Introdução às mudanças climáticas e Interferência no ciclo da água

Eduardo Mario Mendiondo
Universidade de São Paulo, Escola de Engenharia de São Carlos

United Nations
Educational, Scientific and
Cultural Organization

UNESCO Chair on Urban Water -
Quality, Management, Recovery and Reuse
University of São Paulo, Brazil

CEPED-SP/USP

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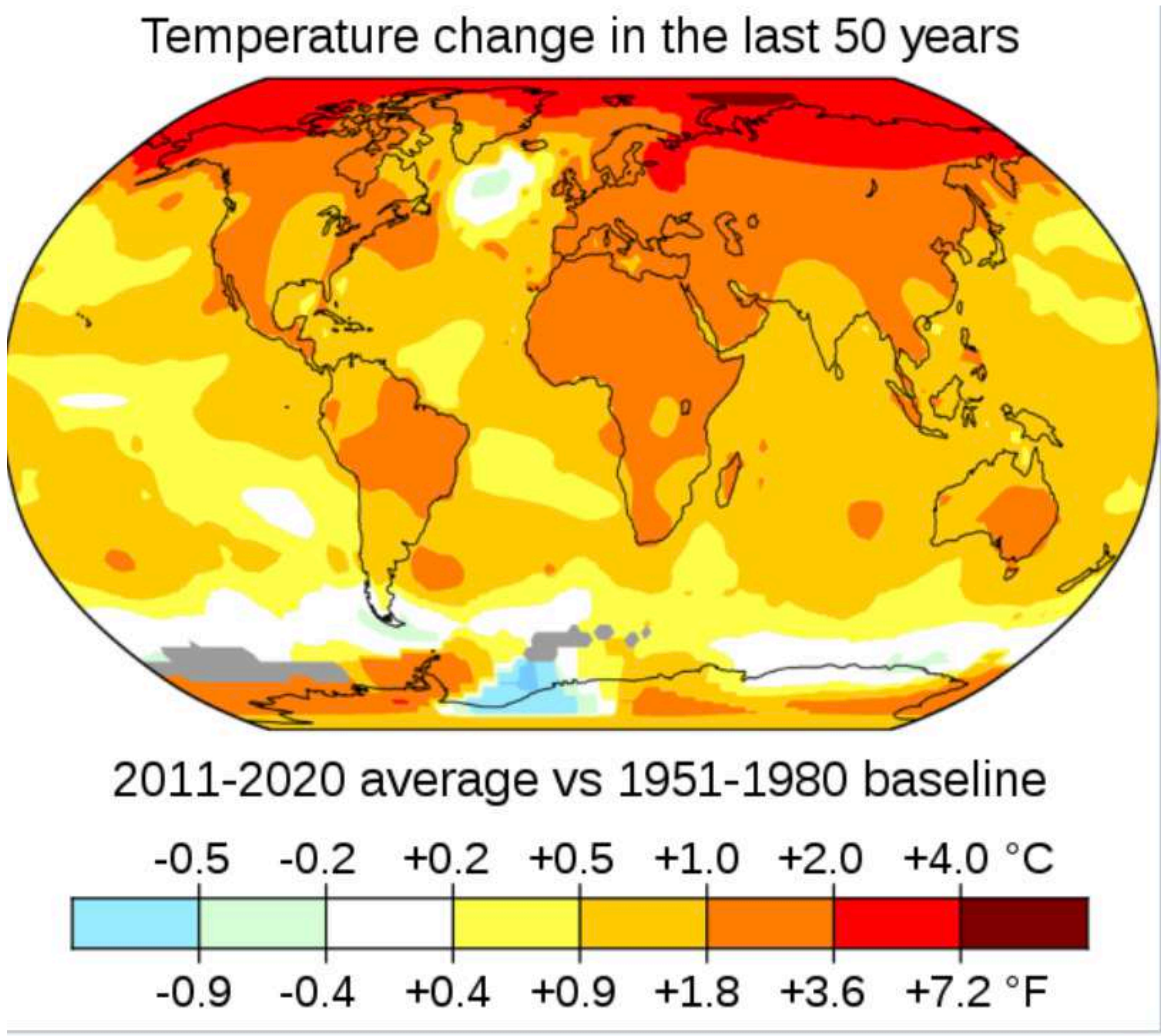
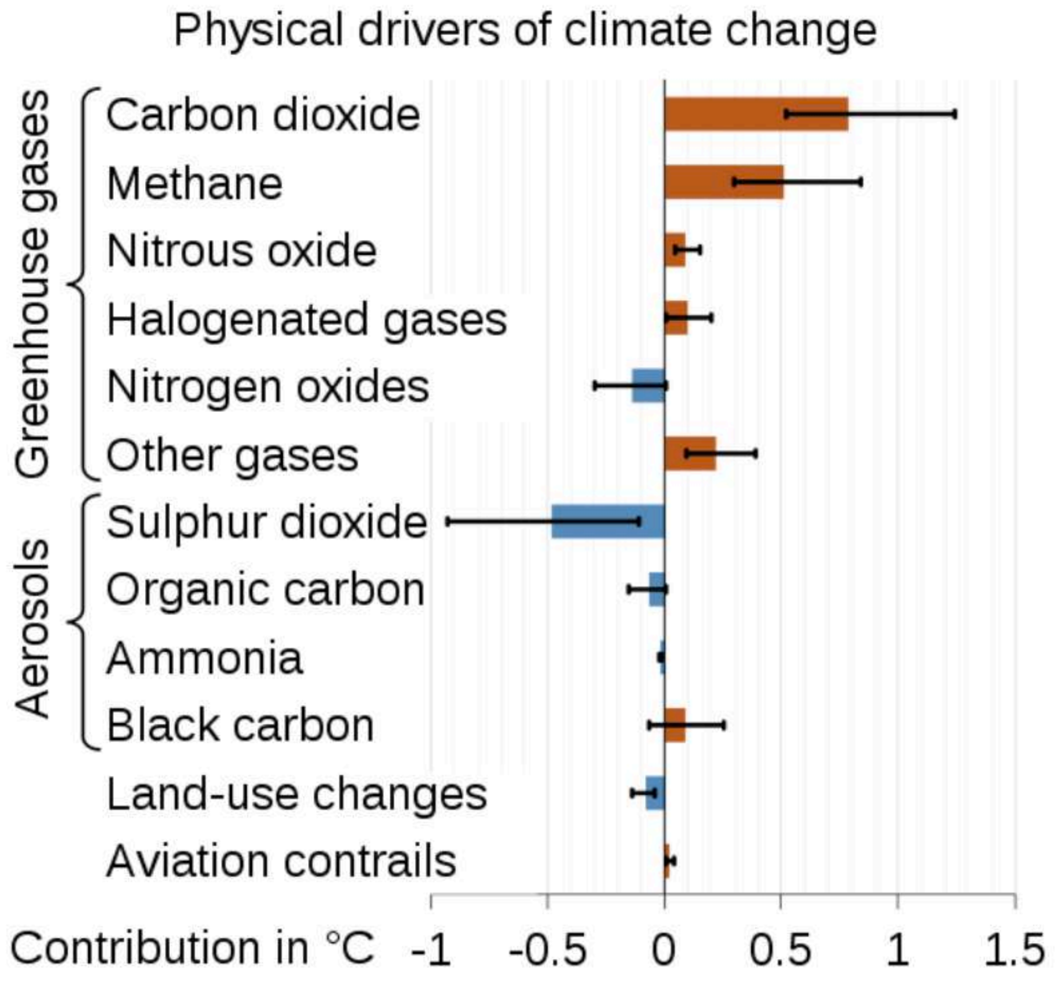
Change in Hydrology and Society

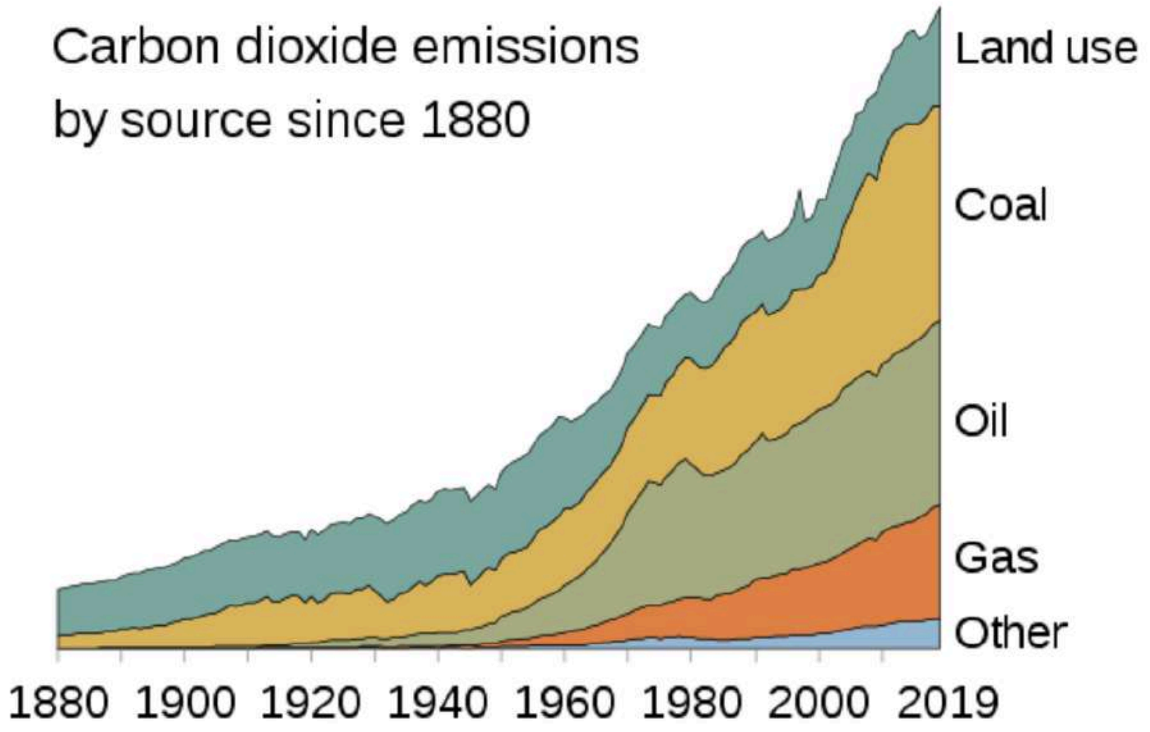
A short history of ‘wet change’



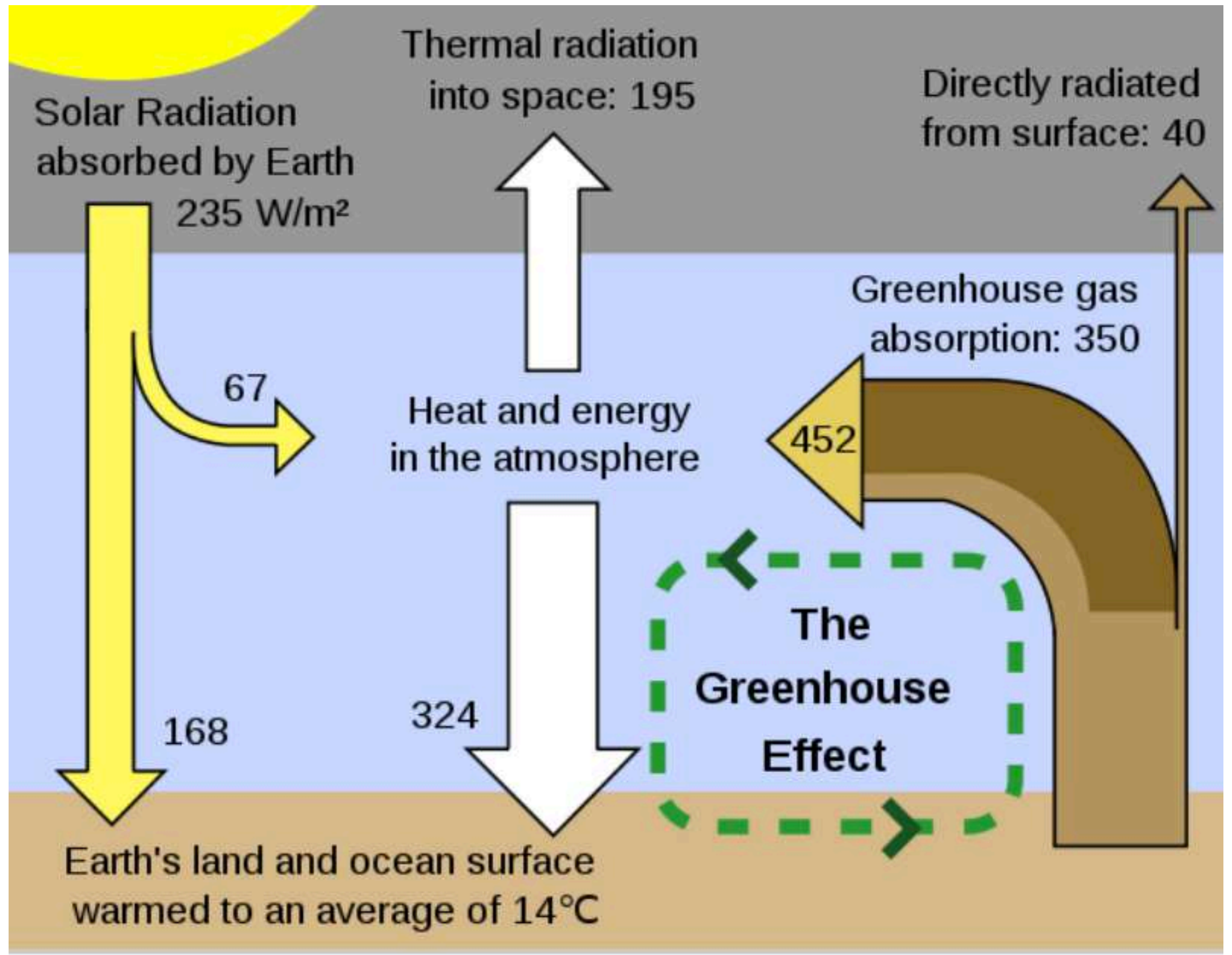
Average surface air temperatures from 2011 to 2020 compared to a baseline average from 1951 to 1980 (Source: NASA)



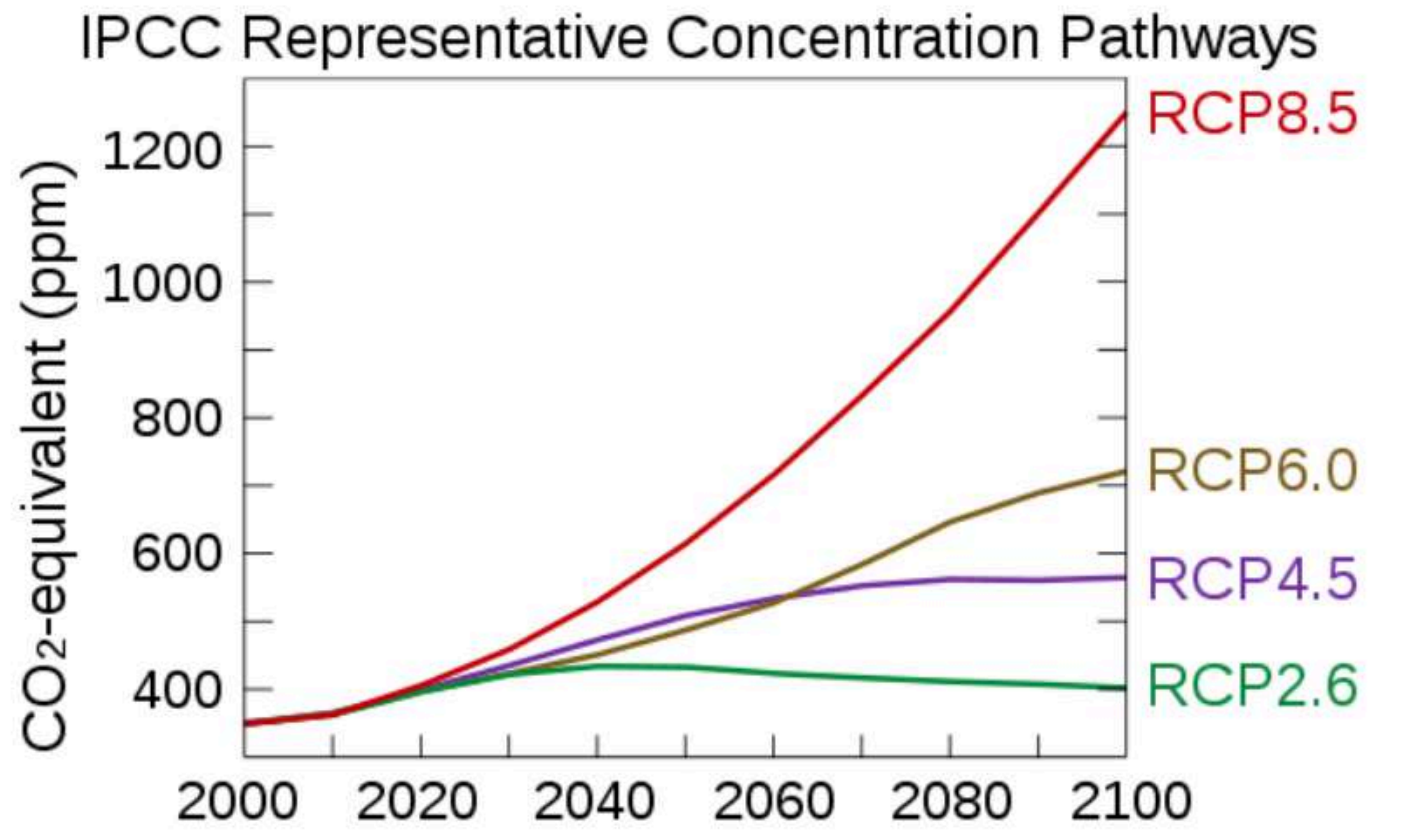
Contributors to climate change from the time period of 1850-1900 to the average from 2010-2019, as reported in the sixth IPCC assessment report. All drivers listed are human caused, as the IPCC found no significant contribution from internal variability or solar and volcanic drivers.



The Global Carbon Project shows how additions to CO_2 since 1880 have been caused by different sources ramping up one after another.

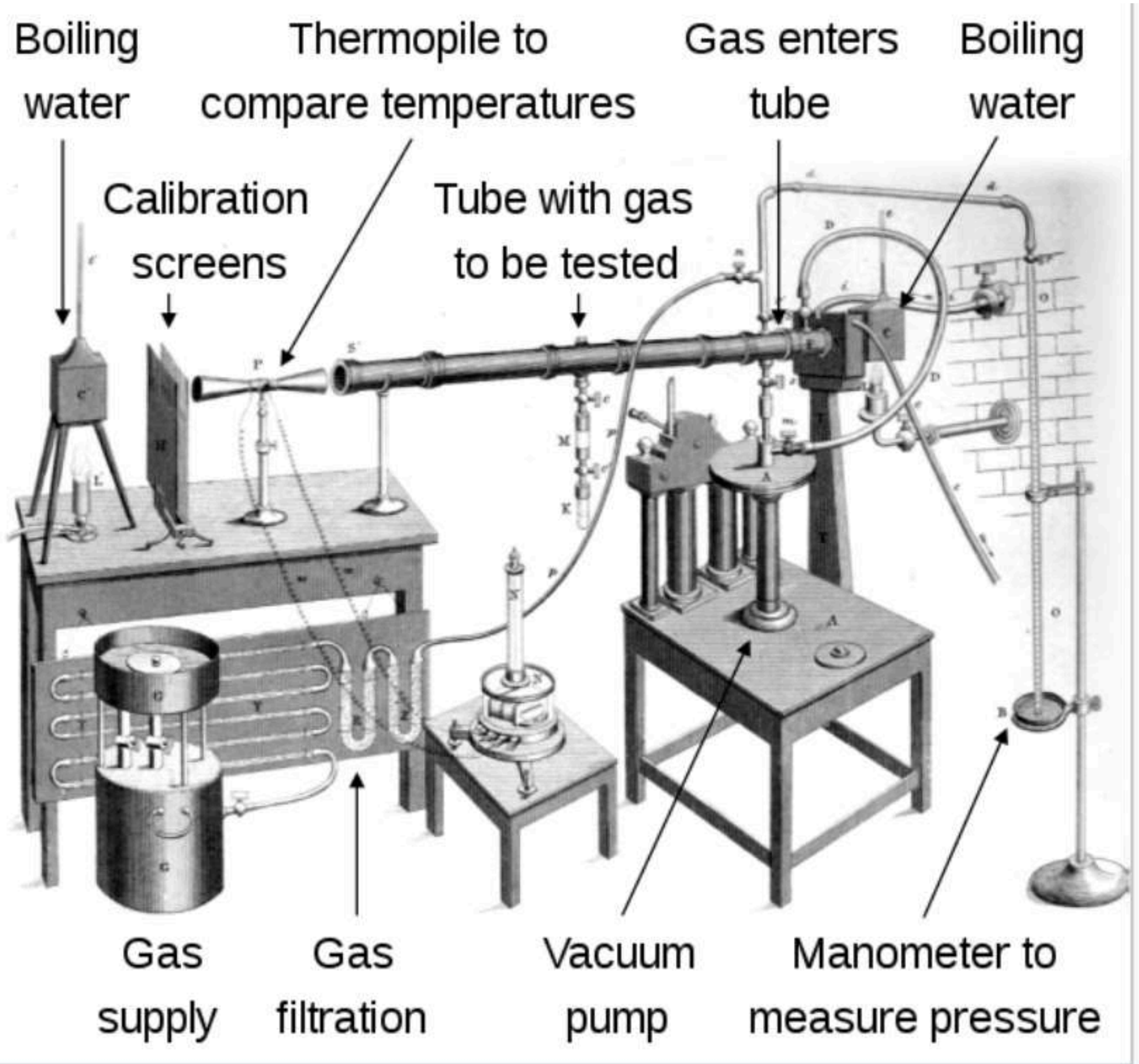


Energy flows between space, the atmosphere, and Earth's surface. Current greenhouse gas levels are causing a radiative imbalance of about 0.9 W/m^2.[12]

