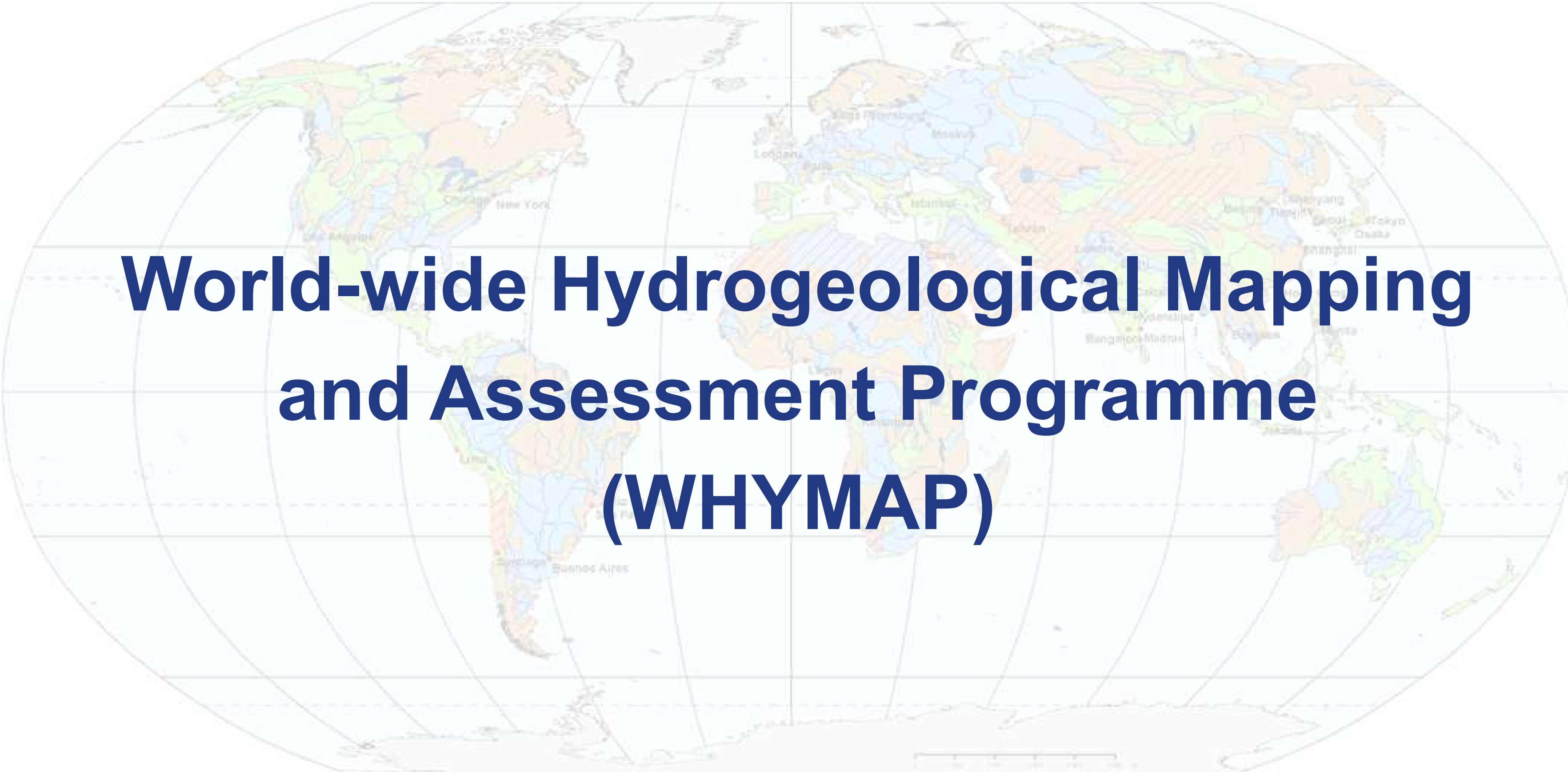

World-wide Hydrogeological Mapping and Assessment Programme (WHYMAP)

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Federal Institute for Geosciences and Natural Resources (BGR), Berlin

