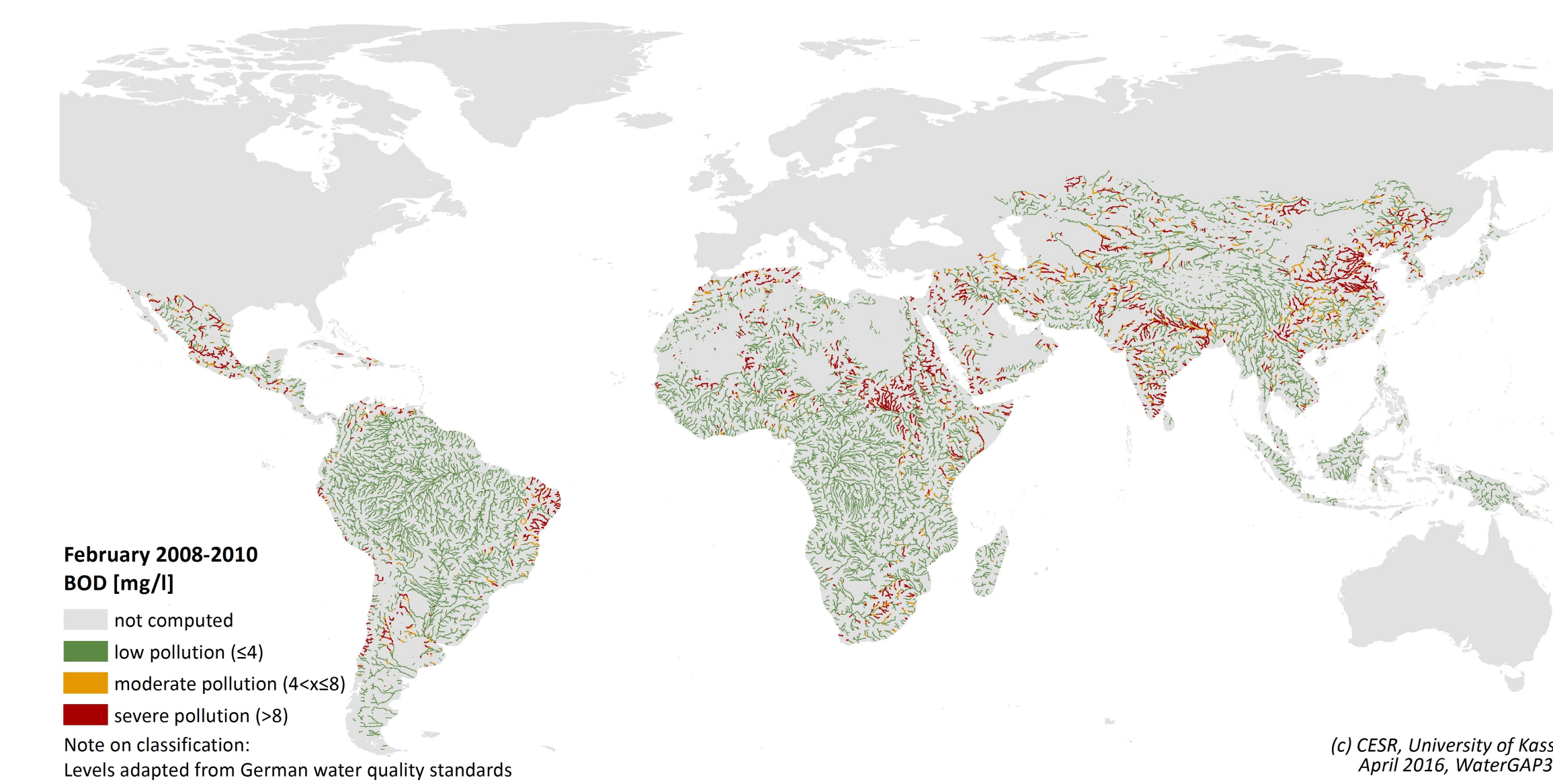

February 2008-2010
BOD [mg/l]
  ▨ not computed
  ▨ low pollution (≤4)
  ▨ moderate pollution (4<x≤8)
  ▨ severe pollution (>8)
Note on classification:
Levels adapted from German water quality standards

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Figure 3. Estimated in-stream BOD concentration for Latin America, Africa, and Asia for February 2008-2010.