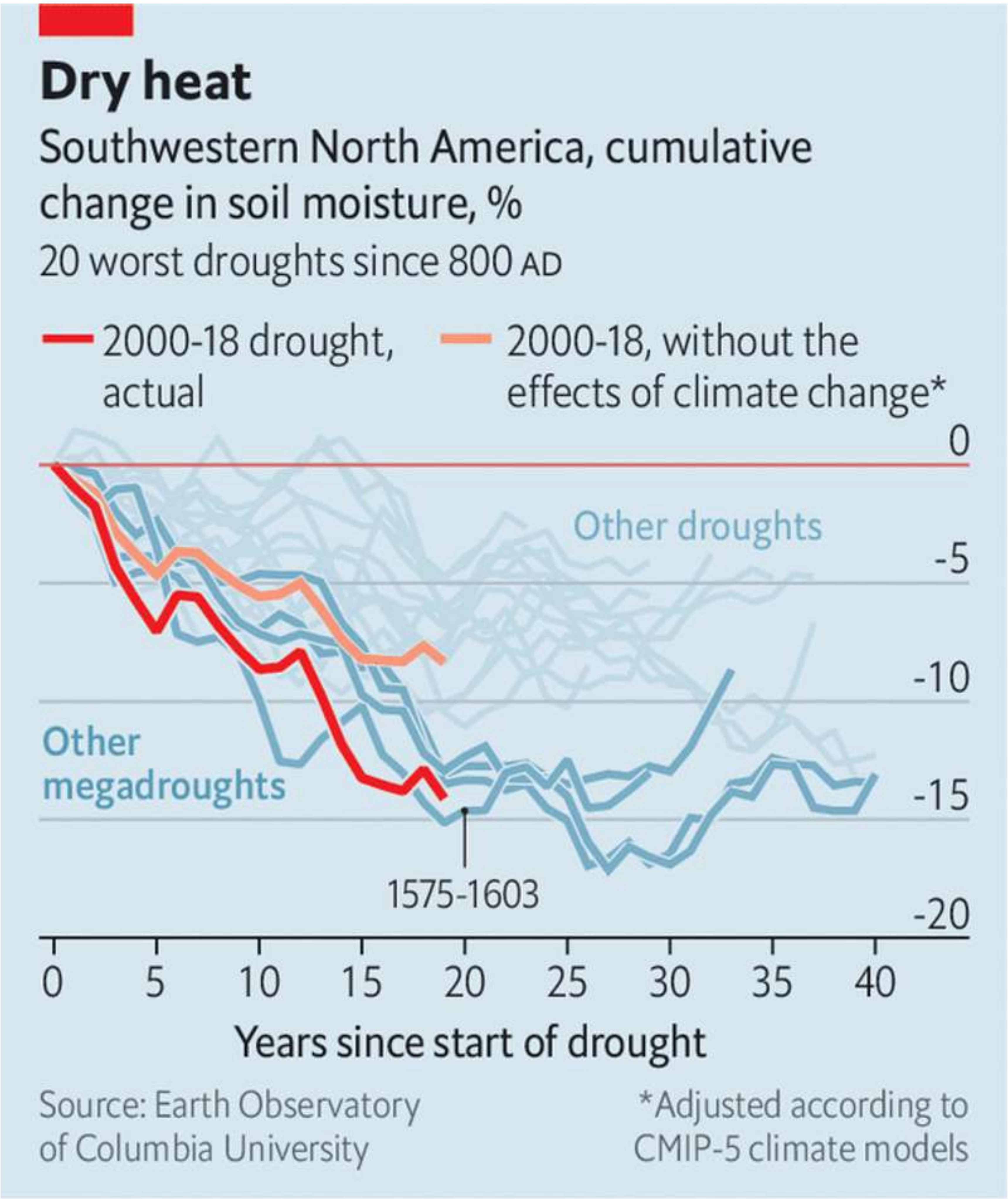


Four possible future concentration pathways, including CO_2 and other gases' CO_2-equivalents

A short history of 'wet change'

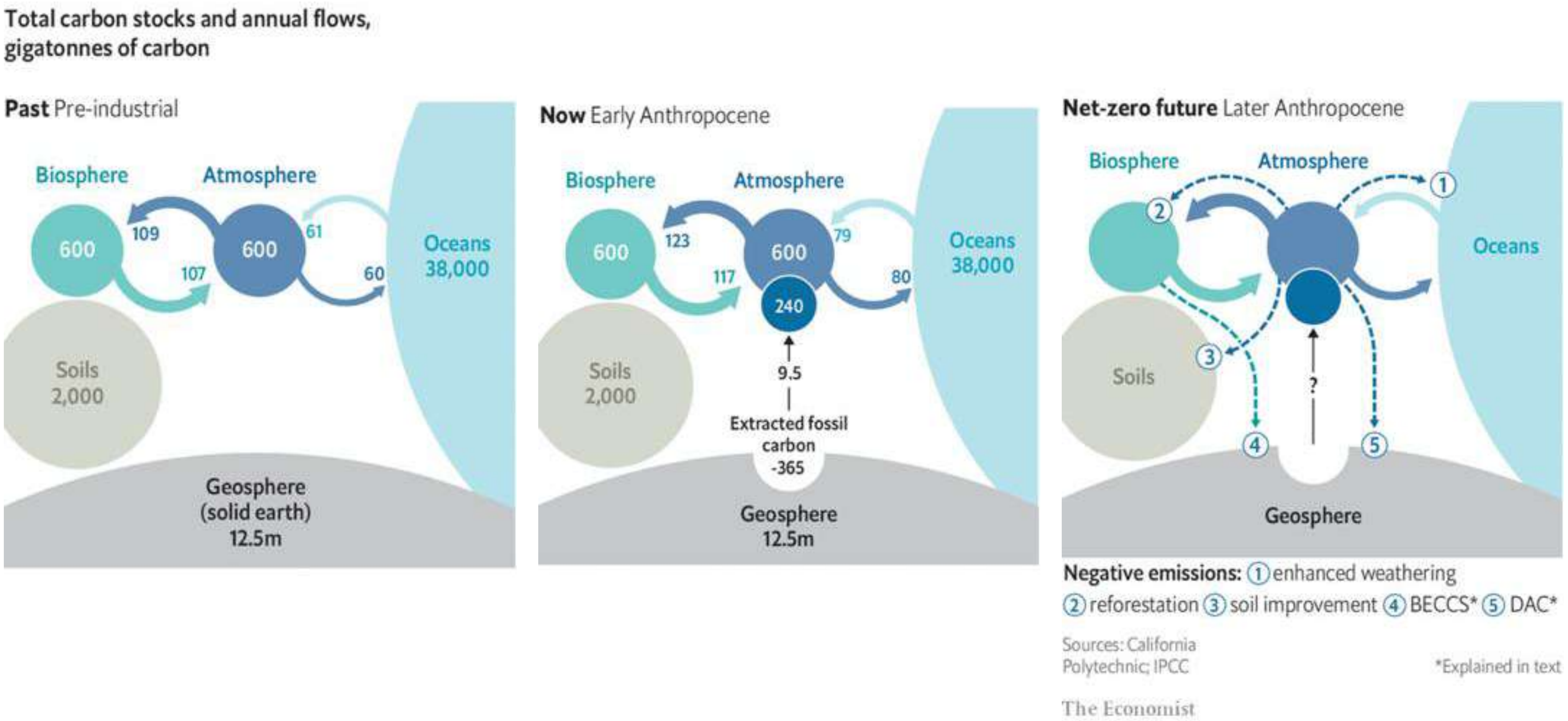


Tyndall's ratio spectrophotometer (drawing from 1861) measured how much infrared radiation was absorbed and emitted by various gases filling its central tube.

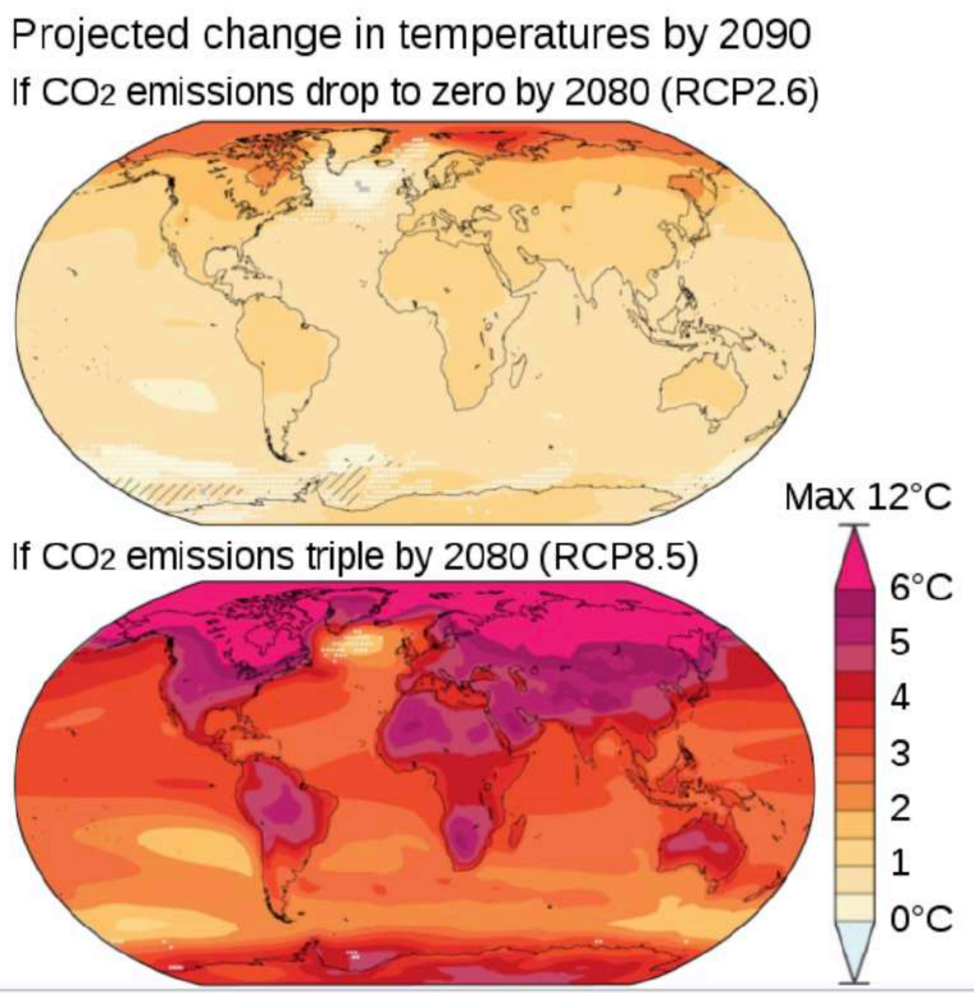


The Economist

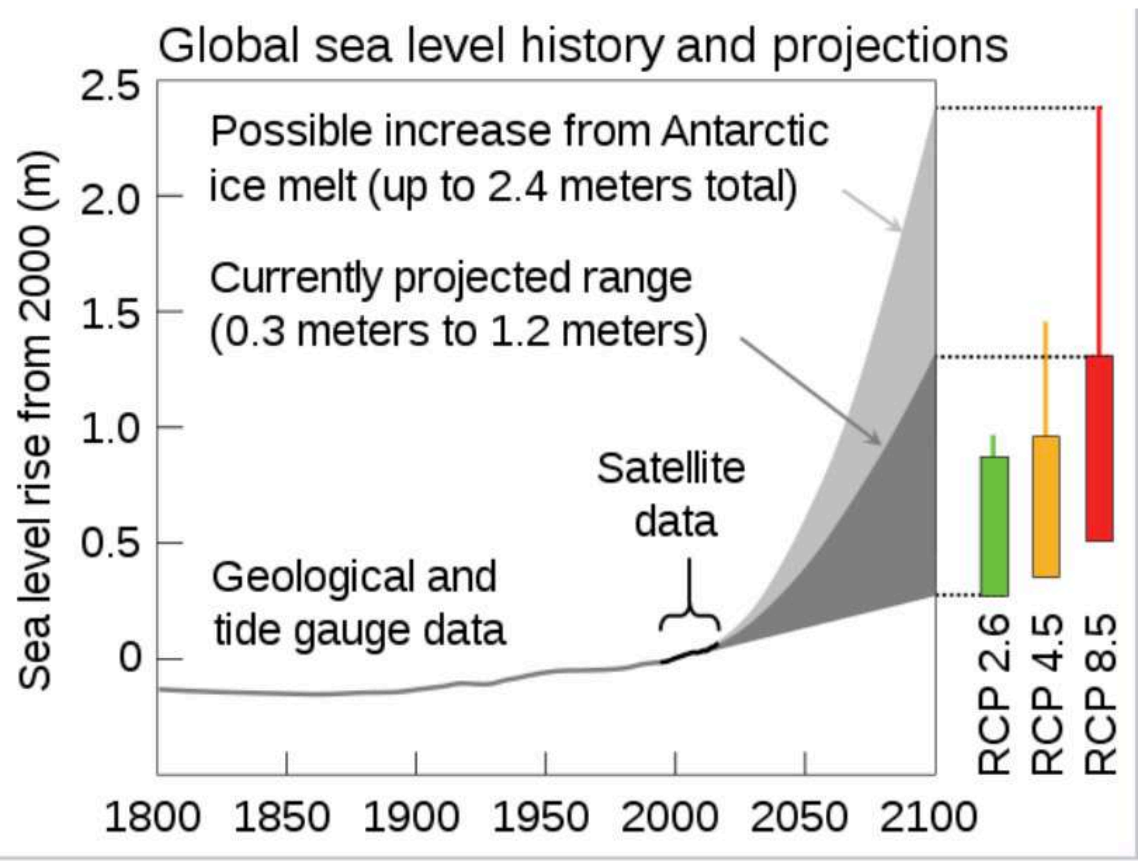
Humans unbalancing the carbon cycle



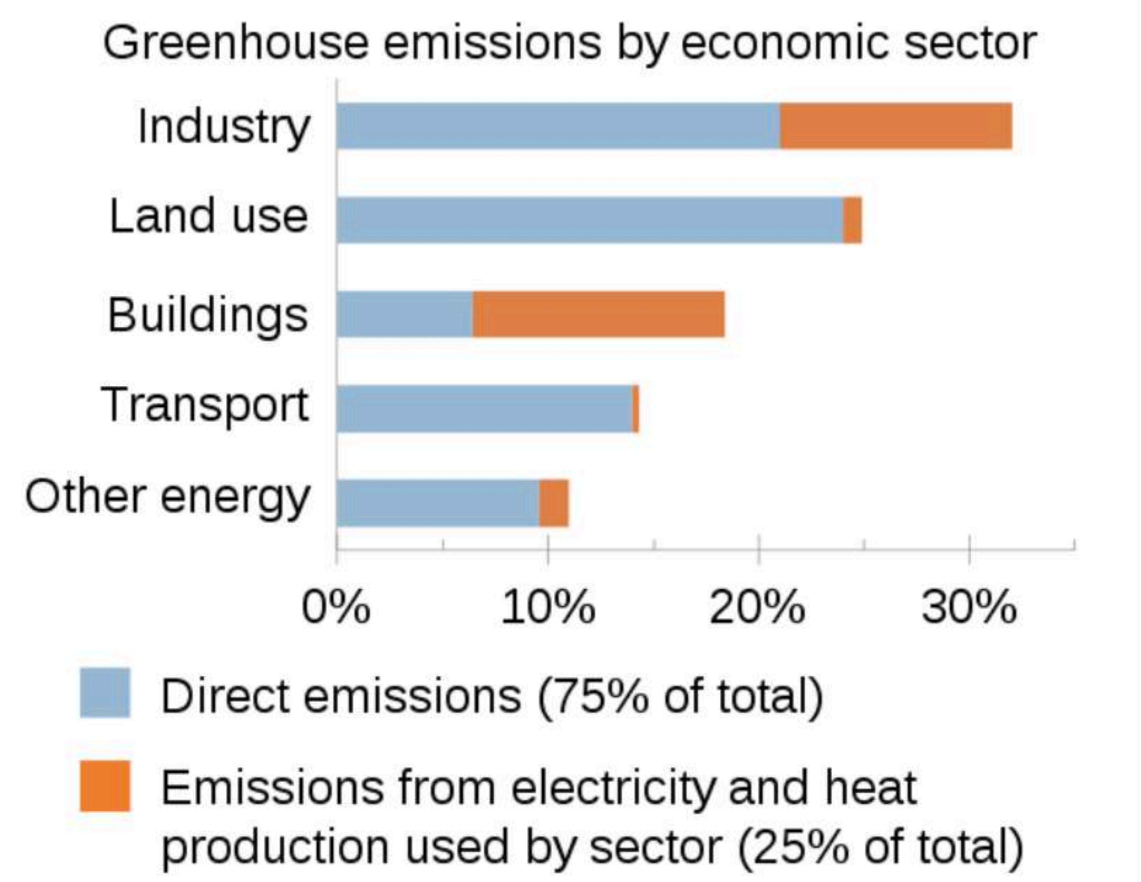
A short history of ‘wet change’



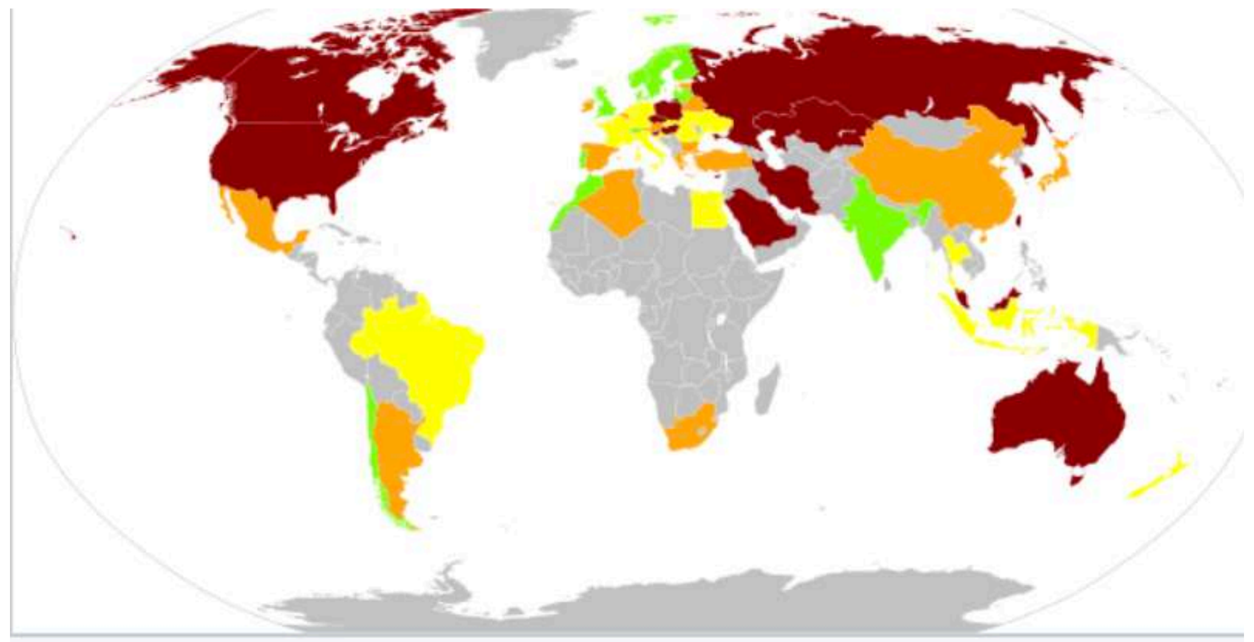
Average climate model projections for 2081–2100 relative to 1986–2005, under low and high emission scenarios



Historical sea level reconstruction and projections up to 2100 published in 2017 by the U.S. Global Change Research Program[131]

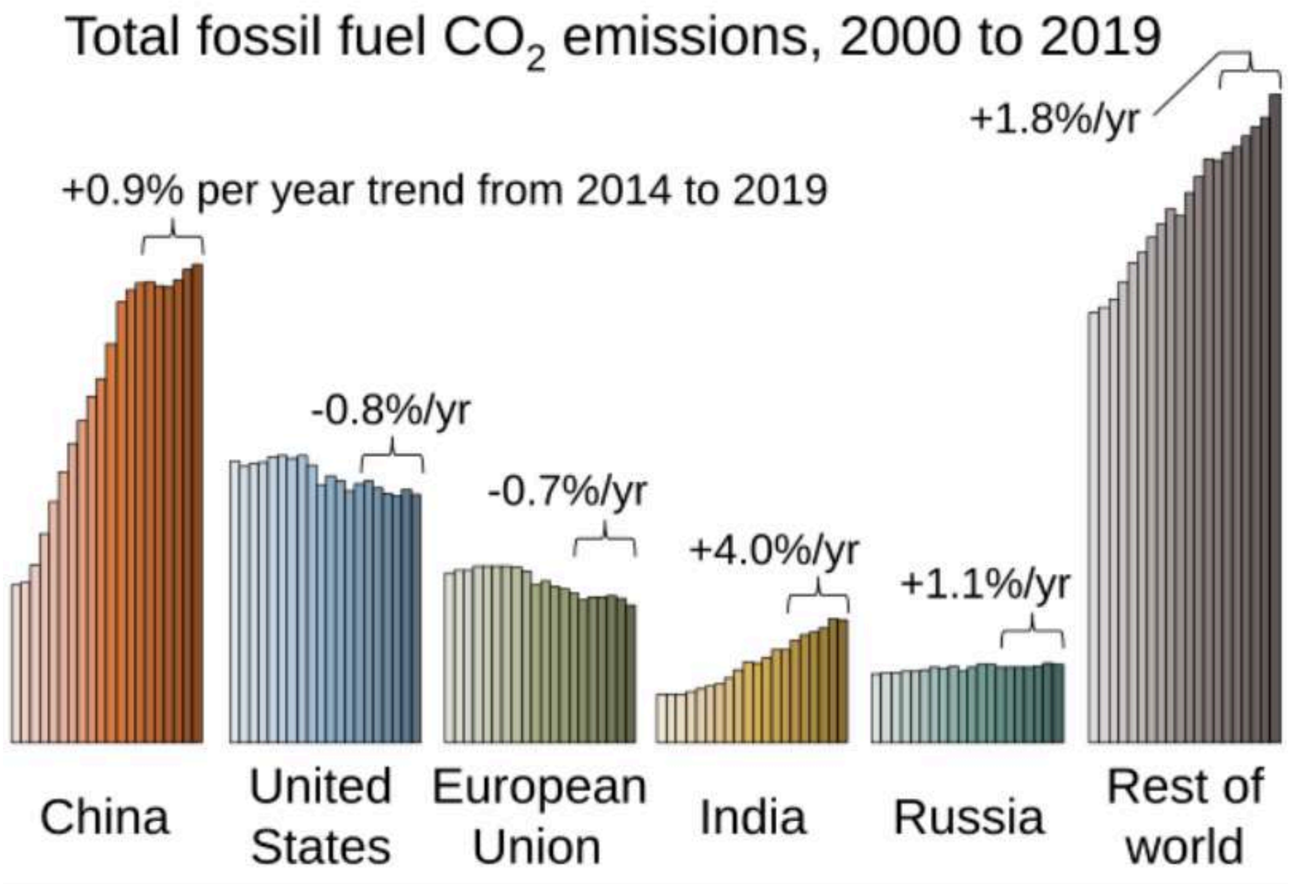


Economic sectors with more greenhouse gas contributions have a greater stake in climate change policies.

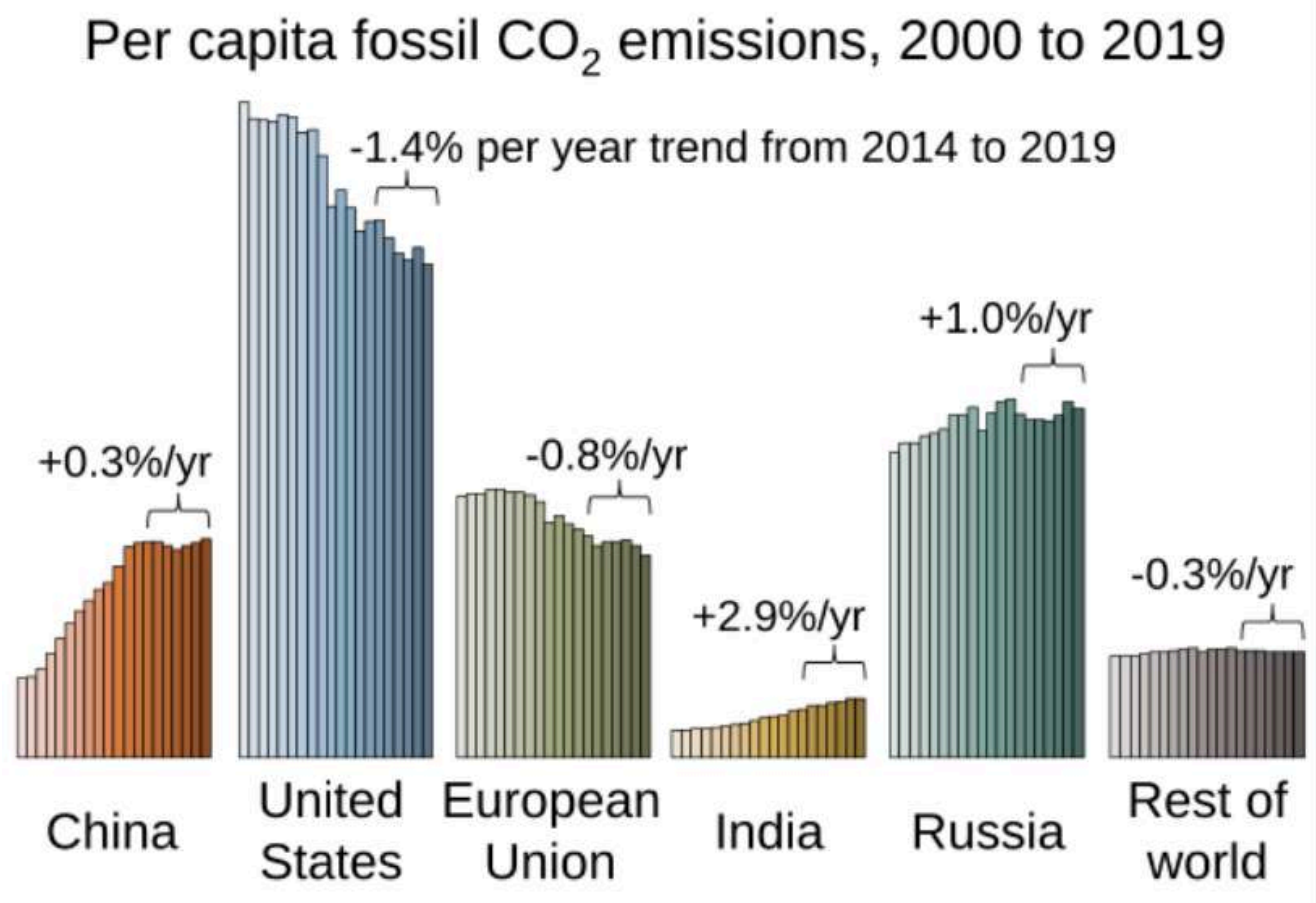


The Climate Change Performance Index ranks countries by greenhouse gas emissions (40% of score), renewable energy (20%), energy use (20%), and climate policy (20%).