Bundesanstalt für Geowissenschaften und Rohstoffe

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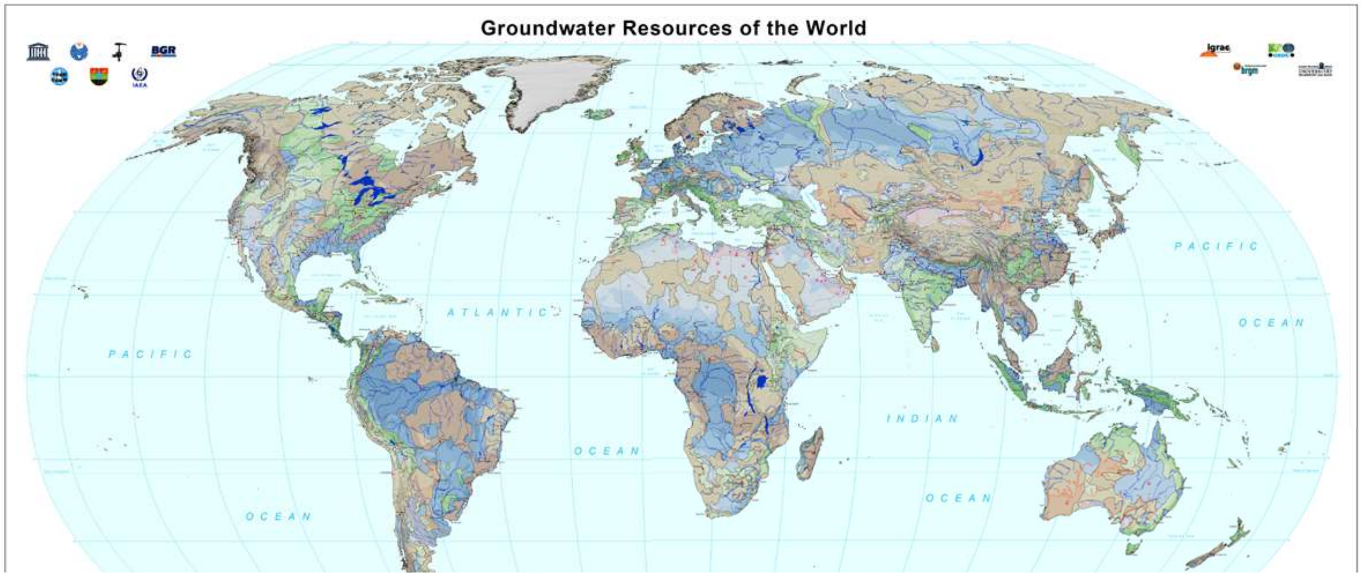
Motivation

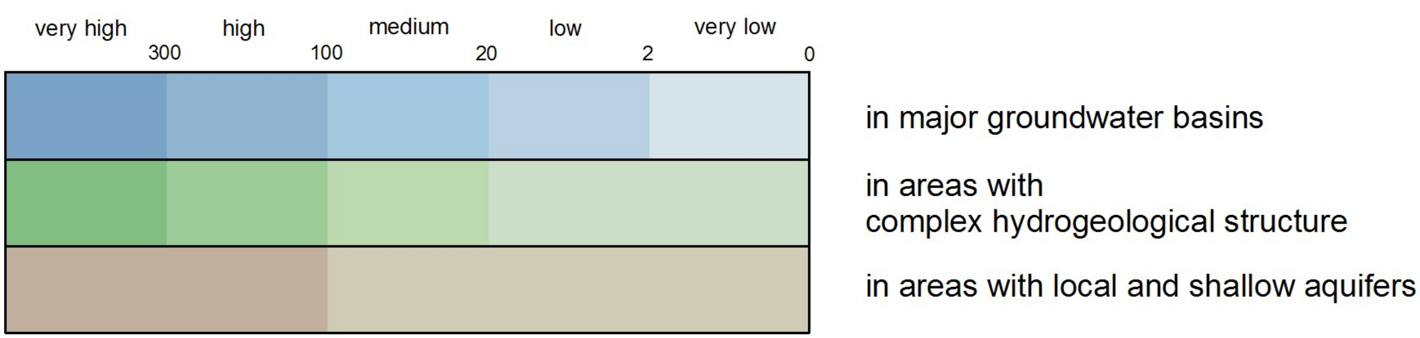
- Awareness rising for groundwater
- General overview on potentials/risks, simple legend
- Full coverage world-wide
- Globally harmonised view on groundwater resources
- Contribute to the world-wide efforts to better study and manage aquifer resources
- Groundwater as a possible solution of increasing water shortage problems ("water crisis")

The WHYMAP Network

Example 1: Global Groundwater Resources Map



Groundwater resources and recharge (mm/year)