F. Results: combined data- and model-driven analysis

An overlay of high consumption of inland fish, decreasing trend in fisheries catch and high percentage of river stretches with increasing BOD trend indicates a country that is potentially a "hotspot".
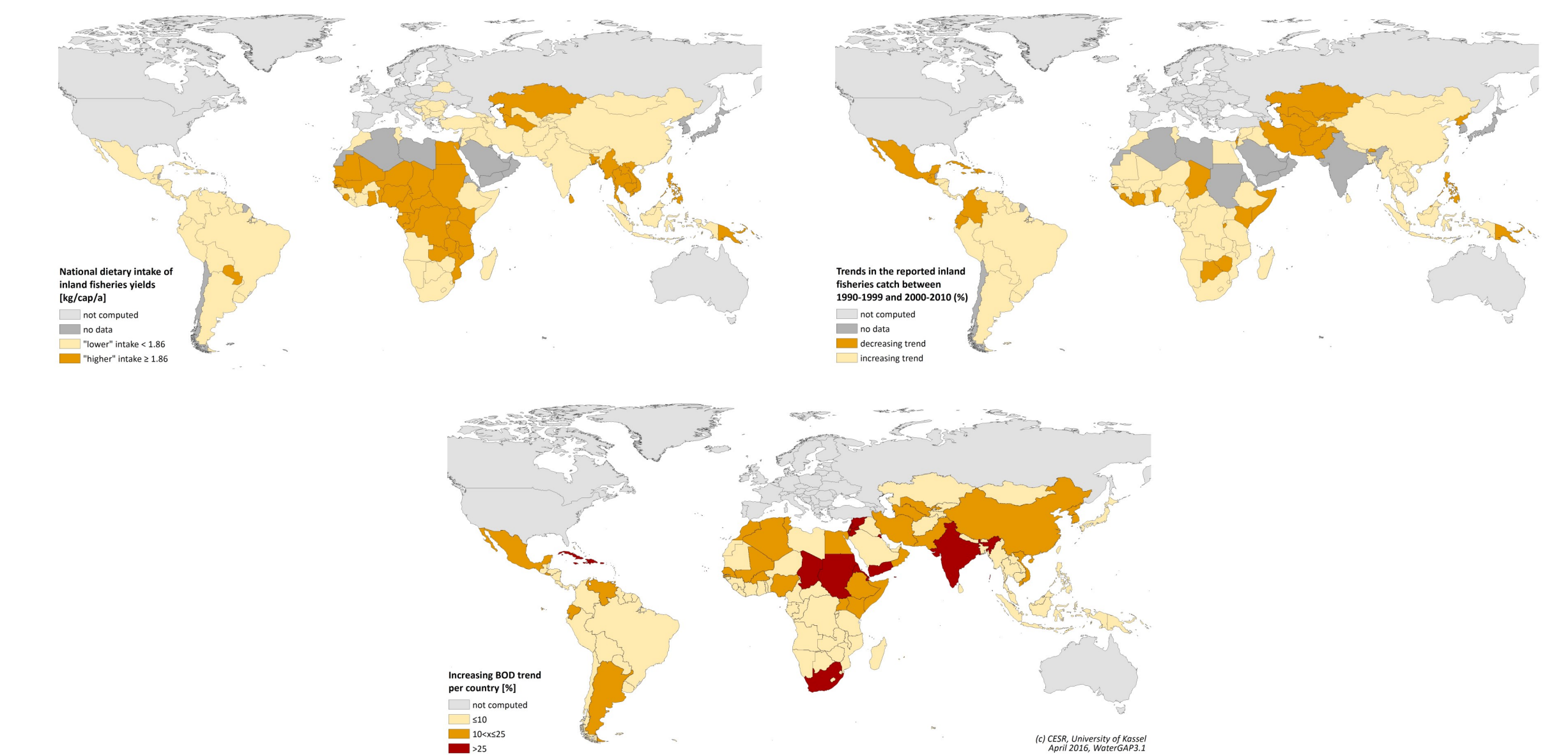

National dietary intake of inland fisheries yields [kg/ca/a]
  ▨ not computed
  ▨ no data
  ▨ "lower" intake < 2.46
  ▨ "higher" intake > 2.46

Trends in the reported inland fisheries catch between (1990-1999 and 2000-2010) [%]
  ▨ not computed
  ▨ no data
  ▨ increasing trend
  ▨ decreasing trend

Increasing BOD trend per country [%]
  ▨ not computed
  ▨ ≤10
  ▨ 10<x≤25
  ▨ >25

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Figure 4. National dietary intake of inland fisheries yields (**above, left**), National inland fisheries catch trend between the time periods 1990-1999 and 2000-2010 (**above, right**), Percentage of river stretches in each country with "increasing trend of BOD of particular concern" meaning that in these stretches the pollution level increased into the severe pollution category in 2008-2010, or that they were already in the severe pollution category in 1990-1992 and further increased in concentration by 2008-2010 (**below**).

G. Products and perspectives

· Combined analysis giving the "big picture" of water quality, indication of potential impacts and perspectives for the solution of the water quality challenge

· First results subject to data gaps, assumptions and scale issues => to be further elaborated in a full assessment

· UNEP report "**A Snapshot of the World's Water Quality: Towards a global assessment**" (launch May 2016)

· Webpages with Executive Summary:

http://www.wwqa-documentation.info/

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