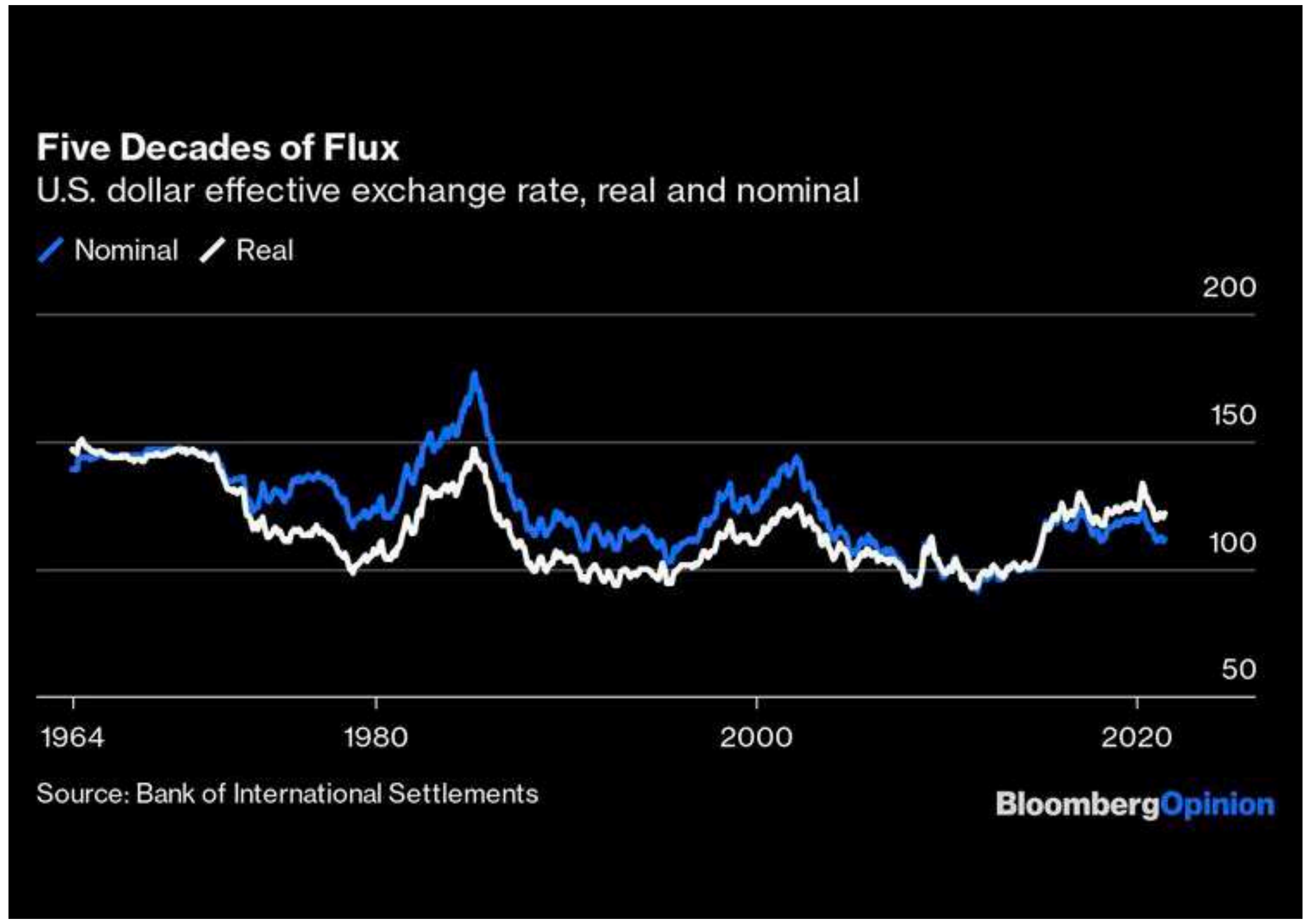
High Medium Low Very Low

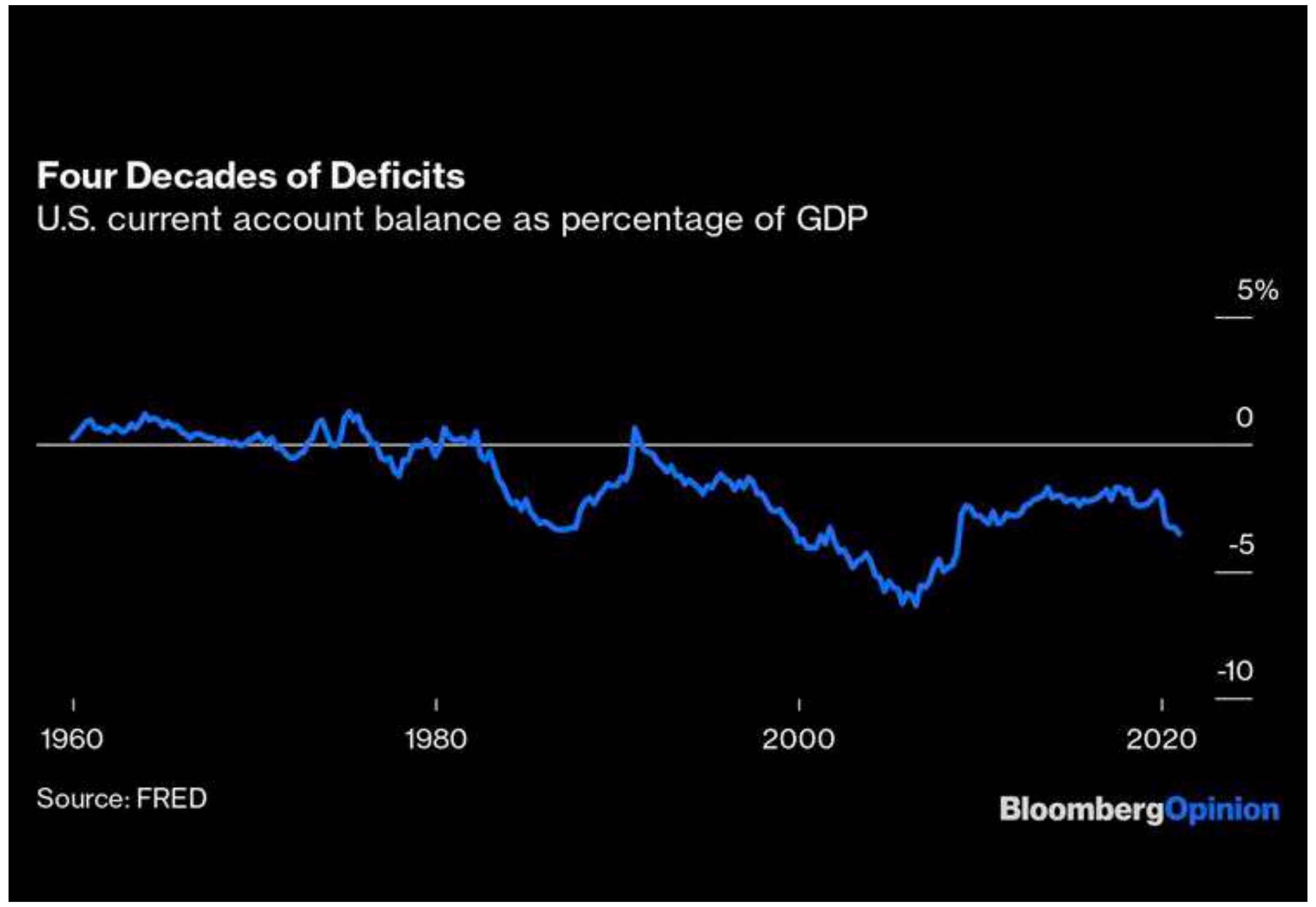


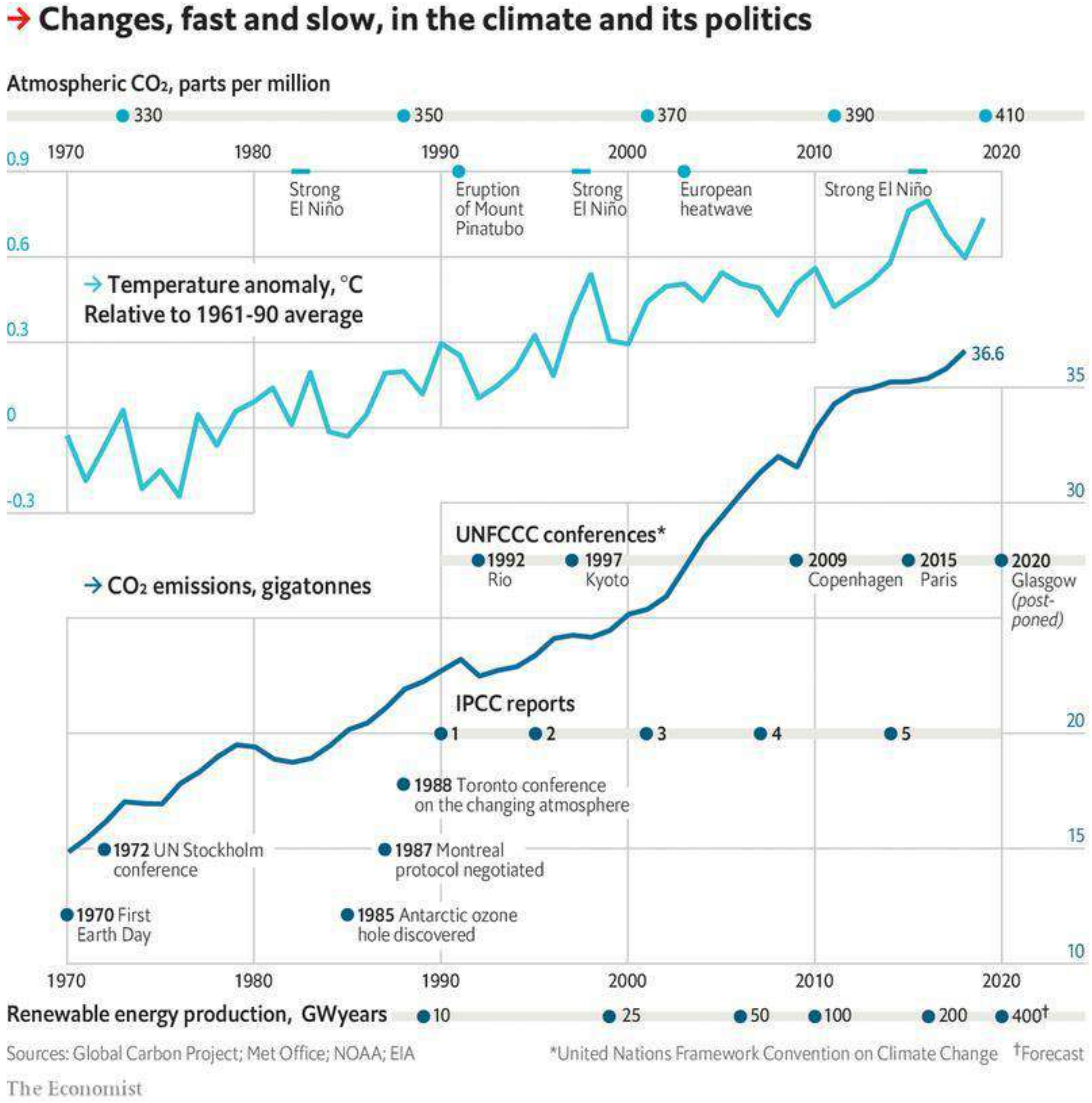
Since 2000, rising CO_2 emissions in China and the rest of world have surpassed the output of the United States and Europe.[278]



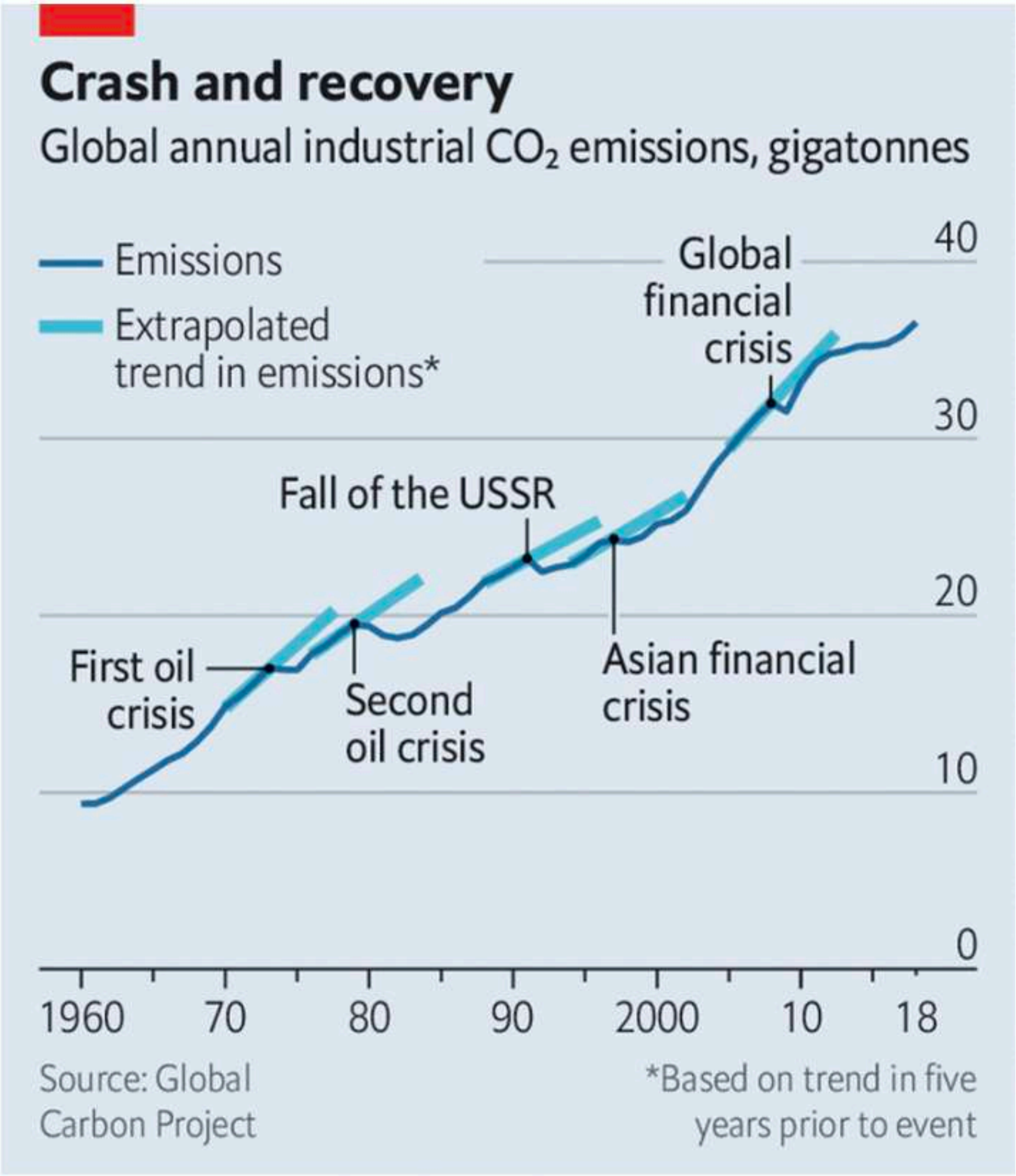
Per person, the United States generates CO_2 at a far faster rate than other primary regions.[278]


Five Decades of Flux
U.S. dollar effective exchange rate, real and nominal
Nominal
Real
200
150
100
50
1964
1980
2000
2020
Source: Bank of International Settlements
BloombergOpinion

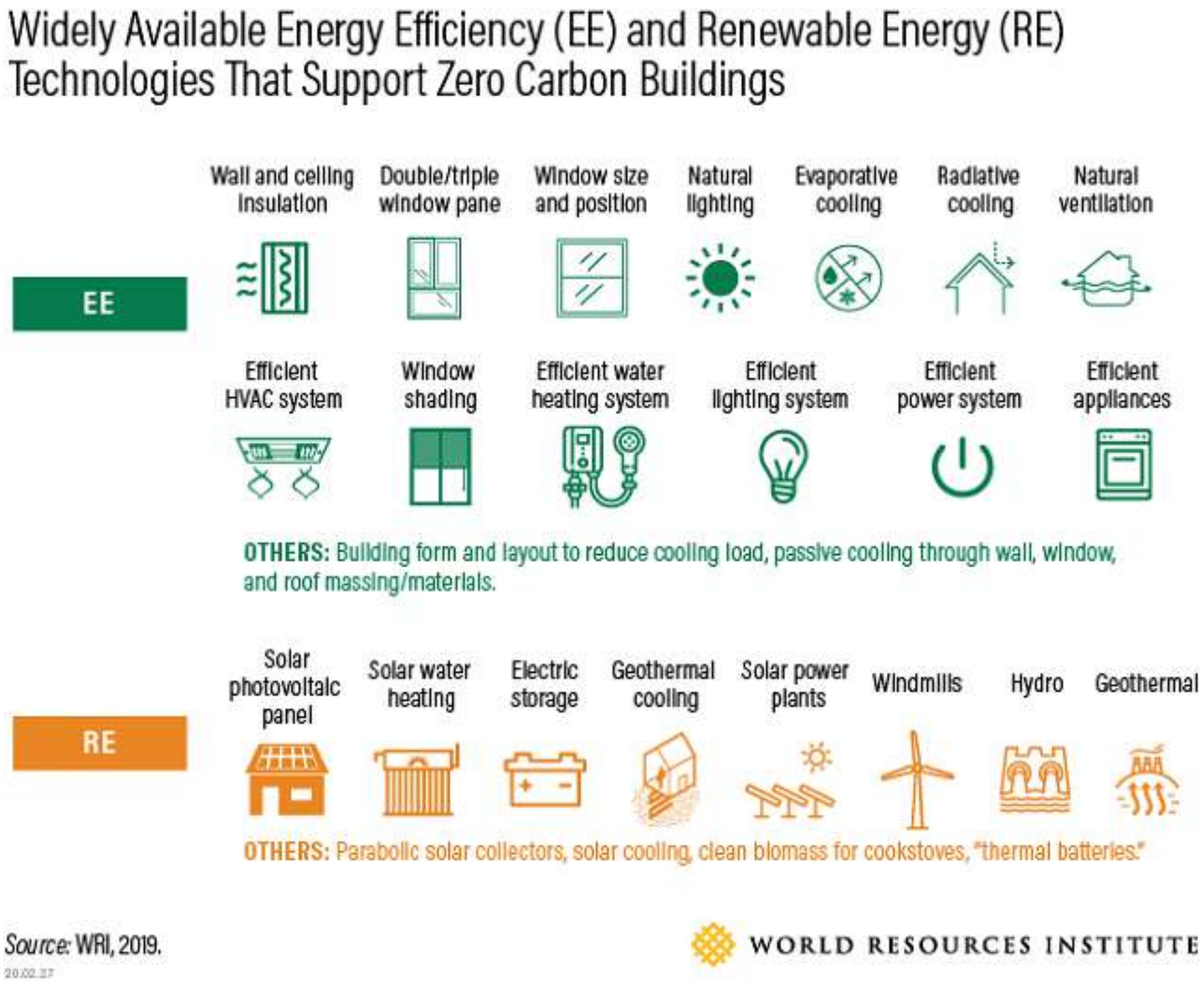

Four Decades of Deficits
U.S. current account balance as percentage of GDP
5%
0
-5
-10
1960
1980
2000
2020
Source: FRED
BloombergOpinion


Changes, fast and slow, in the climate and its politics
Atmospheric CO₂, parts per million
330
350
370
390
410
1970
1980
1990
2000
2010
2020
0.9
0.6
0.3
0
-0.3
Strong El Niño
Eruption of Mount Pinatubo
Strong El Niño
European heatwave
Strong El Niño
Temperature anomaly, °C
Relative to 1961-90 average
36.6
35
30
20
15
10
UNFCCC conferences*
1992 Rio
1997 Kyoto
2009 Copenhagen
2015 Paris
2020 Glasgow (post-poned)
CO₂ emissions, gigatonnes
IPCC reports
1
2
3
4
5
1988 Toronto conference on the changing atmosphere
1972 UN Stockholm conference
1987 Montreal protocol negotiated
1970 First Earth Day
1985 Antarctic ozone hole discovered
Renewable energy production, GWyears
10
25
50
100
200
400†
Sources: Global Carbon Project; Met Office; NOAA; EIA
*United Nations Framework Convention on Climate Change
†Forecast
The Economist