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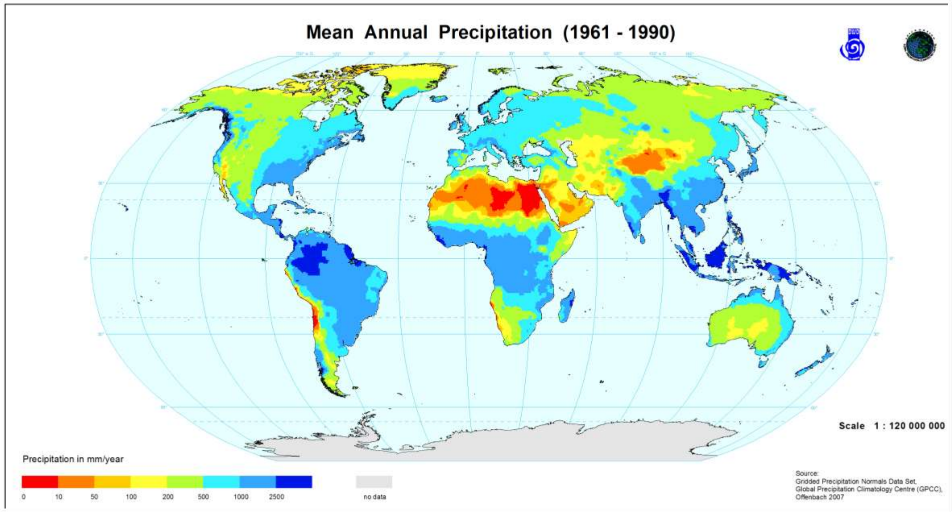
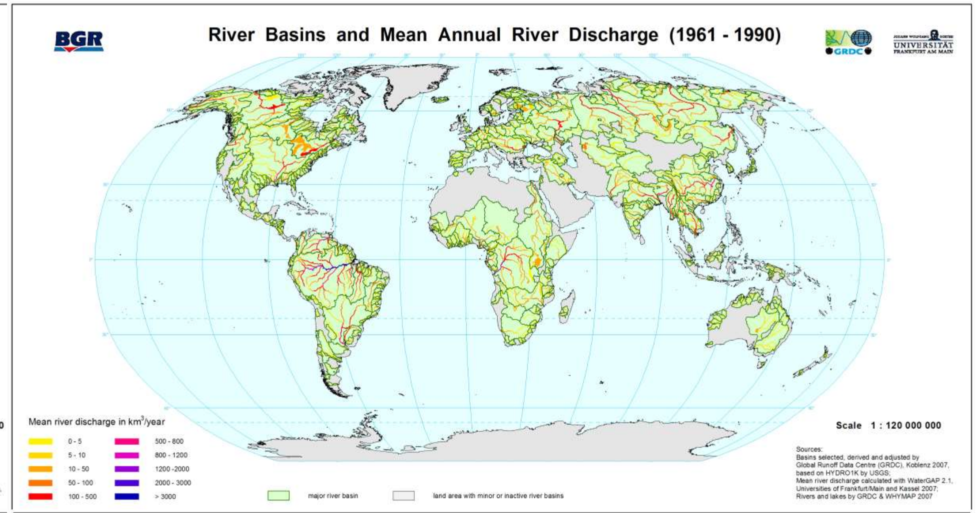
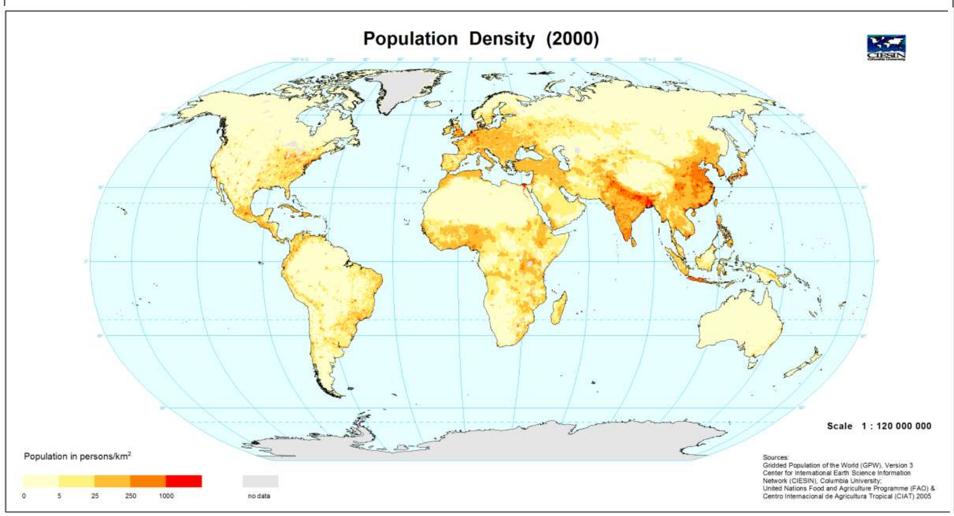
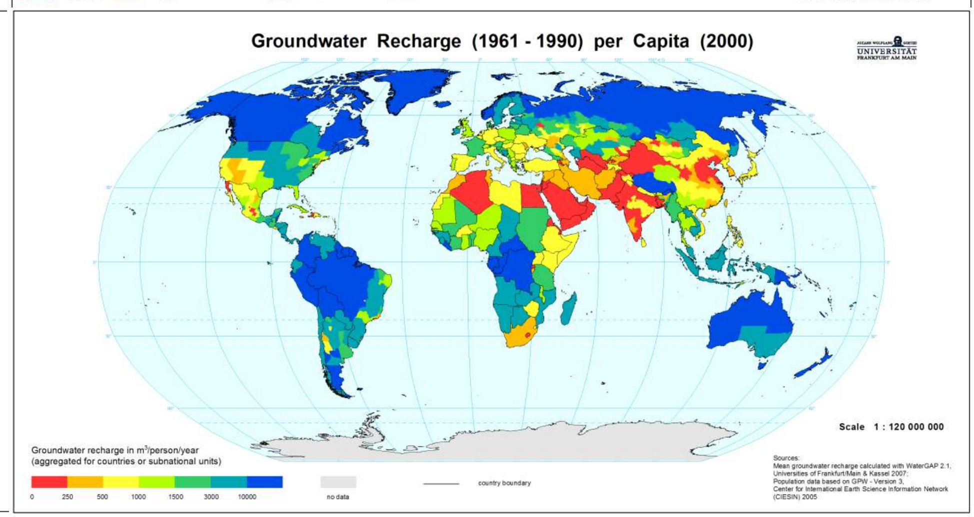
Example 1: Global Groundwater Resources Map cont’d









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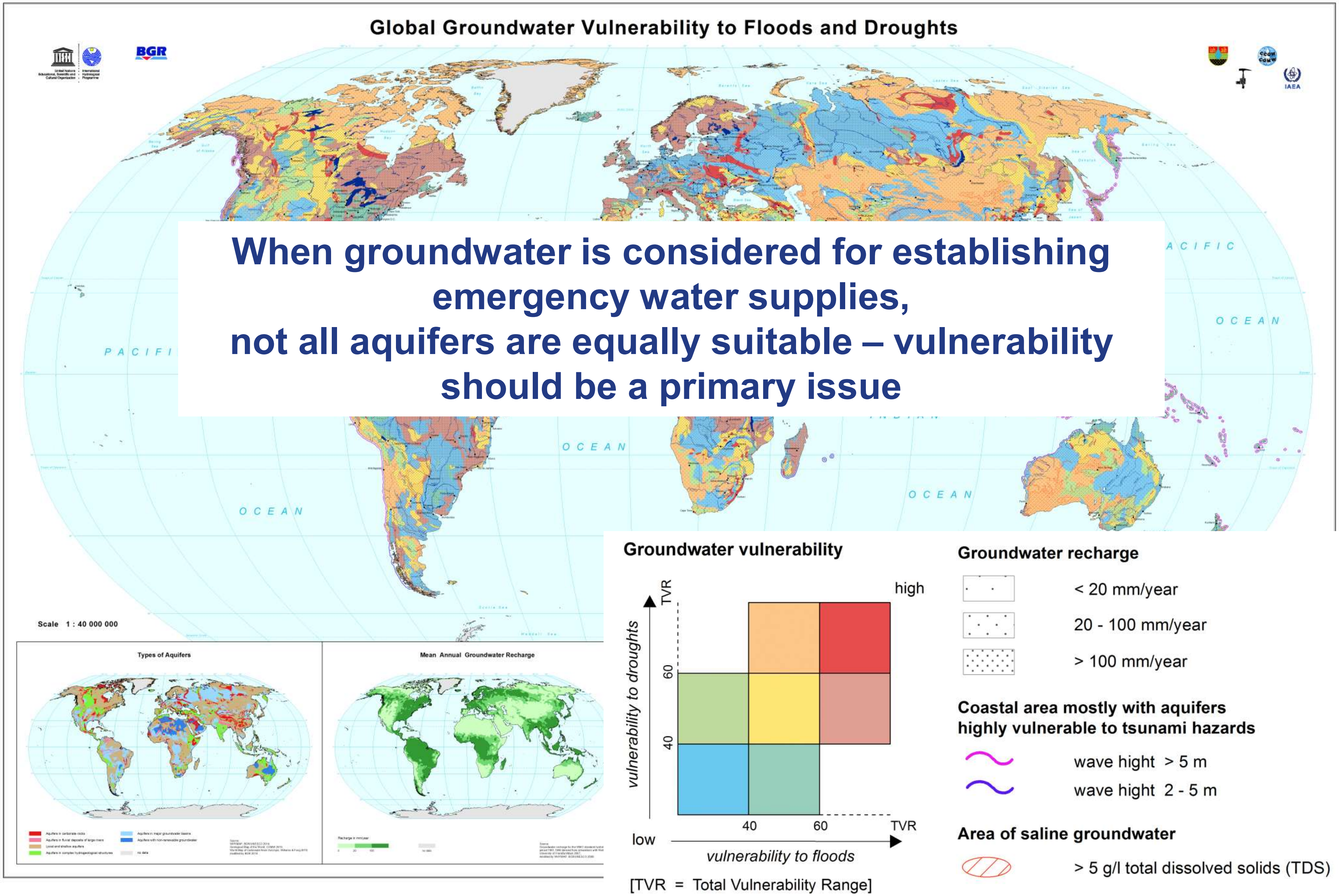
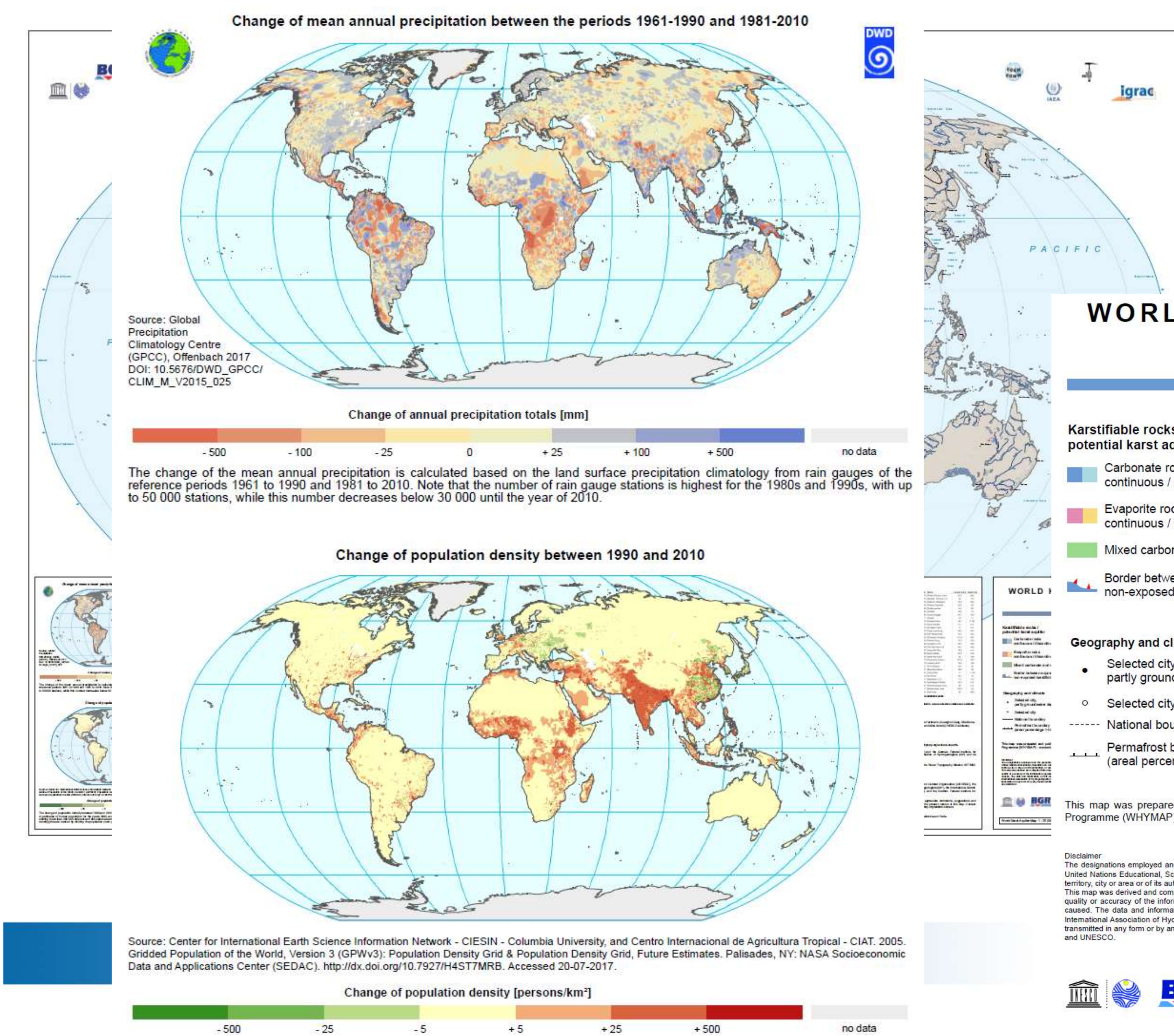