Humans unbalancing the carbon cycle



The Economist



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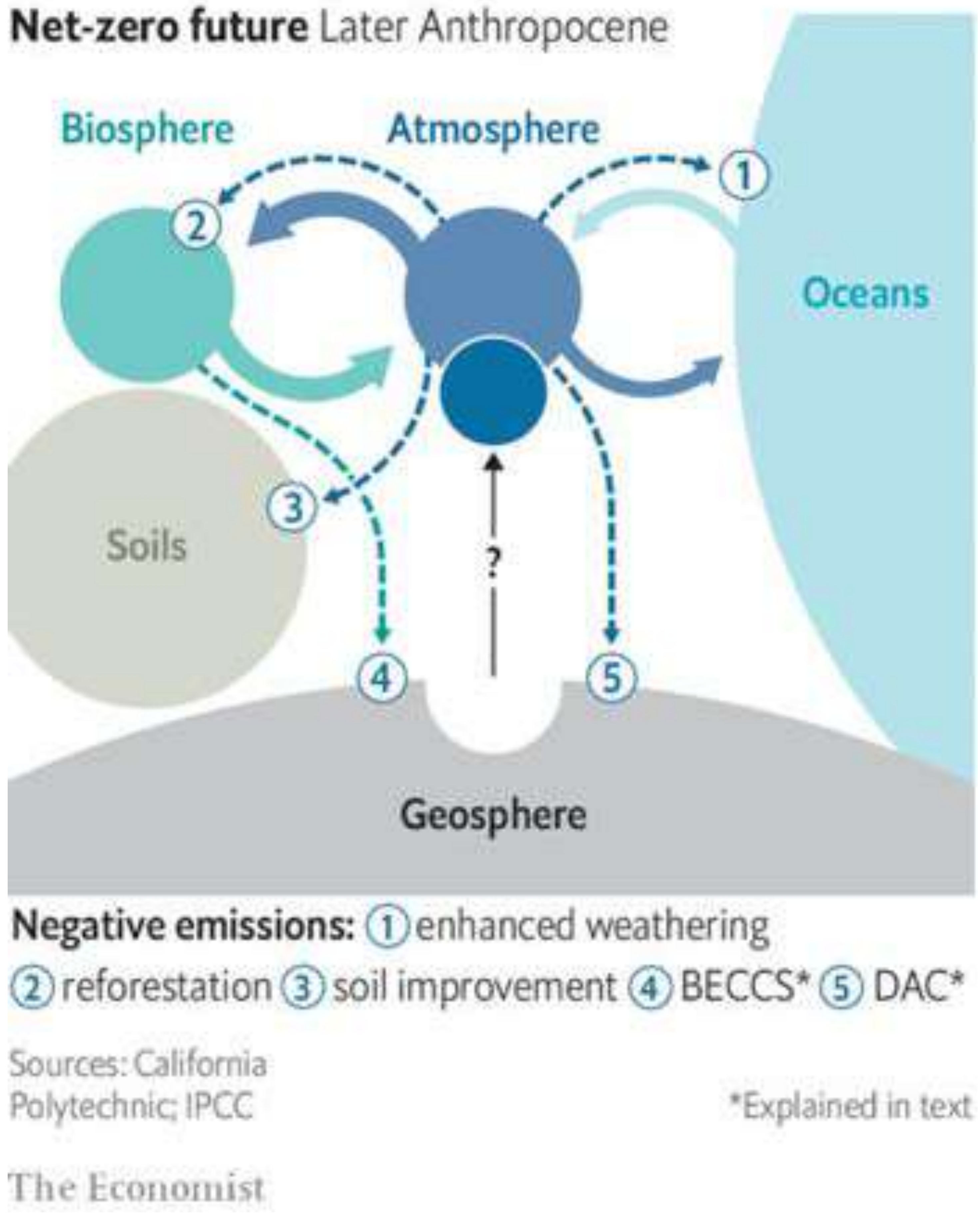
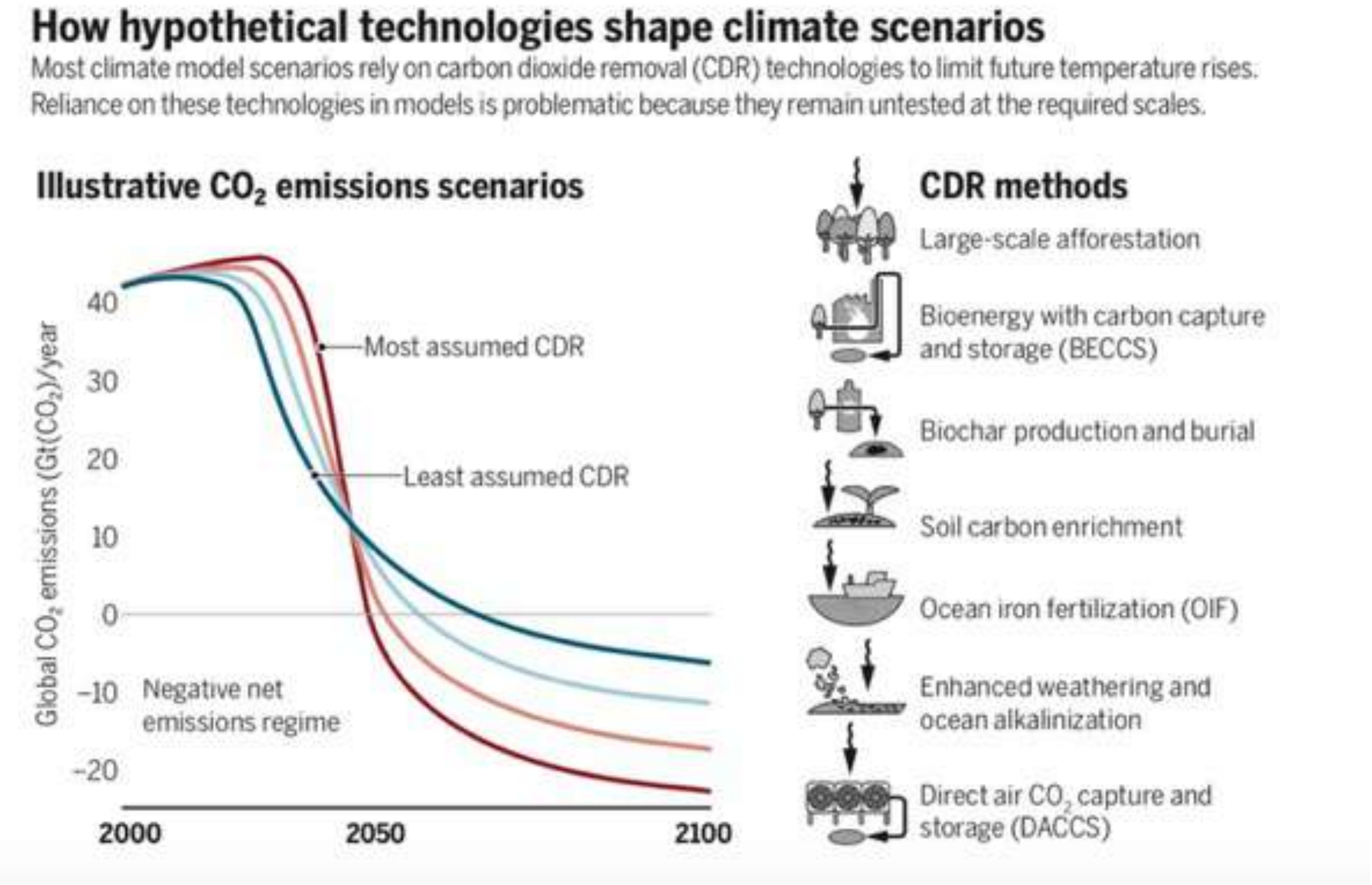




Quais cenários estratégicos para recursos hídricos em bacias hidrográficas para o período 2021-2050? Clima-Água-Megacidades

Millennium Ecosystem Assessment):
“Order from Strength” (reactive / regional)
“Global Orchestration” (reactive / global), “Adapting Mosaic” (proactive / regional),
“Technogarden” (proactive / global)

Brazilian IPEA - Inst Pesq Est. Apl.
“Vai levando”
“Crescer é o Lema”
“Novo Pacto Social”
“Construção” (desired scenario)

National Intelligence Council Global Trends:
“Rennaissance of Democracies”, “World Adrift”,
“Competitive Coexistence”,
“Isolated Siloes”
“Tragedy & Mobilization”

IPEA-PNRH-IICA-MDR)
Cenário A-“Referência”,
Cenário B-“Transformador”,
Cenário C-“Crise”

Shared Socioeconomic Pathways

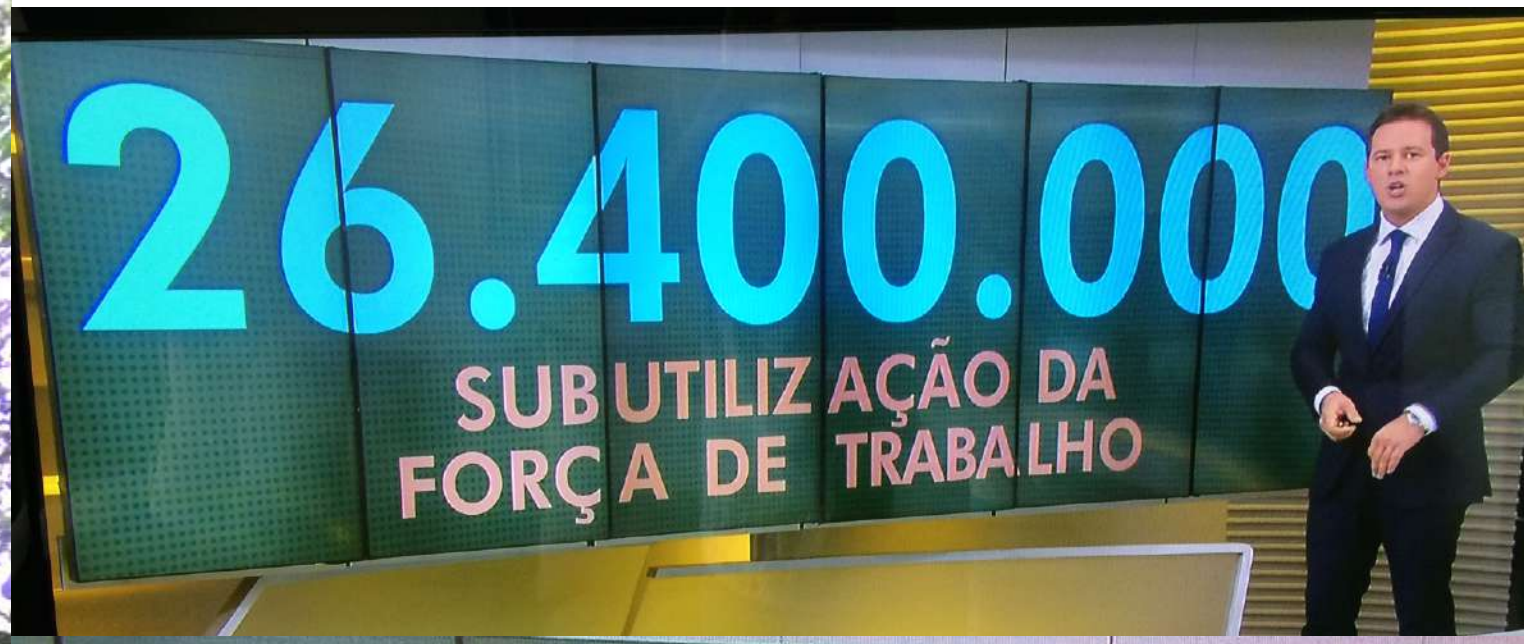
SSP1: Sustainability (Taking the Green Road)
SSP2: Middle of the Road
SSP3: Regional Rivalry (A Rocky Road)
SSP4: Inequality (A Road divided)
SSP5: Fossil-fueled Development (Taking the Highway)

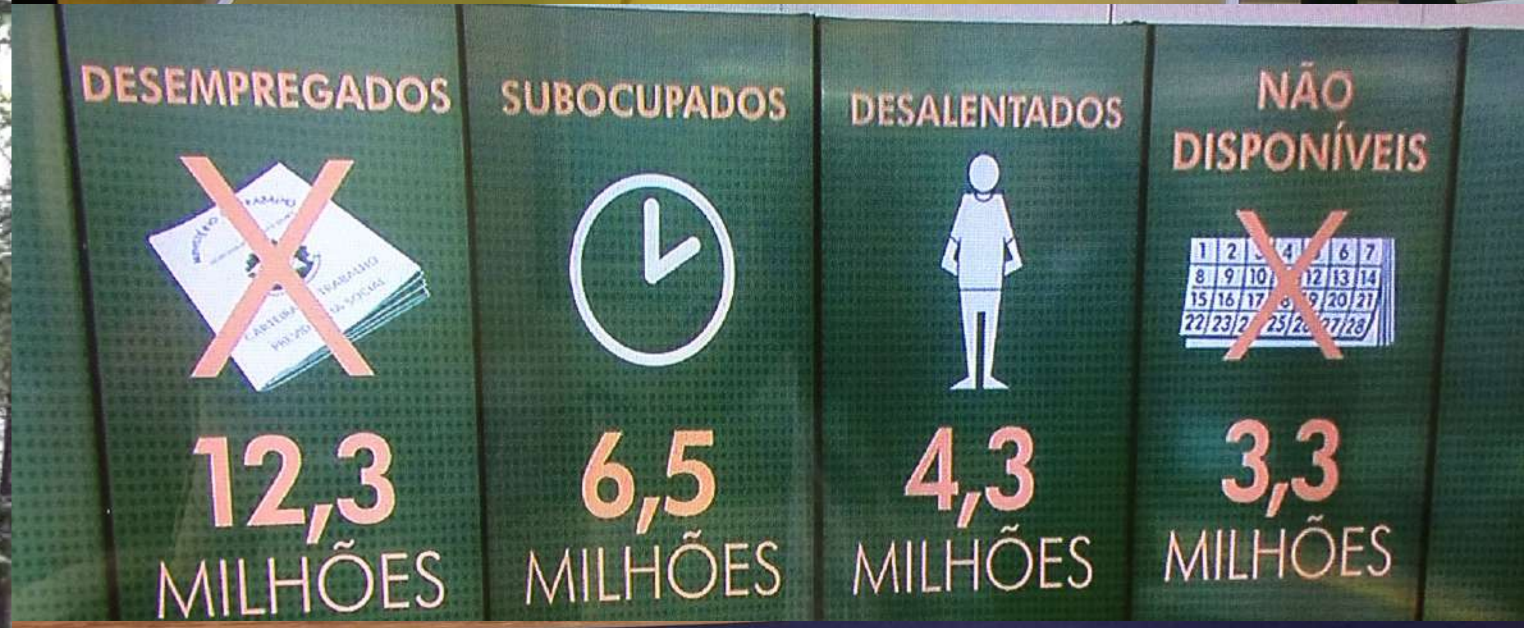
Demographic scenario (SSPs)	World population growth (billion)	World population (billion)	Climate scenario		
			RCP 2.6	RCP 4.5	RCP 8.5
			mean projected global temperature rise of ~1.5 °C	-	mean projected global temperature rise of ~3.2 °C
			Outside "human climate niche" (bn)	Outside "human climate niche" (bn)	Outside "human climate niche" (bn)
Zero growth	0.00	7.26	1.06 ± 0.30	1.62 ± 0.42	2.37 ± 0.43
SSP1	0.98	8.24	1.20 ± 0.34	1.84 ± 0.48	2.69 ± 0.49
SSP2	2.20	9.46	1.38 ± 0.39	2.12 ± 0.55	3.09 ± 0.56
SSP3	3.88	11.14	1.63 ± 0.46	2.49 ± 0.65	3.64 ± 0.66
SSP4	2.20	9.46	1.38 ± 0.39	2.12 ± 0.55	3.09 ± 0.56
SSP5	1.21	8.47	1.24 ± 0.35	1.89 ± 0.49	2.76 ± 0.50

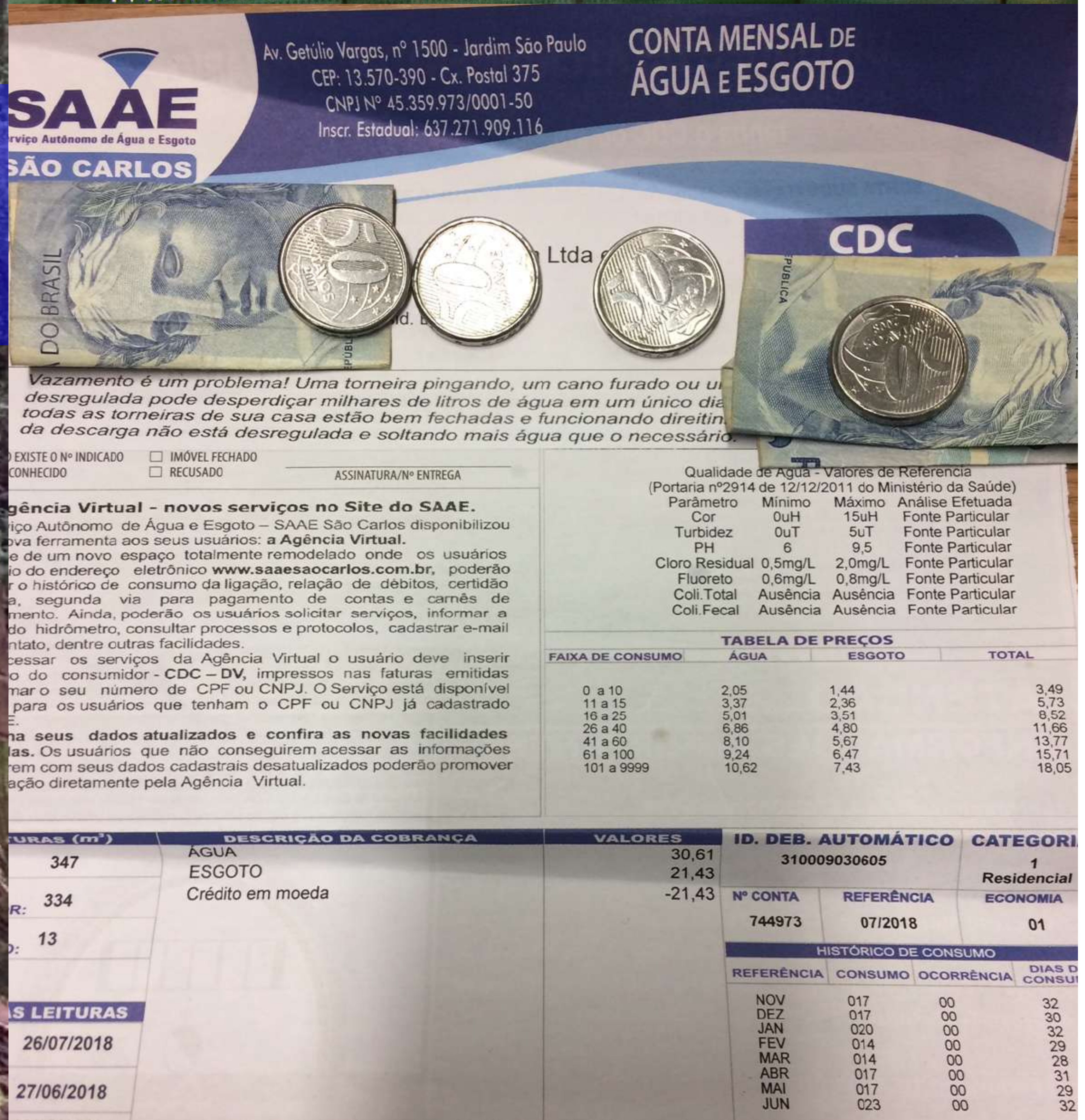
Quais indicadores de ameaças, vulnerabilidades e adaptação das componentes hidrológicas sob mudanças (do clima, do uso do solo, do padrão de consumo, etc)?

Como buscar indicadores simples para audiência interdisciplinar de tomadores de decisão em escala Bacia Hidrográfica ?

Como justificar e discutir com exemplos de indicadores sob mudanças de curto-, médio- e longo-prazo?

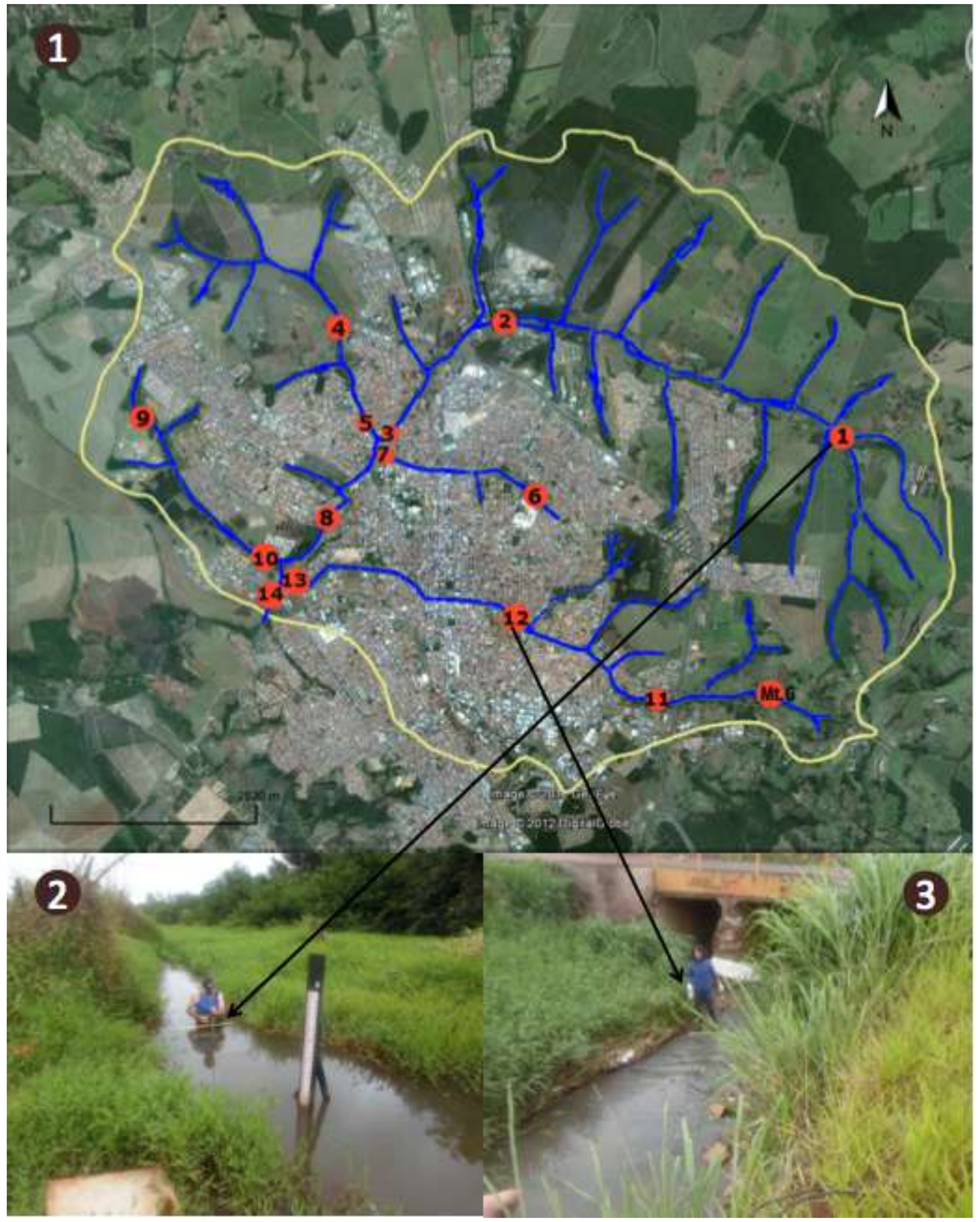






Águas Subterrâneas da Bacia do Paranapanema

O Projeto Rede Integrada de Águas Subterrâneas foi desenvolvido em parceria con os geólogos do Paranapanema e traz um amplo estudo sobre os aquíferos presente na Bacia Hidrográfica do Rio Paranapanema e sua utilização. A partir daí foi possíve criar um planejamento para a implementação da rede de monitoramento d aquíferos da Bacia. O Projeto apresenta a proposta de áreas prioritárias para locaçã de Postos de Monitoramentos (PMs) - 18 no Estado de São Paulo e 20 no Estado d Paraná, assim como mostra os já existentes; ele ainda define as estratégias d implementação da rede, com a instalação dos equipamentos e manutenção com estimativa de custo. Os resultados do projeto serão amplamente divulgados após entrega oficial dos relatórios finais.