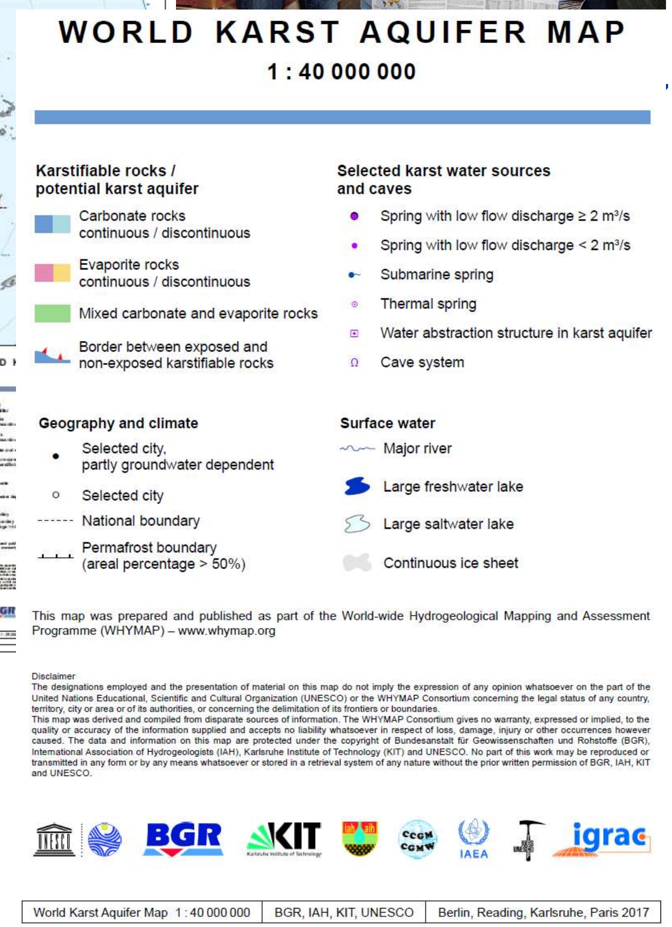
Example 2: Global GW Vulnerability to Floods & Droughts