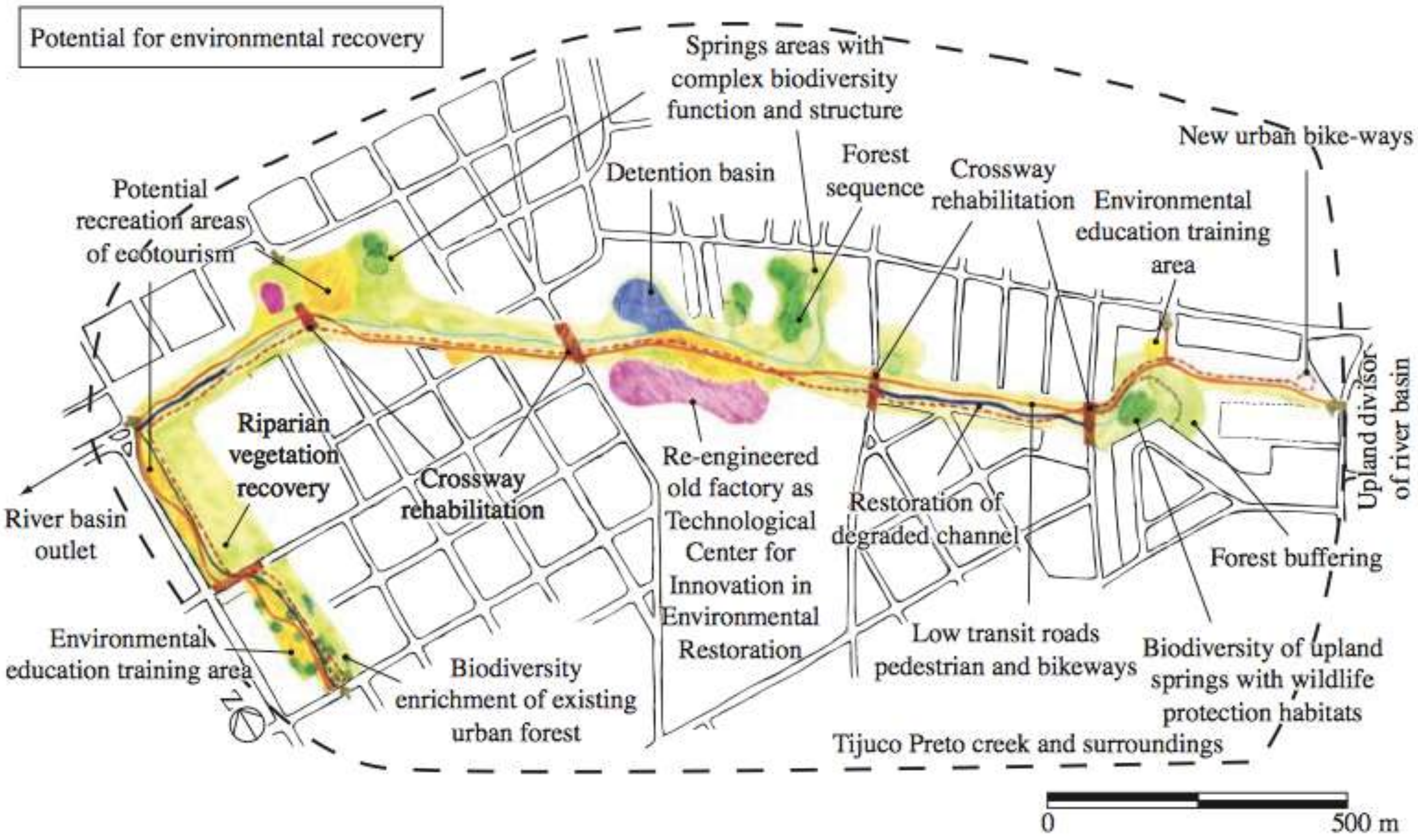
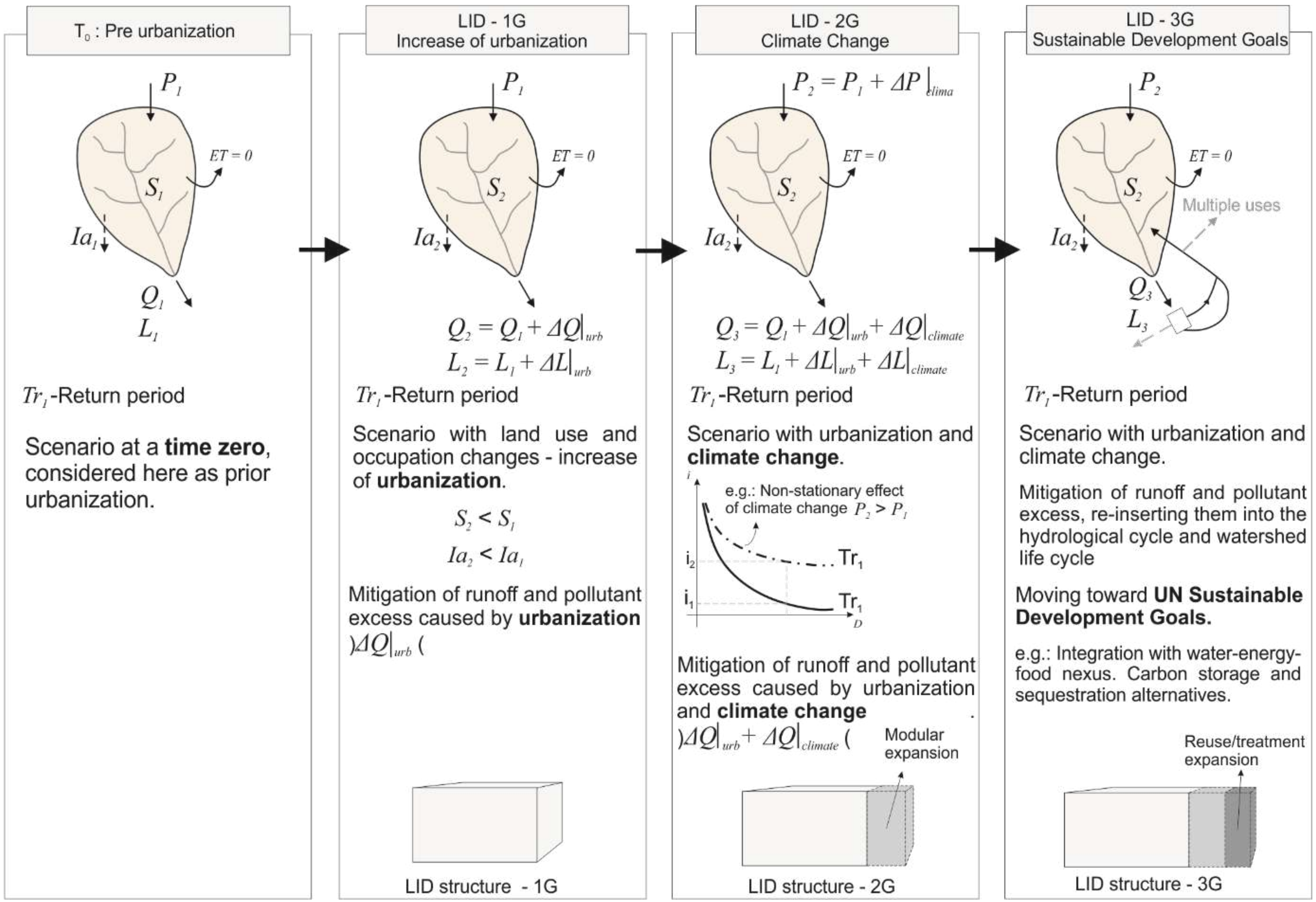


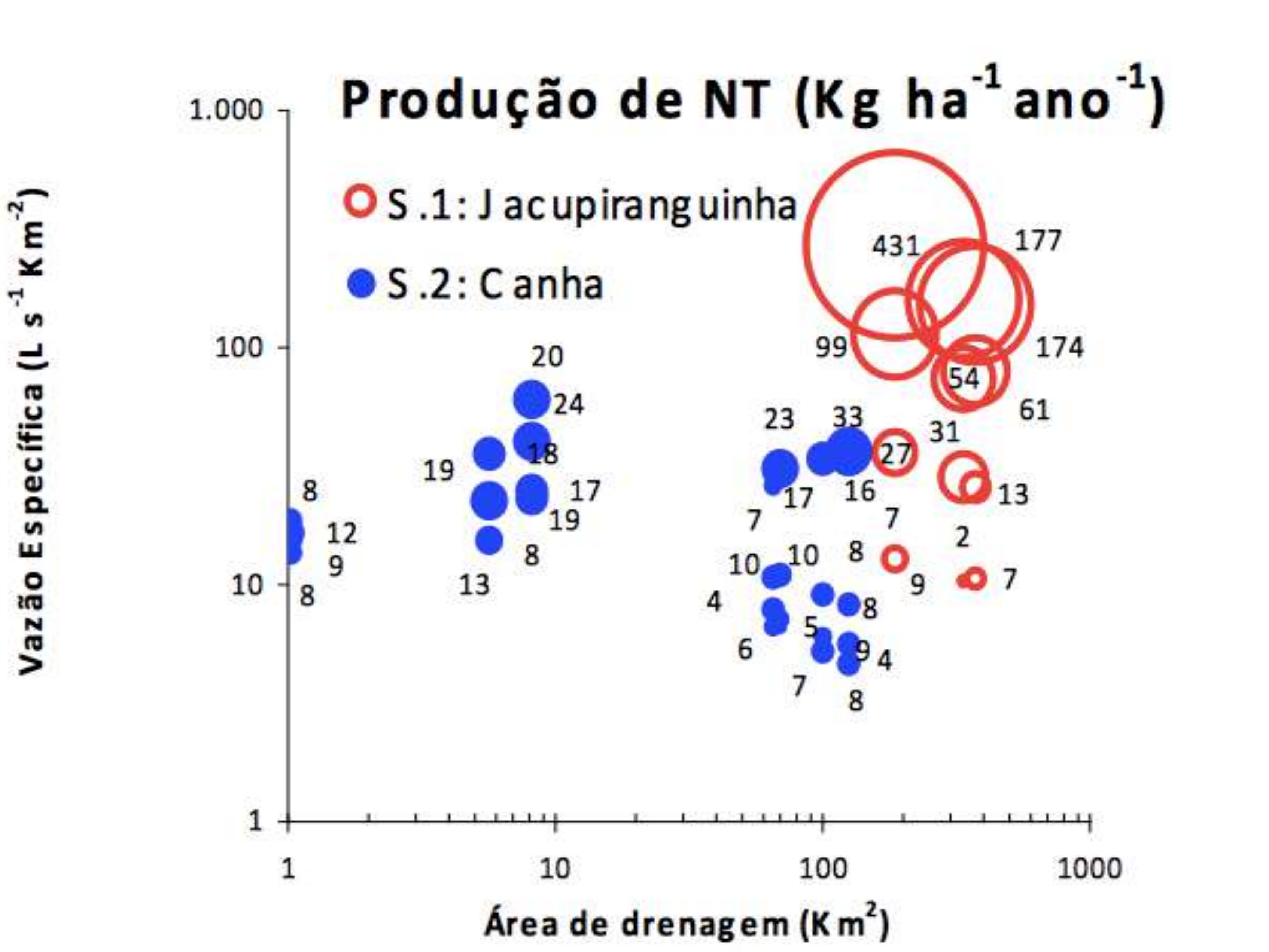
Figure 2. A perceptual approach of local environmental projects to restore biodiversity loss at urban micro-catchment of *Tijuco Preto* Creek, Sao Carlos, Brazil. Total specific cost of biodiversity restoration project was calculated in 2.5 million US$/km^2 of drainage area of river basin. Total environmental services of urban catchment are estimated in ca. 28 to 33 million US$/km^2. Source FIPAI-PMSC (2005).

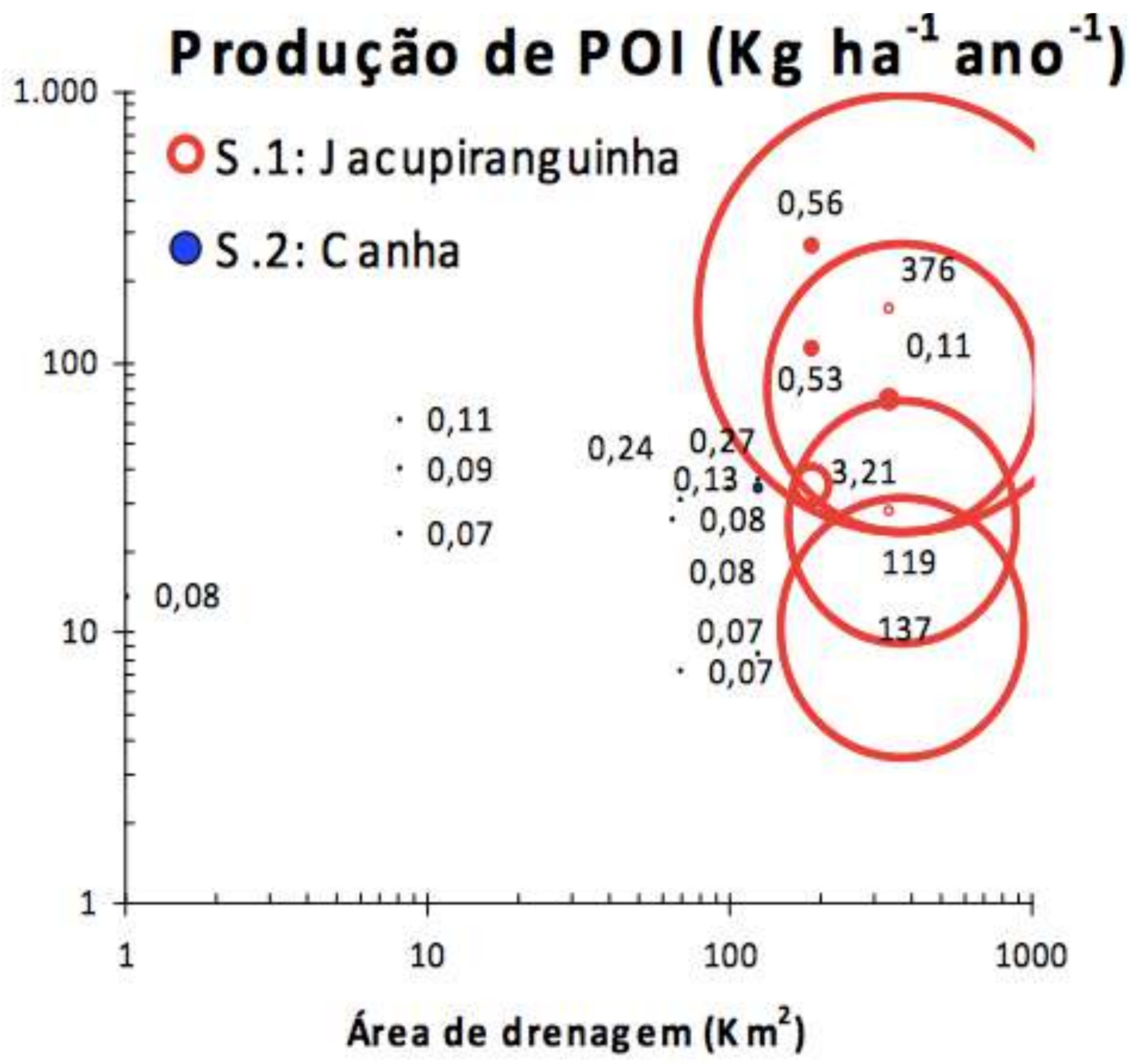


Critical Reviews in Environmental Science and Technology (207609946, under review)

Low Impact Development Practices in the context of United Nations Sustainable Development Goals: A new concept, lessons learned and challenges

M B Macedo[1], M N Gomes Júnior[2], T R P de Oliveira[3], M H. Giacomoni[4], M Imani[5], K Zhang[6], C A F do Lago[7], E M Mendiondo[8]





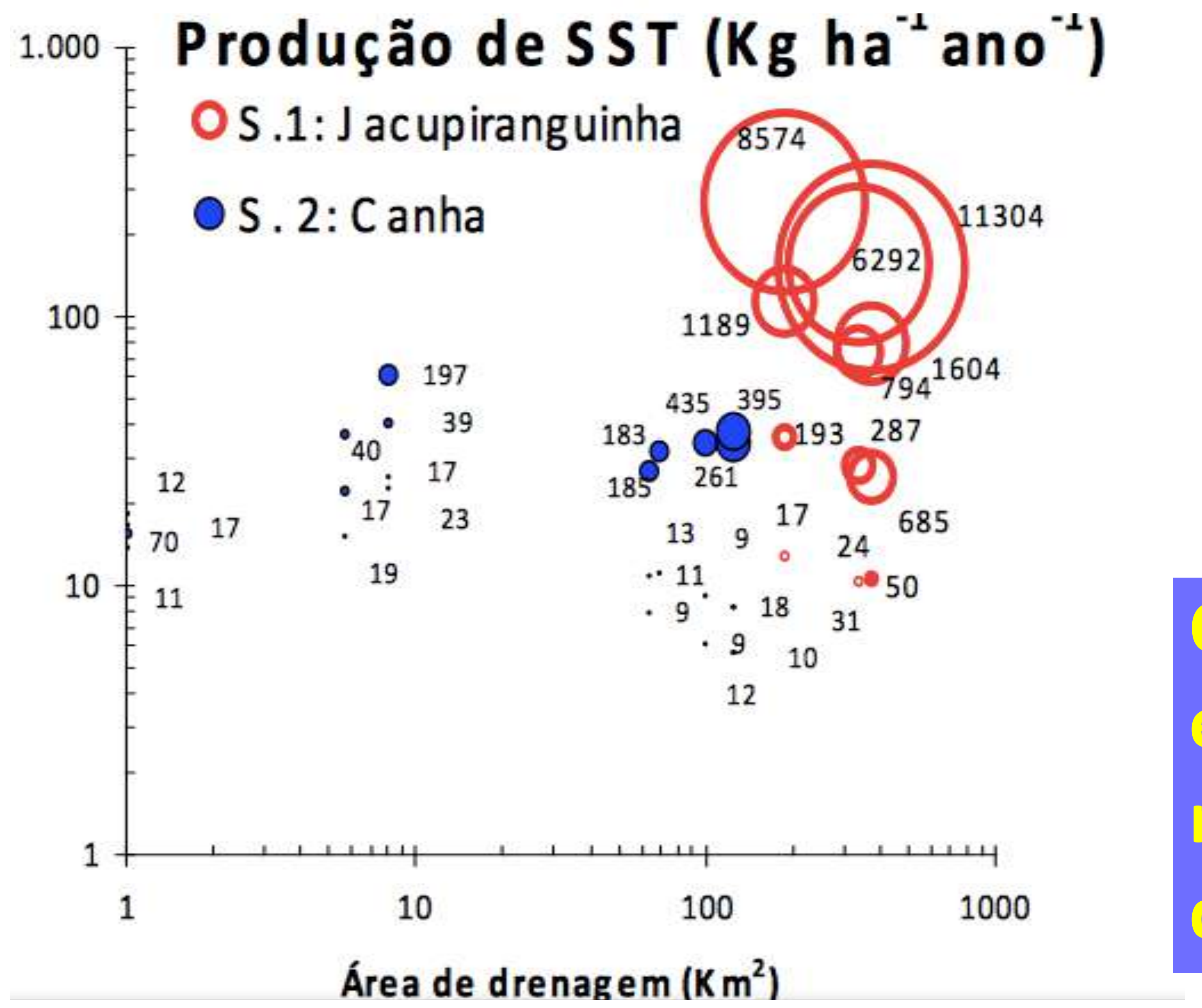
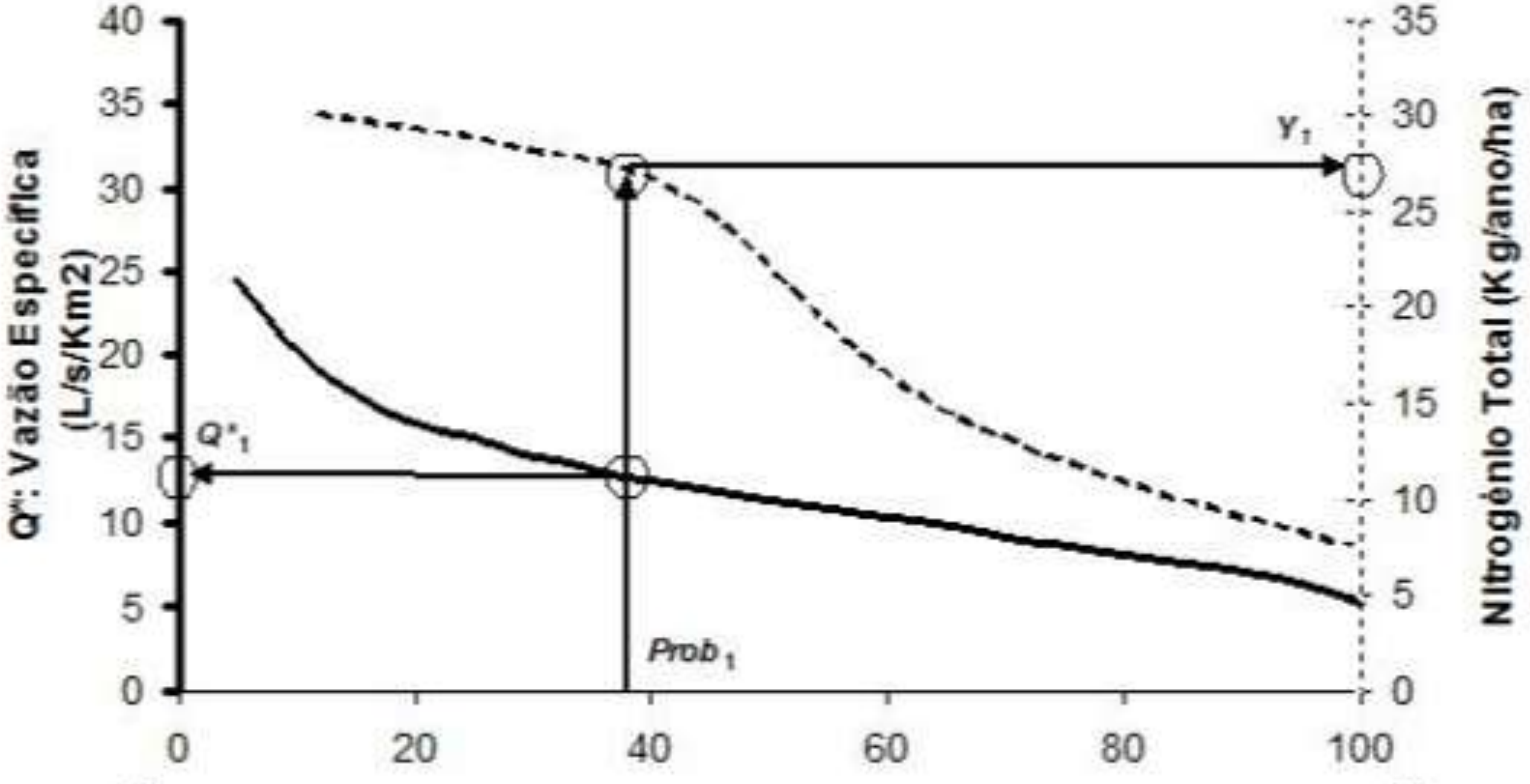


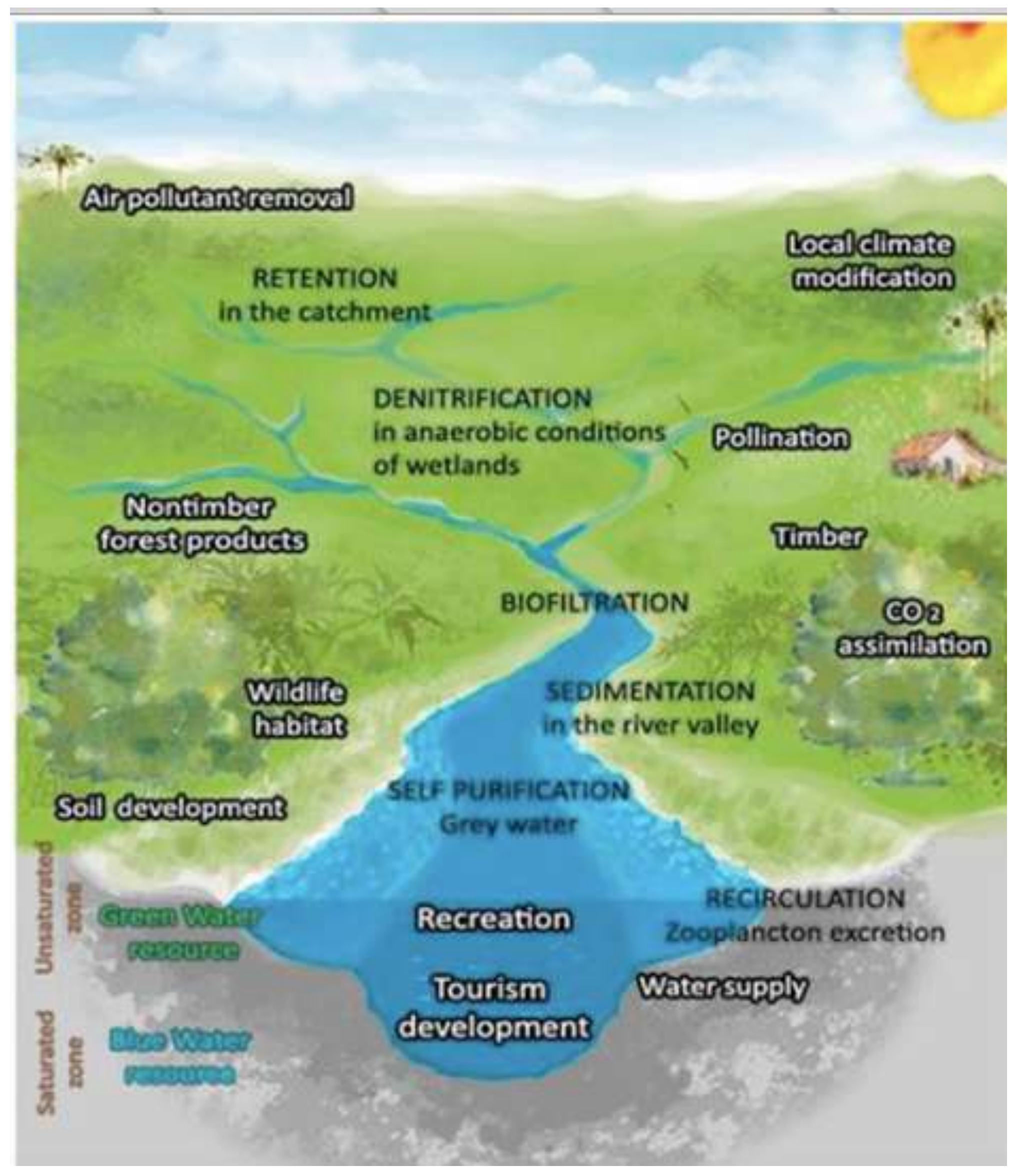
Figura B1.2: Exemplo de regionalização empírica de produção de cargas de nitrogênio total, fosfato inorgânico e sólidos suspensos em sub-bacias afluentes do Rio Jacupiranguinha (•) e Canha (o), respectivamente. Ver explicações sobre vulnerabilidade e impactos no texto.

Quais indicadores de ameaças, vulnerabilidades e adaptação das componentes hidrológicas sob mudanças (do clima, do uso do solo, do padrão de consumo, etc)?

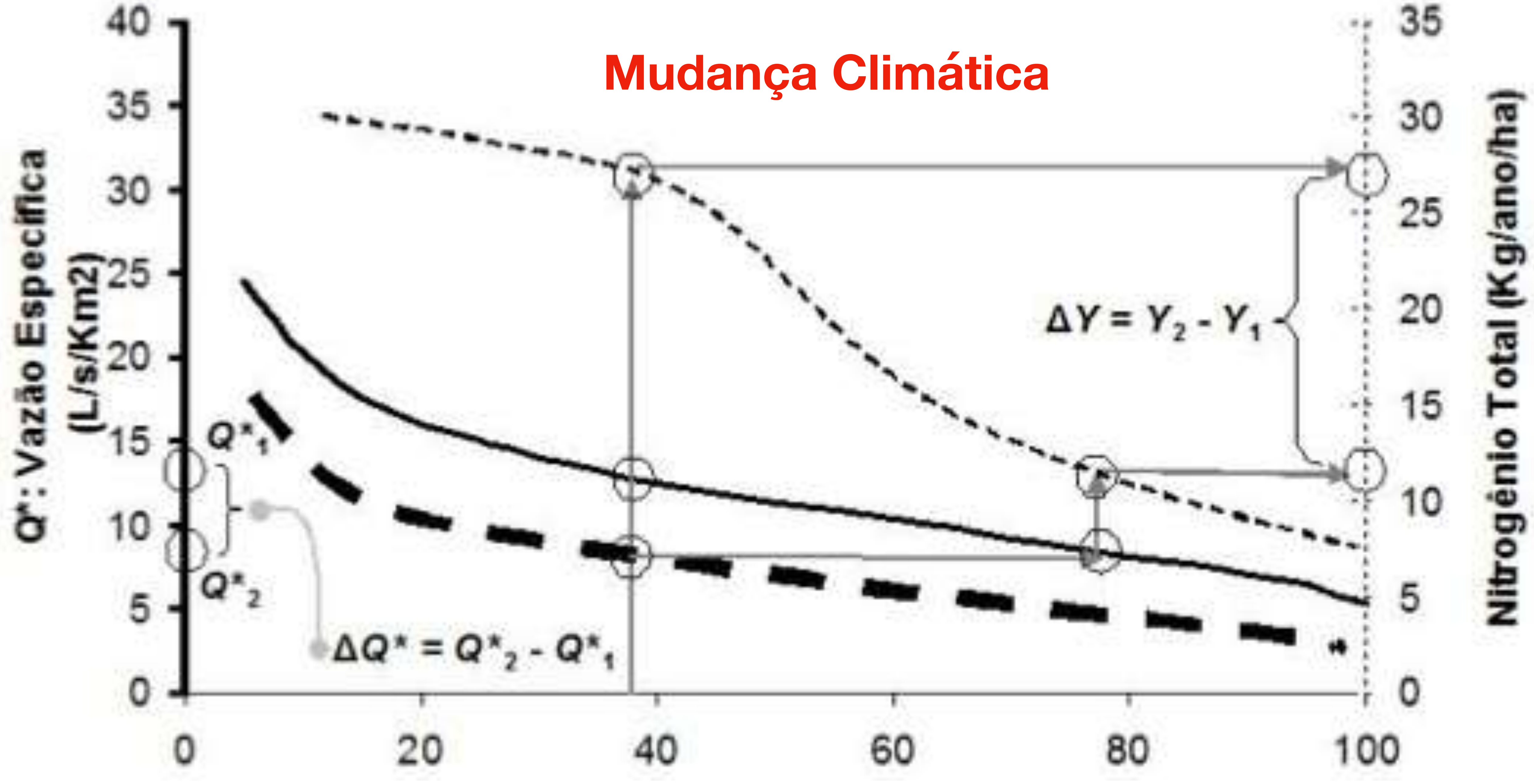
http://www.incline.iag.usp.br/data/arquivos_download/AmbrizziJacobiDutra2015.pdf

First, a Water Footprint Generator module (WFG) is mathematically oriented into a new multiscale water balance equation with traditional components of precipitation, evapotranspiration and runoff, as well as with water supply, sewer production and virtual water fluxes, including garbage production.

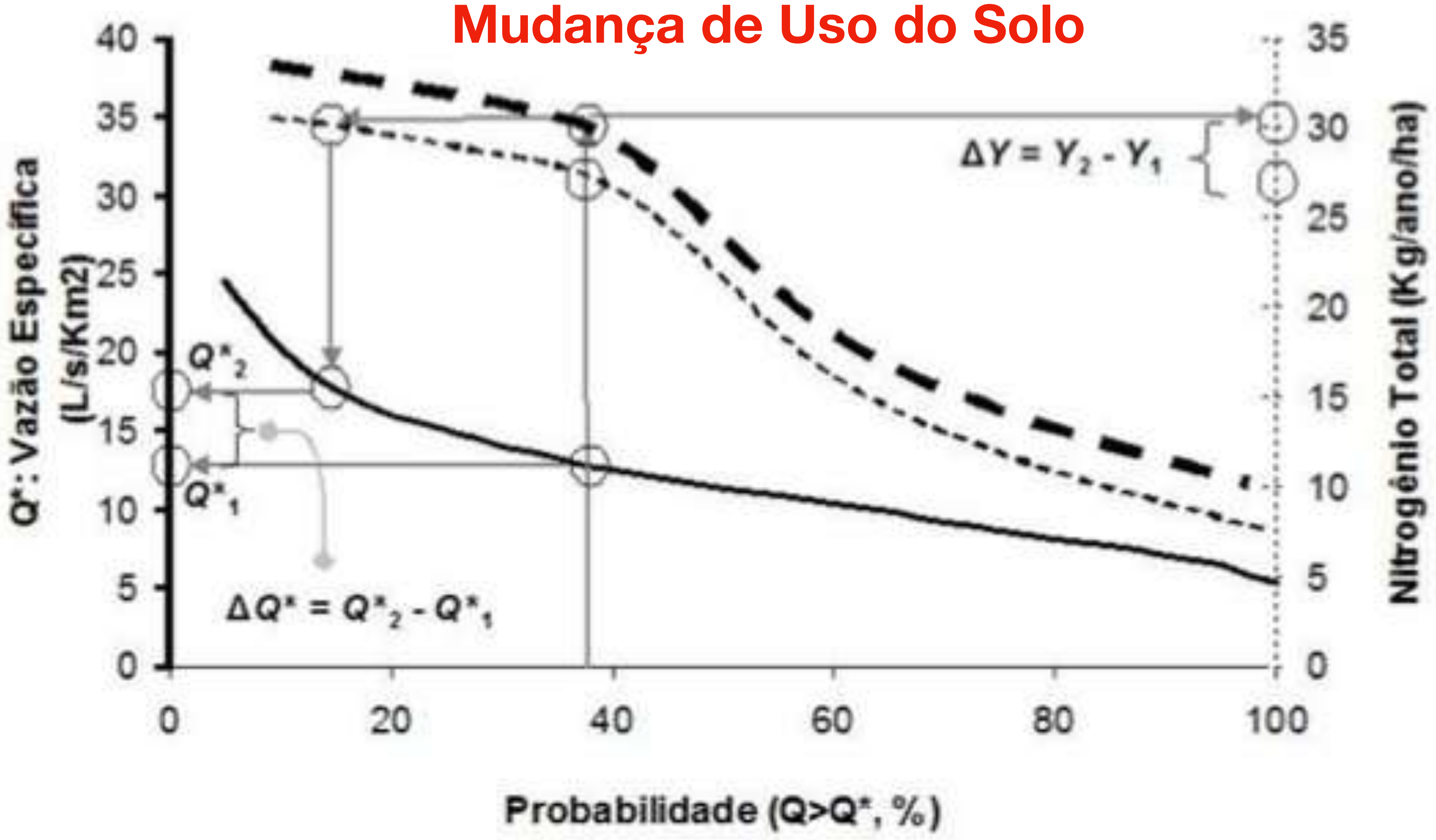




Mudança Climática



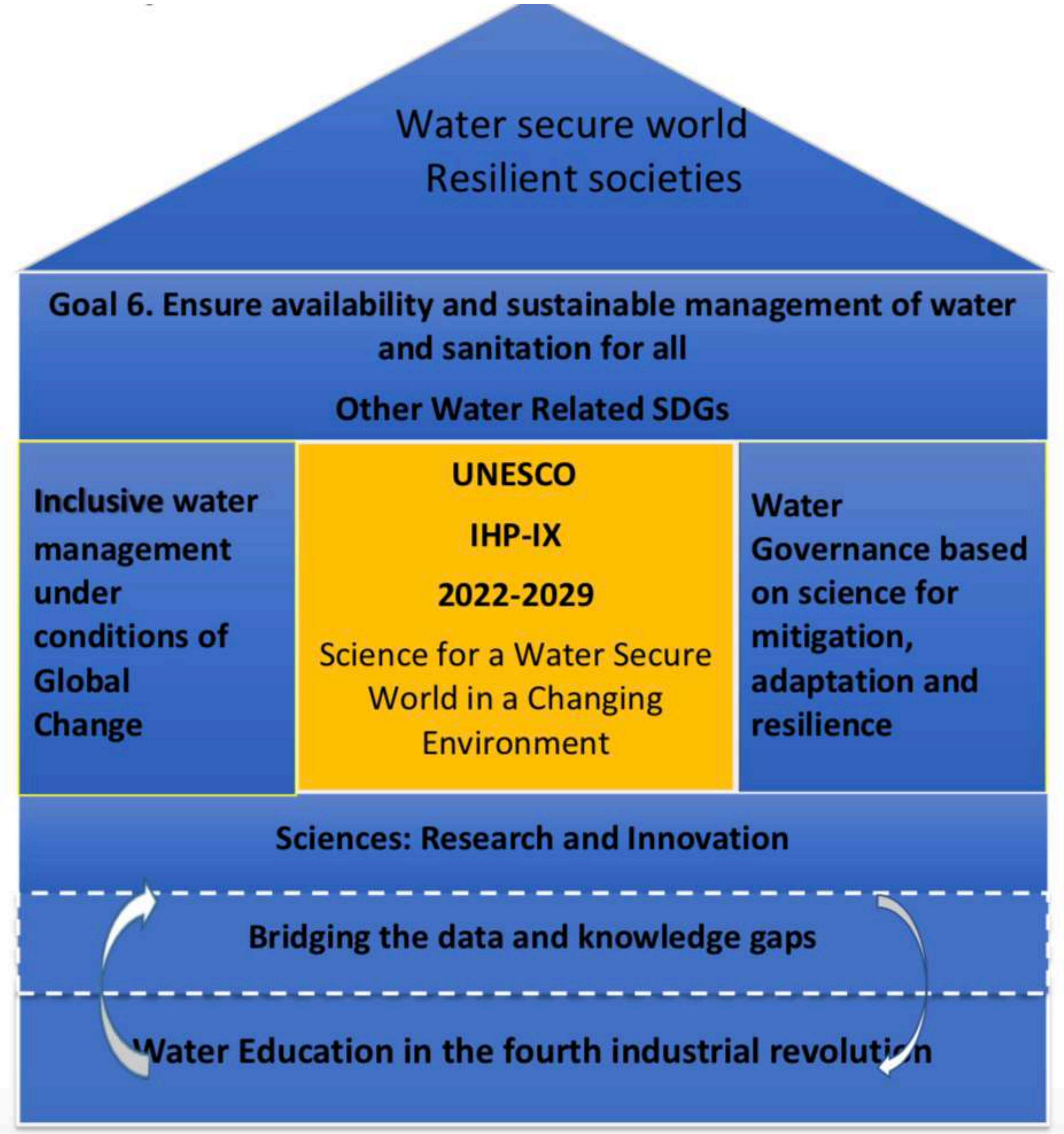
Mudança de Uso do Solo



CBH-Paranapanema

- Vazão de referência unificada: A vazão de referência para outorga em toda Bacia foi unificada, passando a ser adotada a variável hidrológica denominada Q95%. A ação visou consolidar a outorga de direito de uso da água, como instrumento de gestão efetivo na Unidade de Gestão de Recursos Hídricos (UGRH) Paranapanema, unificando-o no âmbito da gestão. A vazão refere-se ao volume de água ou efluente que passa, na unidade de tempo.

Introduction



- The UNESCO-IHP-Phase IX (2022-2029) incorporates Ecohydrological Sciences for water security in a changing environment.

  Impacts of COVID pandemic and food insecurity accelerate the usability of ecohydrological nature-based solutions (EH-NbS)[a], as cooperative as transboundary.

[a] : https://doi.org/10.1016/j.ecohyd.2021.11.005

How can we scale ecohydrological nature-based solutions (EH-NbS)[a], as cooperative as transboundary?

Urban Park "Bosque das Paineiras", Sao Carlos-SP, Brazil / E.M.M. 2022

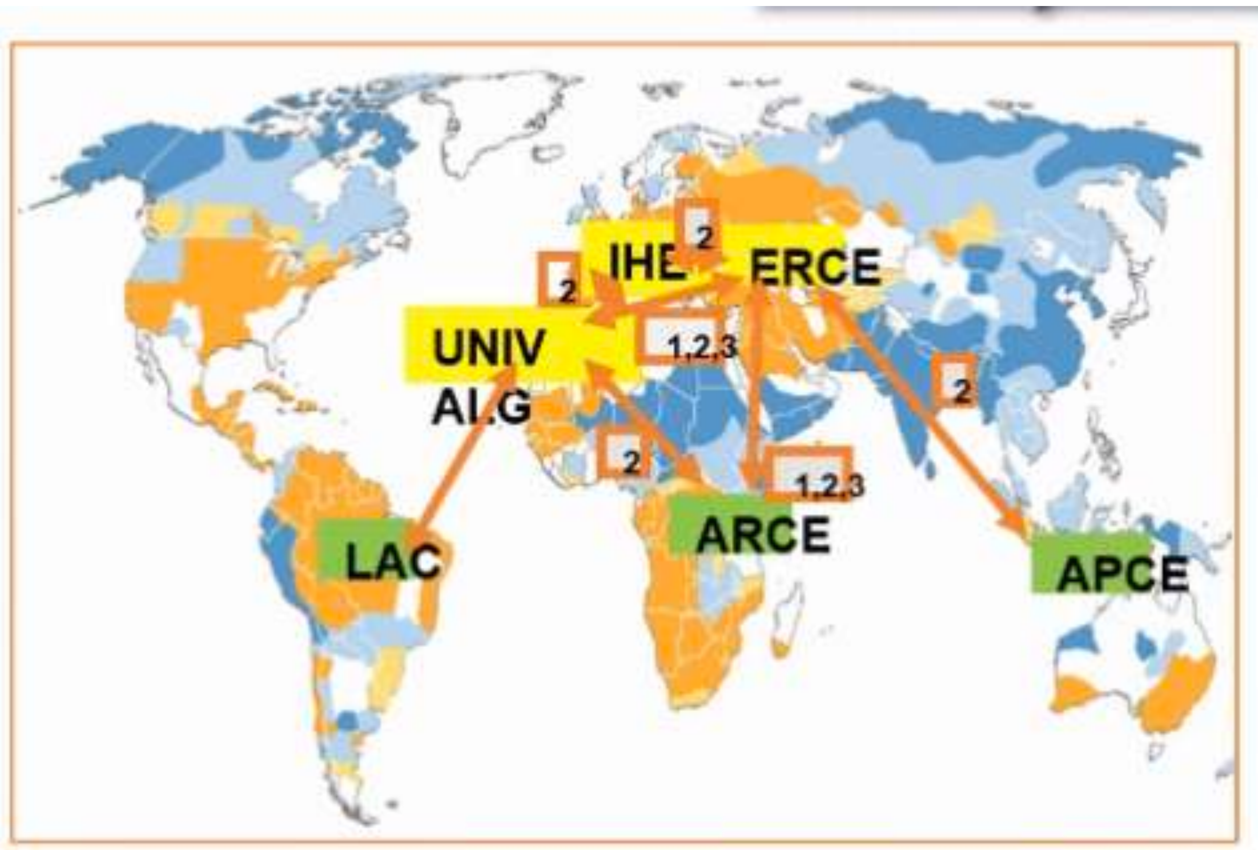
Objective

To share recent interdisciplinary examples of EH-NbS linked to the "WBSRC"[b] (Water, Biodiversity, ecosystem Services for society, Resilience to climate change, and Cultural heritage)

ELSEVIER
Ecohydrology & Hydrobiology
Volume 18, Issue 4, December 2018, Pages 309-310

Low cost, nature-based solutions for managing aquatic resources: integrating the principles of Ecohydrology and the Circular Economy

Maciej Zalewski [1, 2], Giuseppe Arduino [3], Giovanni Bidoglio [4], Wolfgang Junk [5], Johannes Cullmann [6], Stefan Uhlenbrook [7], Jun Xia [8], Carlos Garcia de Leaniz [9], Pawel M. Rowinski [10], Charles J. Vörösmarty [11, 12], Luis Chicharo [13]



[b]: https://doi.org/10.1016/j.ecohyd.2018.12.001

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Popularização Científica - Academia - Comunidade

www.ceped.eesc.usp.br

COVID-19

Popularização Científica para Professores de Escola da Rede Pública

PROSFE – Panta Rhei Open Science for a Future Earth – Envisioning a Post Pandemic Resilient Society

#UmaGotaDeCiencia

#UmaDoseDeResiliencia

UNESCO

Organização das Nações Unidas para a Educação, a Ciência e a Cultura

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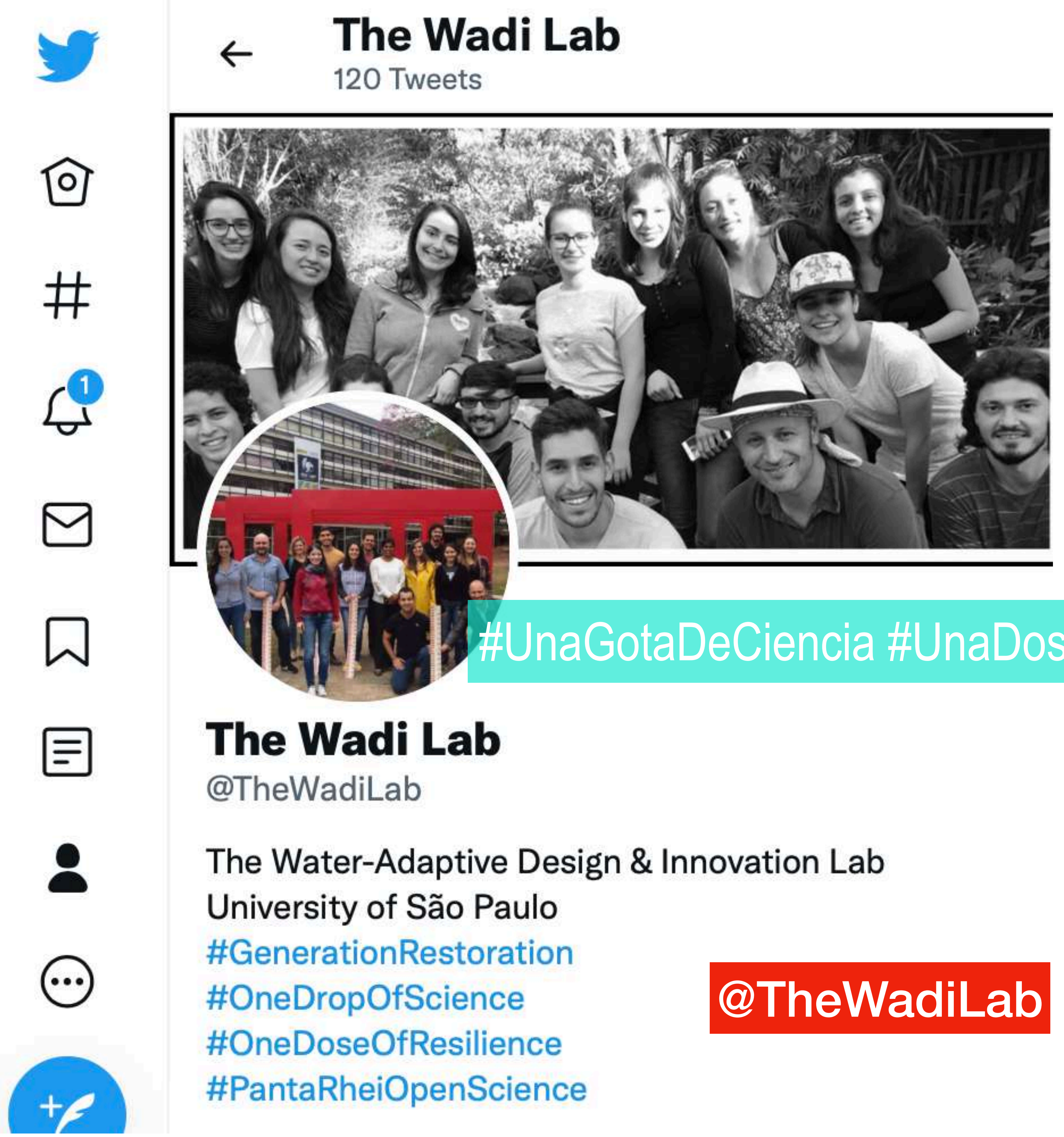
Cátedra UNESCO
Águas Urbanas - Qualidade, Gerenciamento, Recuperação e Reuso
Universidade de São Paulo, Brasil