When groundwater is considered for establishing emergency water supplies, not all aquifers are equally suitable – vulnerability should be a primary issue

Example 3: World Karst Aquifer Map (WOKAM)



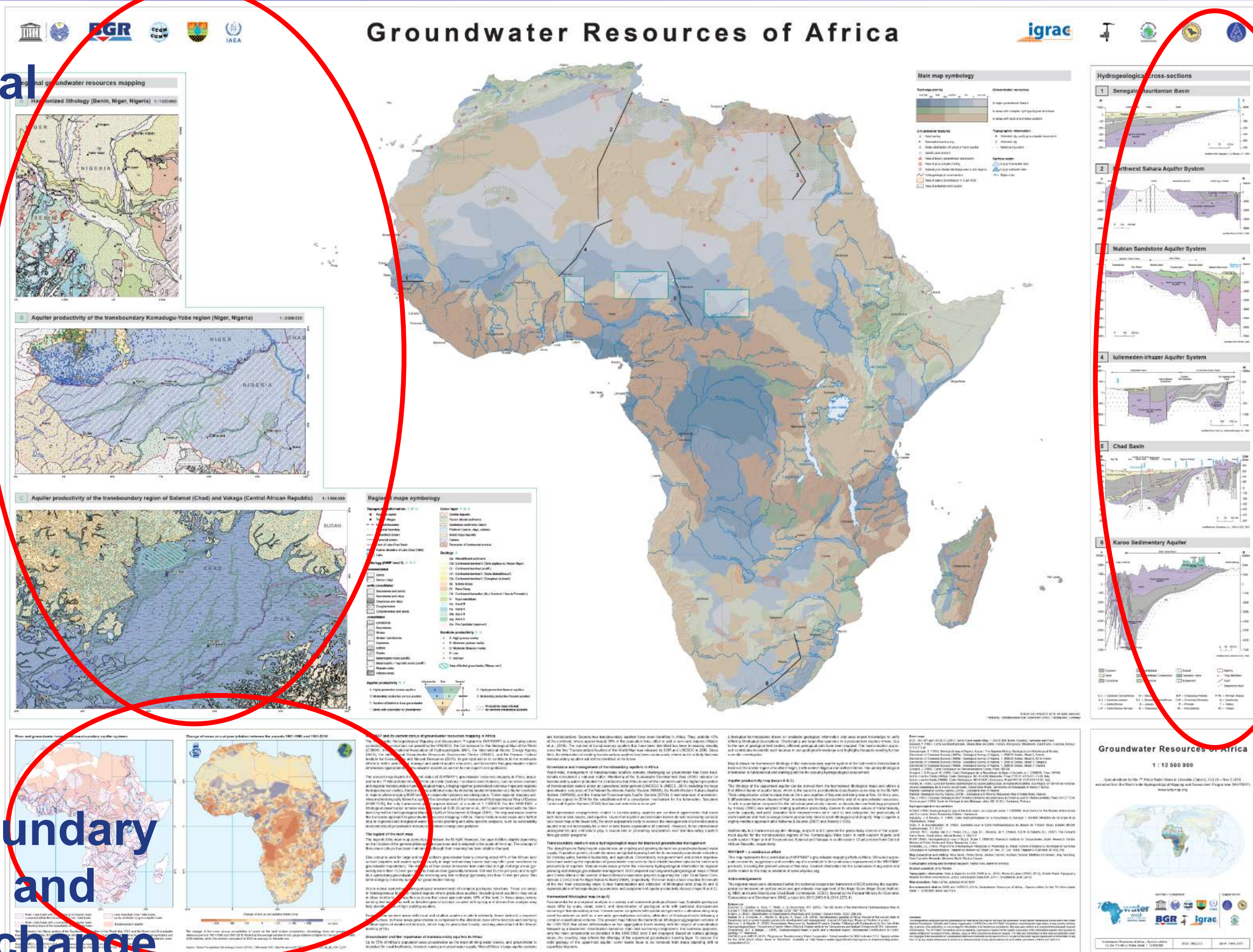


Example 4: Groundwater Resources of Africa

Regional maps

2.5D

Transboundary aquifers and climate change



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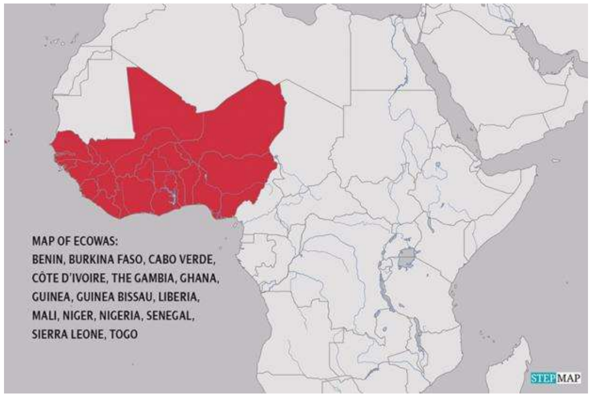
Example 5: ECOWAS Hydrogeological Map (ongoing)

- Consolidate and harmonise existing continental-scale mapping activities to increase water security through sustainable use, management and protection of groundwater



  - Hydrogeological/thematic map
  - Advocacy map
  - Summary report/reference list mapping activities on Africa

→ Publication at WWF/AWW 2022

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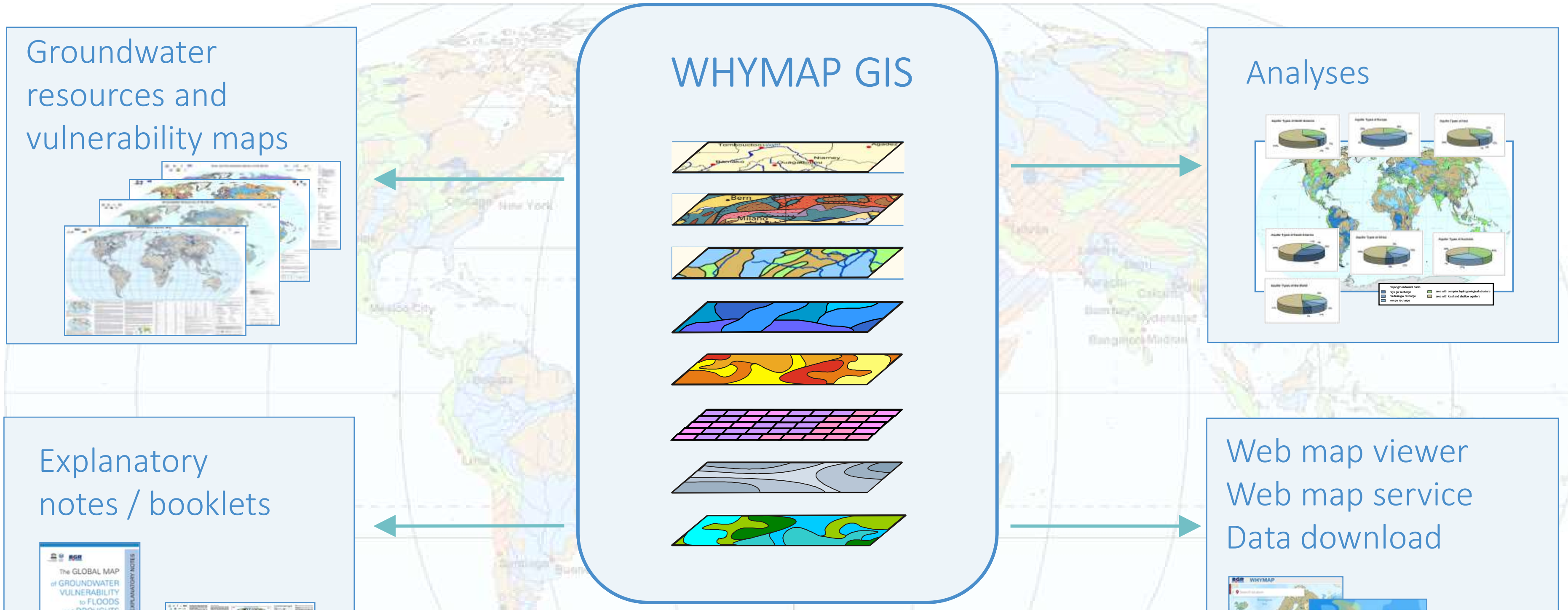
Products summary



More information at: www.whymap.org

WHYMAP online viewer: www.whymap.org/whymap-viewer

Contributions to external publications, atlases, text books etc., e.g. small sketch-maps

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GEOZENTRUM HANNOVER

Applications

LETTER

doi:10.1038/nature11295

Water balance of global aquifers revealed by groundwater footprint

Tom Gleeson[1], Yoshihide Wada[2], Marc F. P. Bierkens[2,3] & Ludovicus P. H. van Beek[2]