Jan. 2020 | Jul. 2020 | Dez. 2020 | Jul. 2021 | Dez. 2021 | Jul. 2022

Ciencia Abierta y Ciudana

Eje Planeta



#UnaGotaDeCiencia #UnaDosisDeResiliencia

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LIBRO GRATUITO: http://www.usp.br/ceped/sites/default/files/LIVROriscosdesastres.pdf

Panta Rhei IAHS AISH Everything Flows — Change in Hydrology and Society

EESC • USP

UNESCO — United Nations Educational, Scientific and Cultural Organization | uniTwin — UNESCO Chair on Urban Water - Quality, Management, Recovery and Reuse, University of São Paulo, Brazil

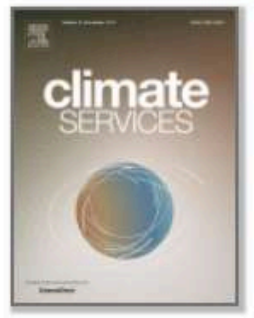
The wadi lab — water-adaptive design & innovation


Cooperative EH-NbS —> Water, Biodiversity, ecosystem Services for society, Resilience to climate change, and Cultural heritage
STEAM
Science
Technology
Engineering
Arts
Maths

Example I: circular framework with feedbacks, scales and stakeholders [c]

ELSEVIER

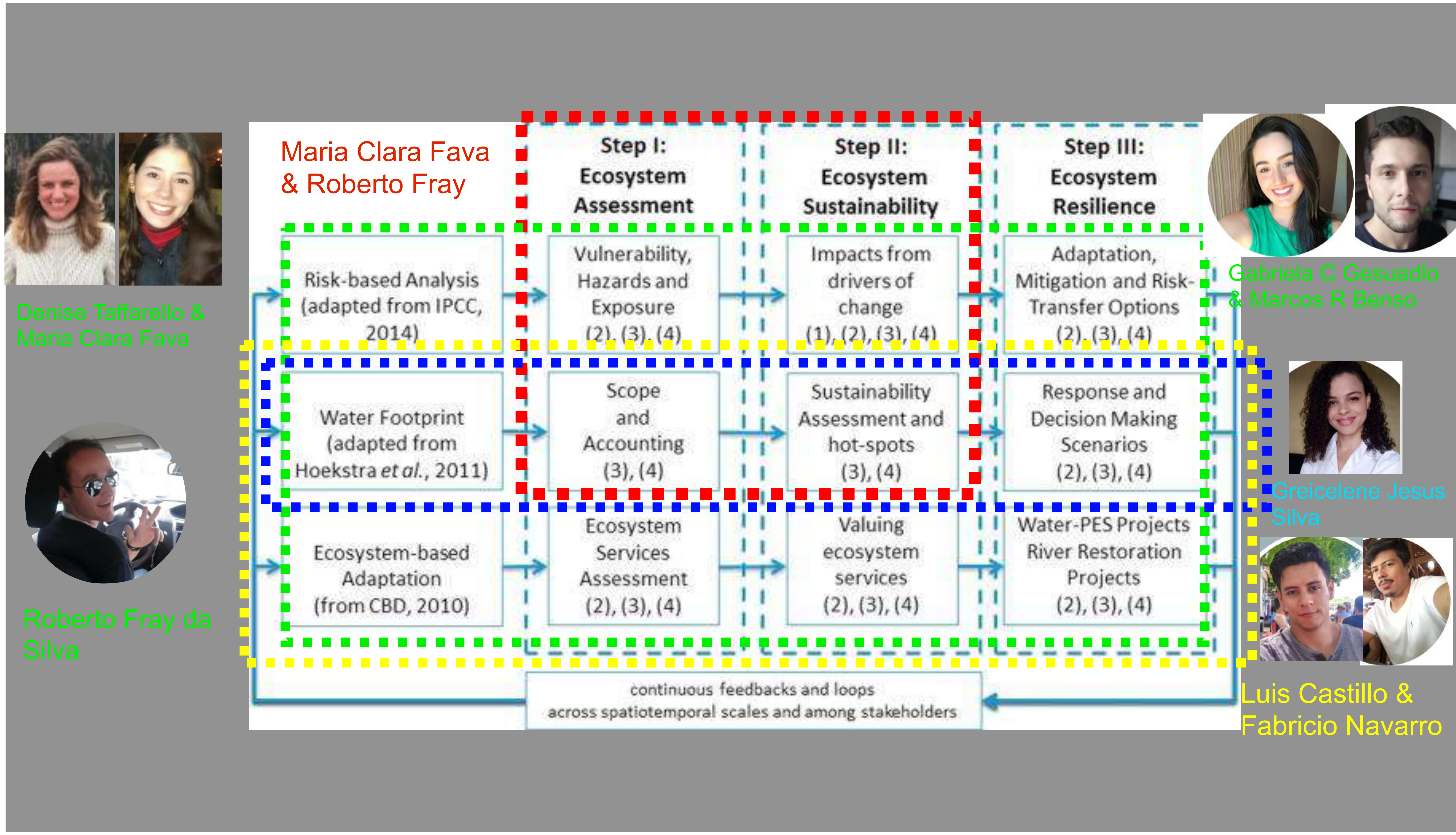
Climate Services
Volume 8, December 2017, Pages 1-16



Hydrological services in the Atlantic Forest, Brazil: An ecosystem-based adaptation using ecohydrological monitoring

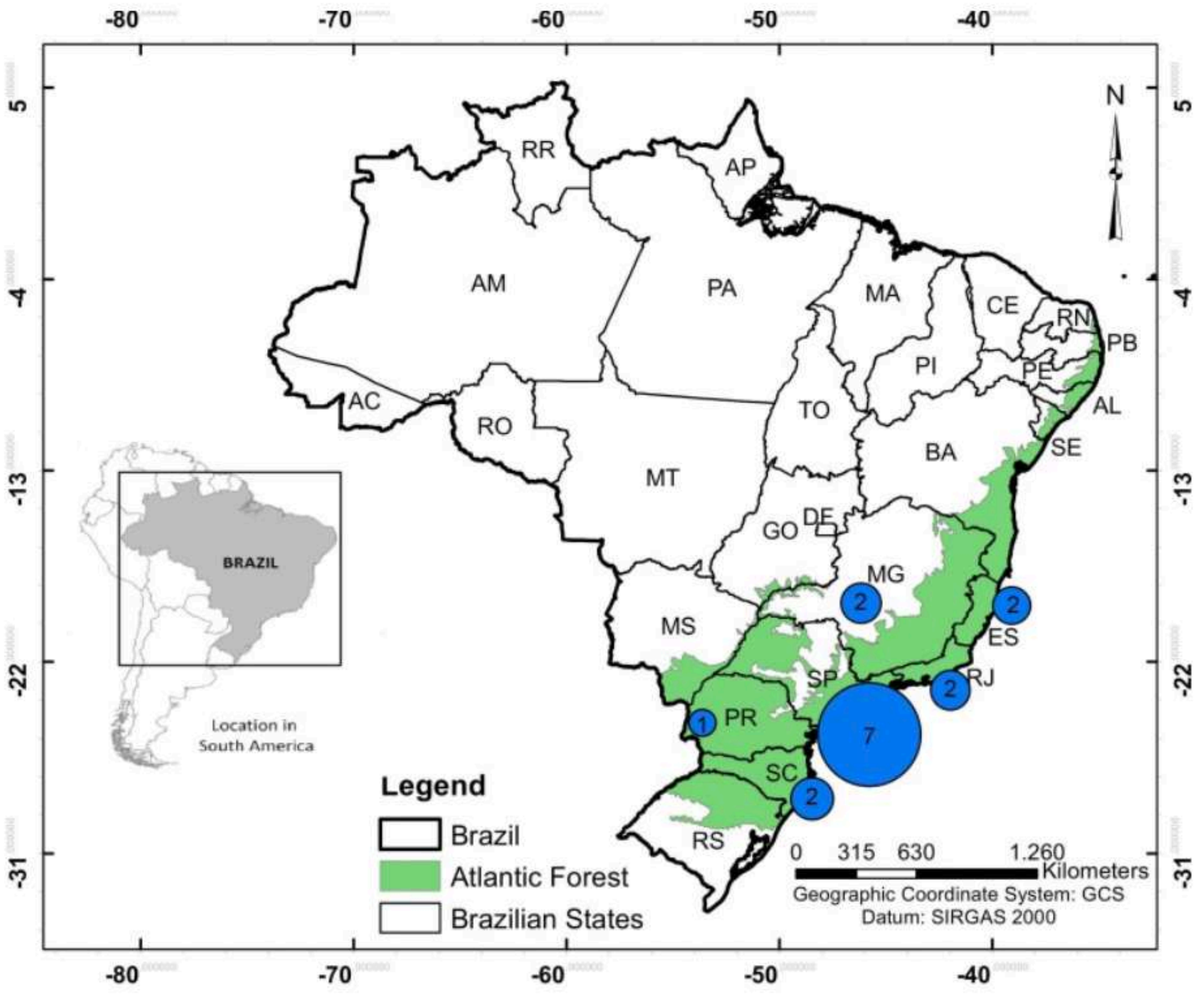
Denise Taffarello [a], Maria do Carmo Calijuri [a], Ricardo A. Gorne Viani [b], José A. Marengo [c], Eduardo Mario Mendiondo [a]

[c]: https://doi.org/10.1016/j.cliser.2017.10.005



Cooperative EH-NbS related to:
Ecosystem Step-by-Step Approach
Flexibility to adapt to different approaches
High recursivity (feedback loops)

Example I: circular framework with feedbacks, scales and stakeholders [c]



Brazilian States

WATER-PES PROJECTS BY STATE IN THE ATLANTIC FOREST


ELSEVIER

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Volume 8, December 2017, Pages 1-16

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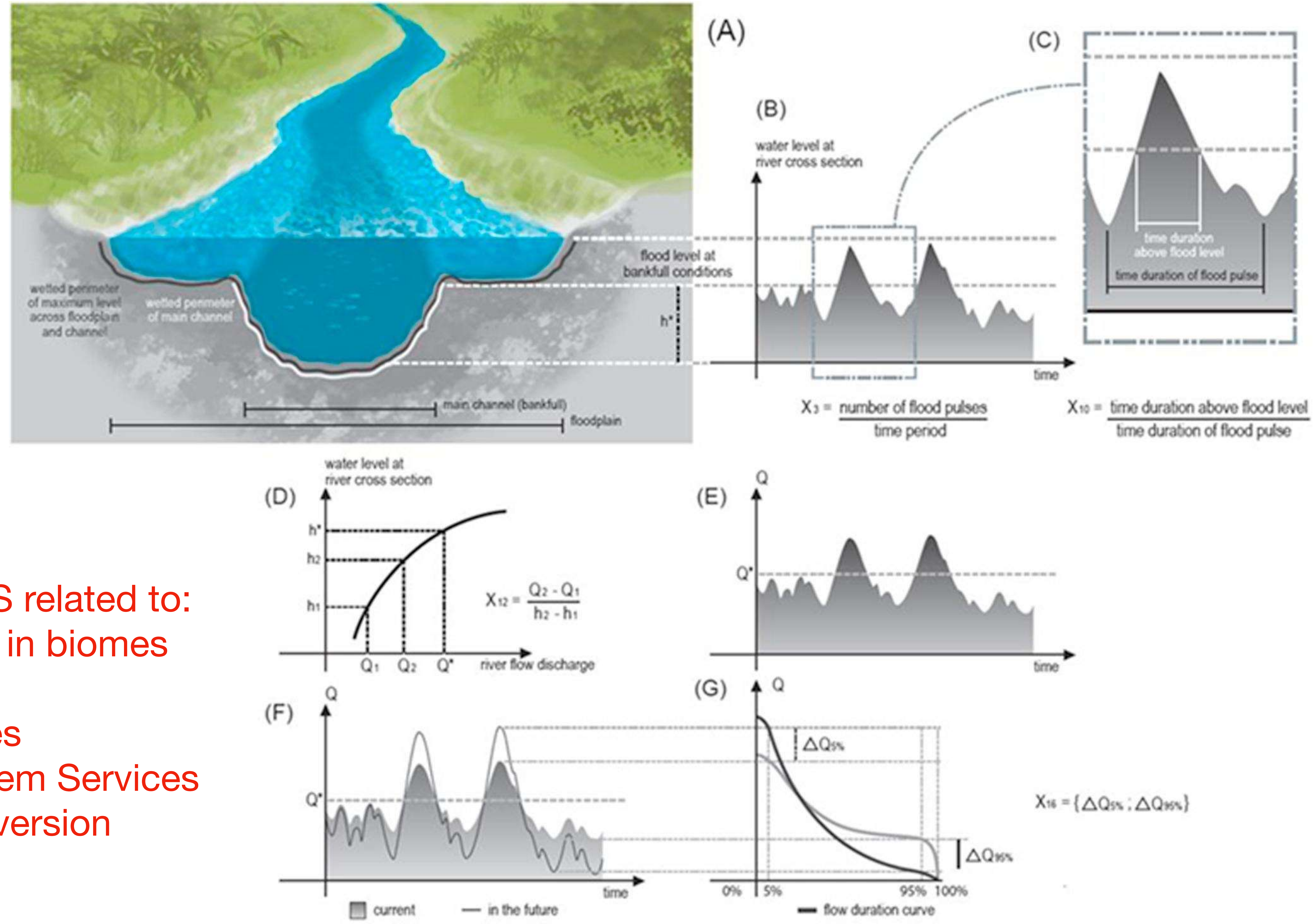
Cooperative EH-NbS related to:
River pulse patterns in biomes
Flood rating curves
Flow-duration Curves
Payment of Ecosystem Services
Stakeholders' risk aversion



[c]: https://doi.org/10.1016/j.cliser.2017.10.005

- Proposta metodológica para o enquadramento dos corpos d´água da bacia: O projeto que está desenvolvendo a modelagem hidrológica da Bacia Hidrográfica do Rio Paranapanema, também trará as bases para que o Comitê inicie o diálogo sobre enquadramento de corpos d’água. O estudo está sendo desenvolvido pela Universidade Federal do Paraná (UFPR) juntamente à Agência Nacional de Águas e Saneamento Básico (ANA). O projeto resultou em um mapa interativo em que é possível ter diversas informações, como ocupação de solo, outorgas e qualidade dos cursos d’água, de toda a Bacia do Paranapanema. A entrega será feita durante o Encontro Integrado.

Example II: multi-stage disaster risk reduction (DRR) management [d]

Cooperative EH-NbS related to:
Risk Aversion Framework
Willingness-To-Adapt Ability
Non-Stationary to Stationary Gap

Ecohydrology & Hydrobiology
Volume 21, Issue 3, July 2021, Pages 443-453

A novel multistage risk management applied to water-related disaster using diversity of measures: A theoretical approach

Fabricio Alonso Richmond Navarro, Gabriela Chiquito Gesualdo, Renan Gon Ferreira, Luis Miguel Castillo Rápalo, Marcos Roberto Benso, Marina Batalini de Macedo, Eduardo Mario Mendiondo

[d]: https://doi.org/10.1016/j.ecohyd.2021.07.004

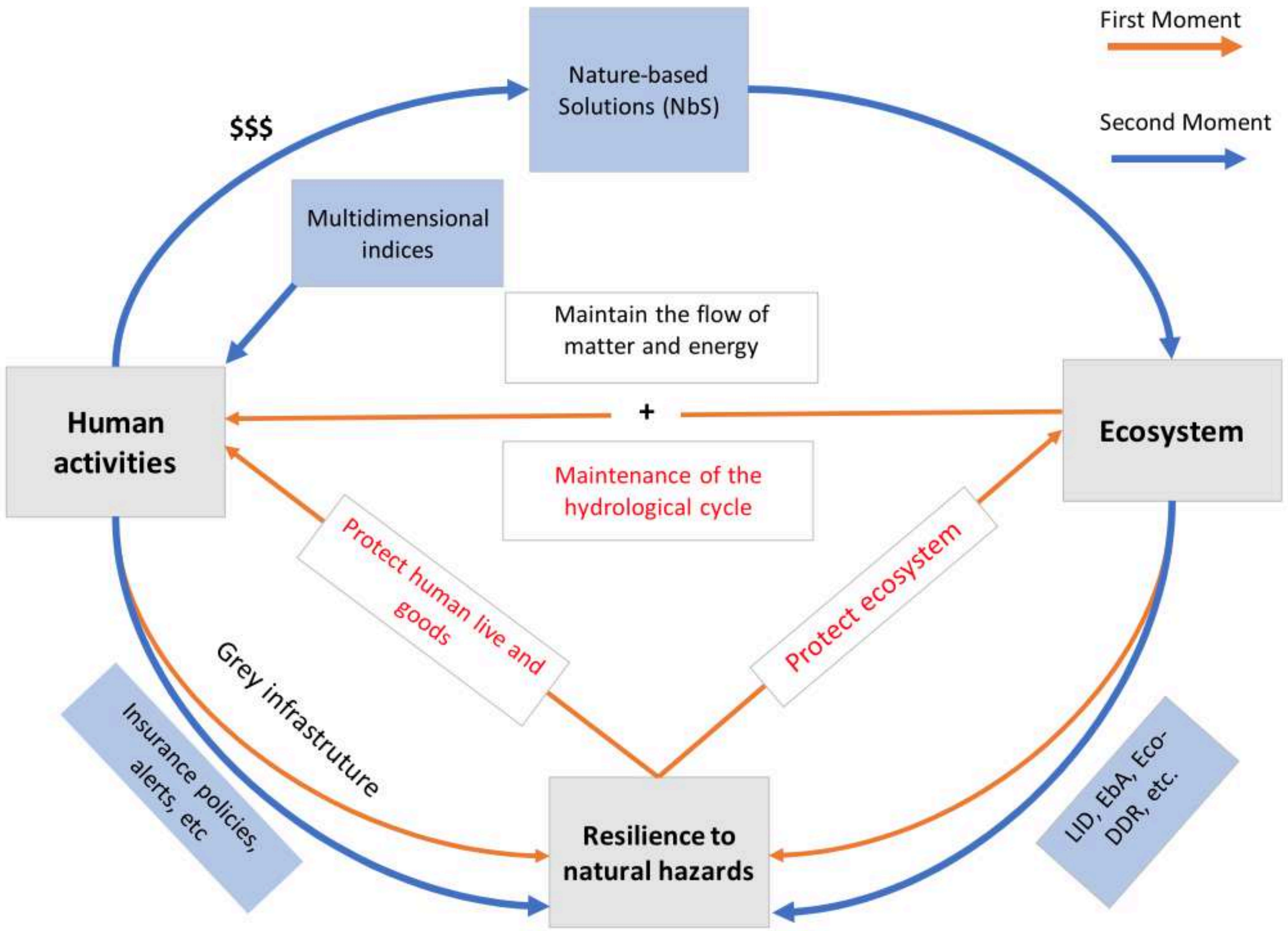


Figure 1. Relationship of three main elements of water security. Description: In gray boxes the relationship of three main elements of water security: human activities, ecosystem maintenance, and resilience to natural threats, in two different moments: conventional approach (orange arrows) and a novel approach using NbS, insurance policy and multidimensional indices (blue arrows).

Tijuco Creek, Sao Carlos-SP, Brazil / EMM 2005

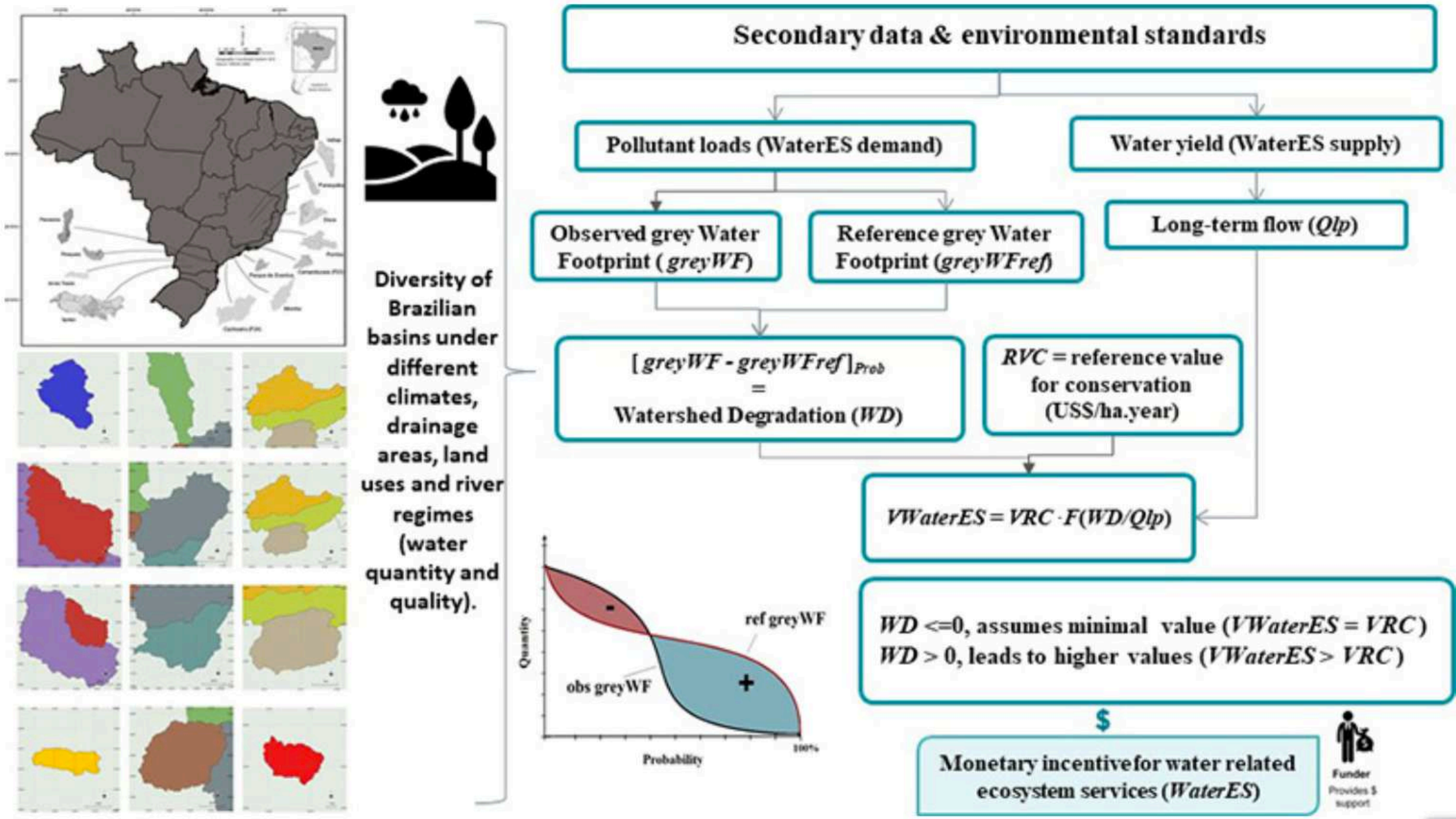
Example III: ecosystem-based valuation using water footprint[e]