AGU PUBLICATIONS

Water Resources

RESEARCH ARTICLE

10.1002/2015WR017349

Special Section:
The 50th Anniversary of Water Resources Research

Key Points:
- Renewable groundwater stress is quantified in the world's largest aquifers
- Characteristic stress regimes are defined to determine the severity of

AGU PUBLICATIONS

JGR

Journal of Geophysical Research: Solid Earth

RESEARCH ARTICLE

10.1002/2017JB014845

Key Points:
- Terrestrial water storages exhibit positive trend for the Niger River basin over the last decade
- Significant part of storage rise originates from groundwater
- Observations confirm large-scale impact of previously found water table rises in response to land cover changes

GRACE Detected Rise of Groundwater in the Sahelian Niger River Basin

S. Werth[1,2], D. White[3], and D. W. Bliss[4]

[1]School of Geographical Sciences and Urban Planning, Arizona State University, Tempe, AZ, USA, [2]School of Earth and Space Exploration, Arizona State University, Tempe, AZ, USA, [3]School of Community Resources and Development, Arizona State University, Tempe, AZ, USA, [4]School of Electrical and Computer Engineering, Arizona State University, Tempe, AZ, USA

Abstract West African regions along the Niger River experience climate and land cover changes that affect hydrological processes and therewith the distribution of fresh water resources (WR). This study provides an investigation of long-term changes in terrestrial water storages (TWS) of the Niger River basin


World Water Assessment Programme
United Nations Educational, Scientific and Cultural Organization
International Hydrological Programme of UNESCO
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MANAGING A VITAL RESOURCE
THE UNILC DRAFT ARTICLES
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SkillBuilder author
Jeana Kriewaldt
jacaranda
A Wiley Brand
Nicht-erneuerbares (fossiles) Grundwasser
„Der Begriff nicht-erneuerbares Grundwasser bezeichnet Grundwasservorkommen, die gegenwärtig nicht Teil des hydrologischen Kreislaufs sind. Dies bedeutet, dass keine Erneuerung über Niederschläge oder Infiltration erfolgt bzw. dass diese Erneuerung sehr gering ist und nur in sehr langen Zeiträumen zu einer nennenswerten Grundwasserneubildung führt. Da diese Zeiträume – häufig handelt es sich um mehrere hundert bis tausend Jahre – den menschlichen Planungshorizont deutlich übersteigen, werden diese Ressourcen als nicht-erneuerbar betrachtet. Der Grund für die Abkoppelung vom hydrologischen Kreislauf sind Veränderungen der klimatischen Bedingungen im Einzugsgebiet. Nicht-erneuerbares Grundwasser findet sich insbesondere in ariden und semiariden Gebieten wie dem Nahen Osten, Nordafrika, Zentralasien und im südlichen Afrika. Die Vorkommen haben sich zu einer Zeit gebildet, als in den betreffenden Regionen noch feuchteres Klima vorherrschte. Aufgrund ihres hohen Alters spricht man auch von fossilem oder Paläo-Grundwasser.
Die Abkoppelung vom aktuellen hydrologischen Kreislauf und die daraus resultierende Nicht-Erneuerbarkeit unterscheidet diese Vorkommen wesentlich von ‚normalem' Grund-
‚grünen' Ressourcen wie Wald und Boden zu vergleichen. Treffenderweise wird die Nutzung dieses Wassers im Englischen auch als „groundwater mining" bezeichnet. Diese natürlichen Rahmenbedingungen haben weitreichende Konsequenzen für die Bewirtschaftung der Vorkommen." [1]
Oberflächenwasser
Grundwasser
Kapillarwasser
Aquifer (G), Quelle
Grundwasserneubildung
fossiles Grundwasser
M6 Verteilung gering- bzw. nicht-erneuerbarer Grundwasservorkommmen in Nordafrika und Nahost
Algier
Tunis
Rabat
Mittelmeer
Teheran
Kairo
Tigris
Euphrat
Nil
Rotes Meer
Riad
Khartoum
Niger
N'Djamena
Conakry
Lagos
ATLANTISCHER OZEAN
INDISCHER OZEAN
area of low rainfall (<200 mm/year)
Groundwater recharge (mm/year)
300 100 20 2 0
Groundwater resources
in major groundwater basins
in areas with complex hydrogeological structure
in areas with local and shallow aquifers
BGR
0 500 km

Thank you!

Acknowledgements to Patrick Clos, Wiebke Just, Martin Krombholz, Uta Philipp, Andrea Richts, Willi Struckmeier, Peter Winter, Markus Zaepke and many others who have contributed to WHYMAP.

United Nations Educational, Scientific and Cultural Organization

International Hydrological Programme

CCGM CGMW

iah aih

IUGS UNESCO IGCP

igrac International Groundwater Resources Assessment Centre

Dr Stefan Broda (stefan.broda@bgr.de)
Federal Institute for Geosciences and Natural Resources

« We never know the worth of water till the well is dry. »

Thomas Fuller,
Gnomologia, 1732