Cooperative EH-NbS related to:
Grey Water Footprint
Flow-Duration Curves
Valuation Methods
Conservation Effects
Restoration Impacts

ELSEVIER
Science of The Total Environment
Volume 738, 10 October 2020, 139408

Ecosystem service valuation method through grey water footprint in partially-monitored subtropical watersheds

D. Taffarello [a, b], M.S. Bittar [a, c], K.S. Sass [d], M.C. Calijuri [a], D.G.F. Cunha [a], E.M. Mendiondo [a]



[e]: https://doi.org/10.1016/j.scitotenv.2020.139408

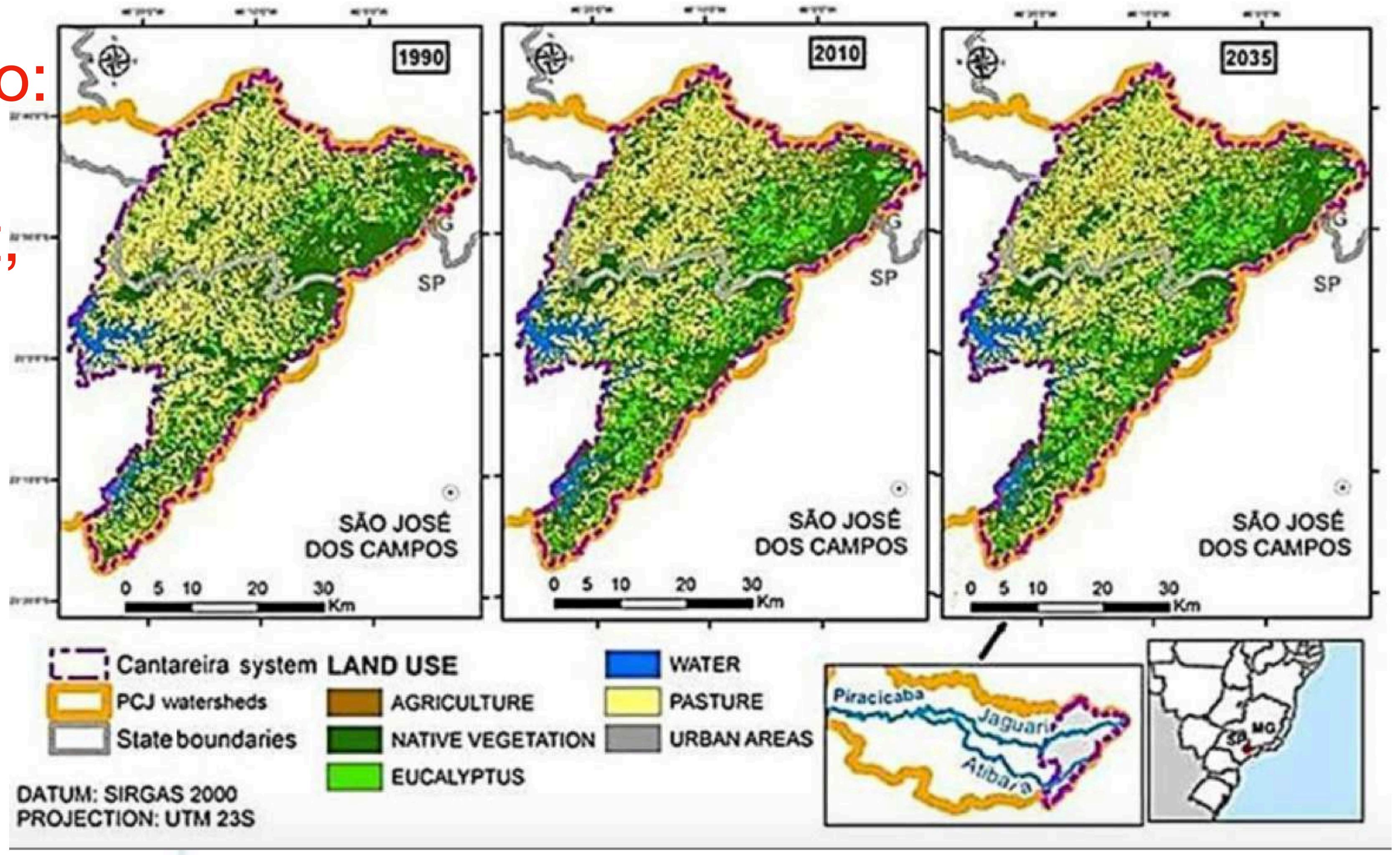
How can we communicate ecohydrological nature-based solutions (EH-NbS)[a], as cooperative as transboundary?

Estrada Municipal de Payol Grande, Sao Bento do Sapucaí-SP, Brazil / E.M.M. 2020

Example IV:

water-quality scenarios of ecosystem-based adaptation [f]

Cooperative EH-NbS related to:
Field observations,
Scenario Criteria+Assessment,
Scaling Problems,
Water Cycle Changes,
Ecophysiological Patterns



Hydrol. Earth Syst. Sci., 22, 4699–4723, 2018
https://doi.org/10.5194/hess-22-4699-2018
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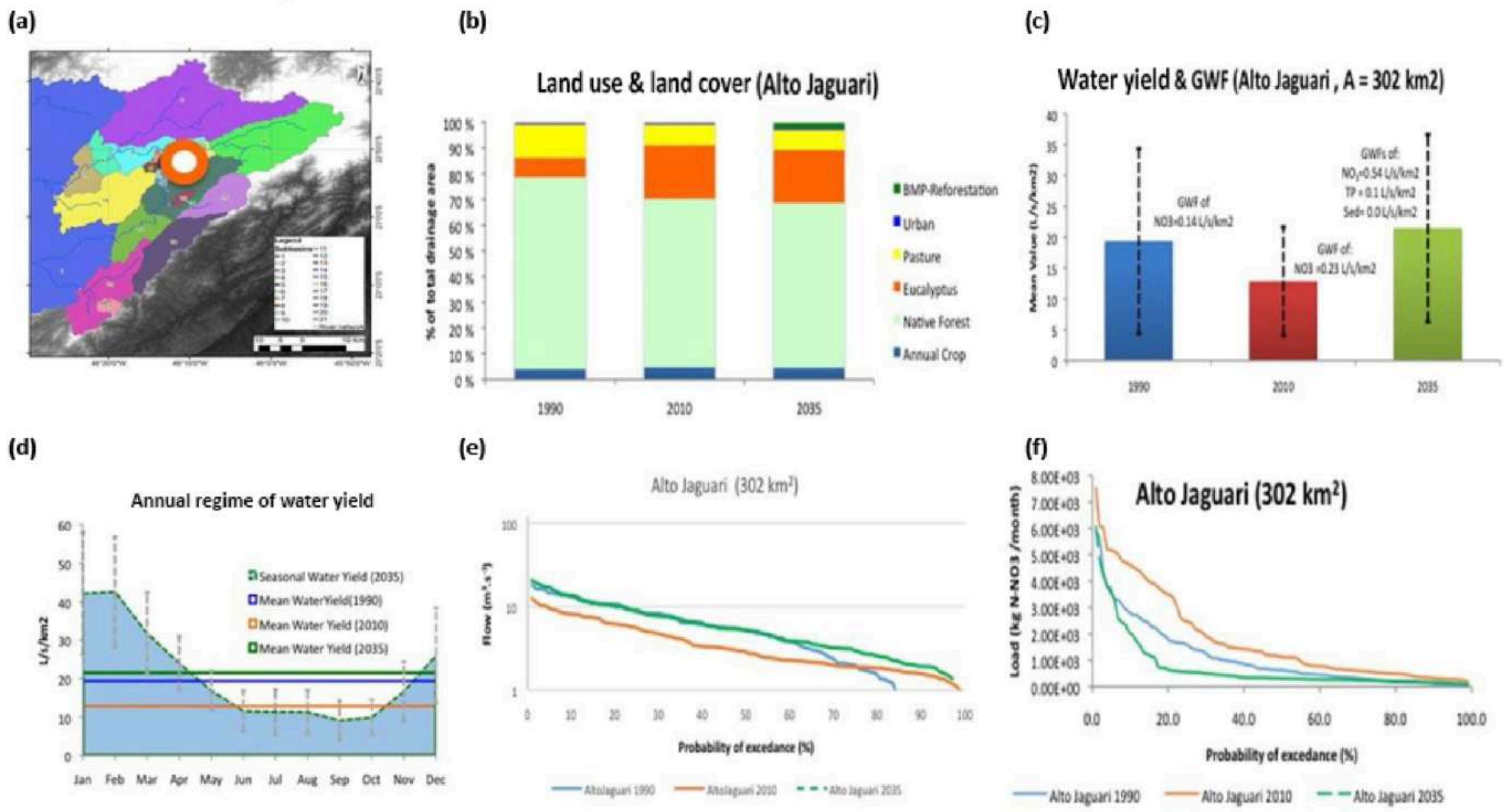
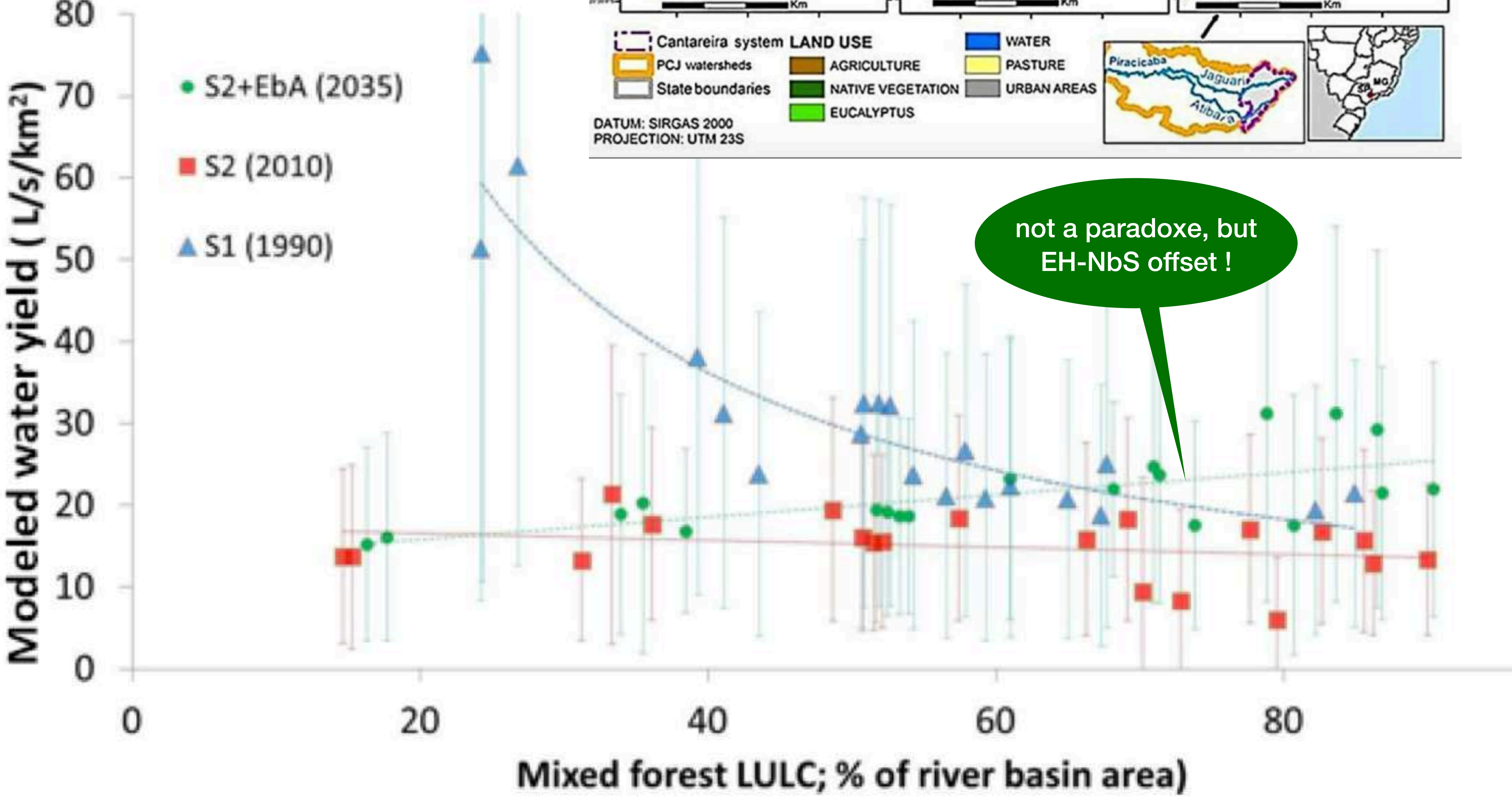
Hydrology and Earth System Sciences
Open Access
EGU

[f]: https://doi.org/10.5194/hess-22-4699-2018

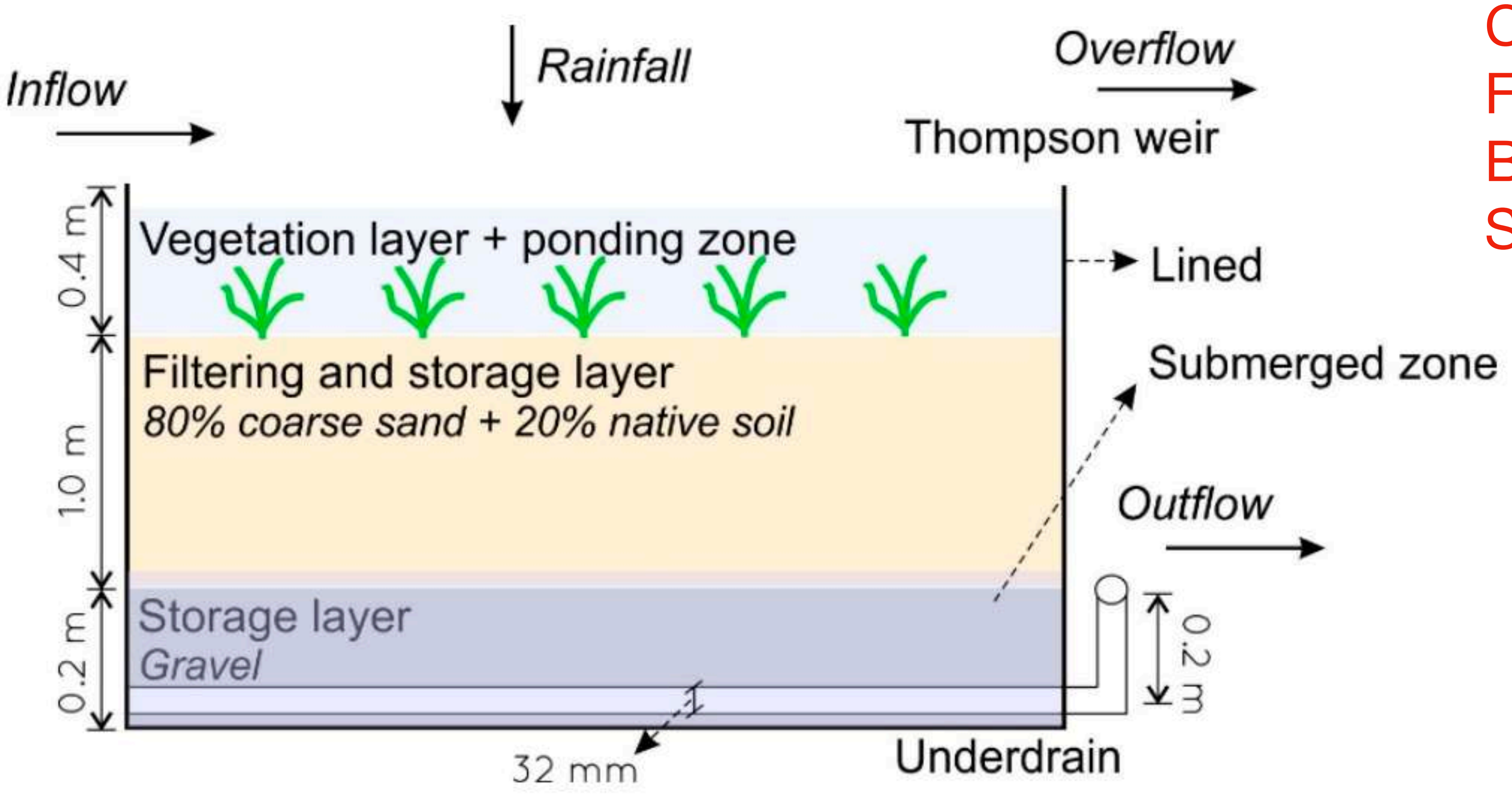
Modeling freshwater quality scenarios with ecosystem-based adaptation in the headwaters of the Cantareira system, Brazil

Denise Taffarello[1], Raghavan Srinivasan[2], Guilherme Samprogna Mohor[1,3], João Luis Bittencourt Guimarães[4], Maria do Carmo Calijuri[1], and Eduardo Mario Mendiondo[1]

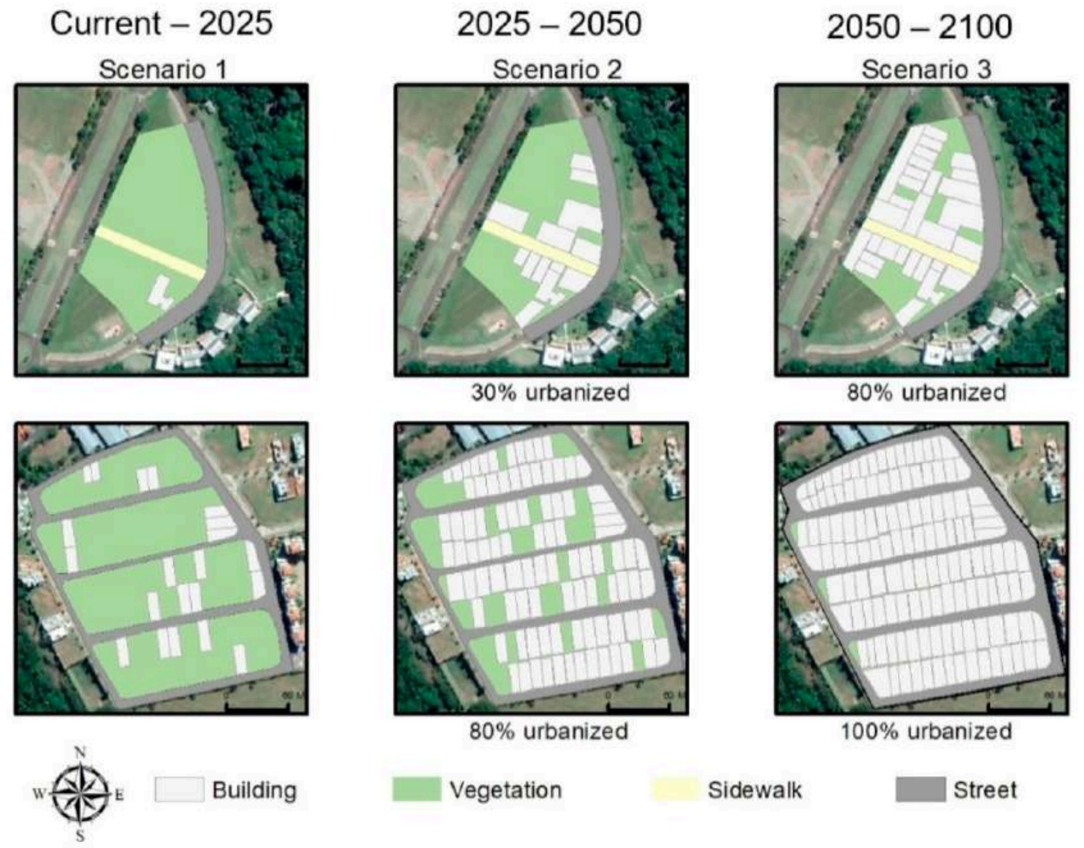


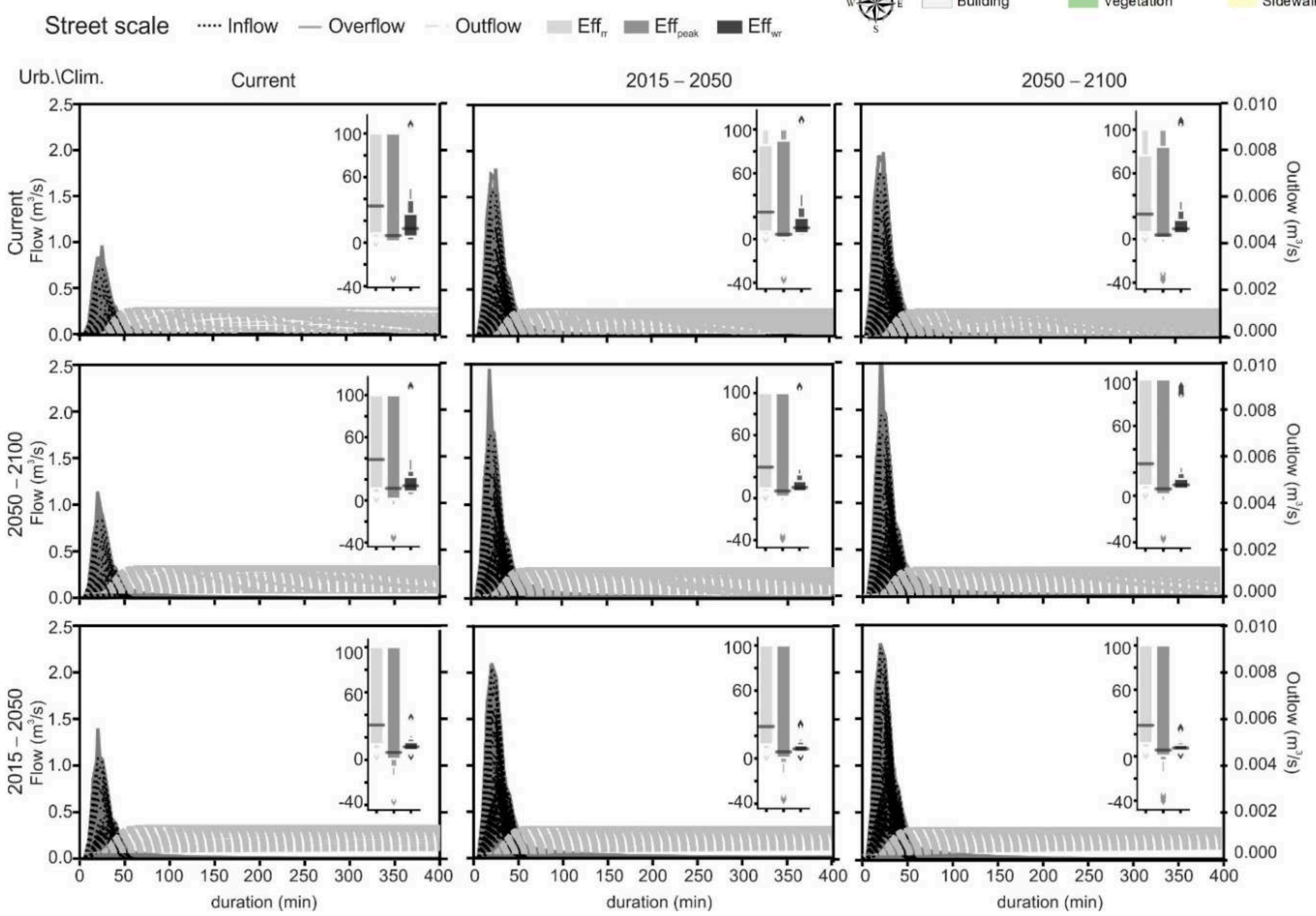


Example V: modular bioretention systems for sustainable stormwater management [g]



Cooperative EH-NbS related to:
Flexible, adaptive design,
Bioretention Systems
Scalable Drivers (Climate+Land Use)





sustainability

MDPI

Article

Modular Design of Bioretention Systems for Sustainable Stormwater Management under Drivers of Urbanization and Climate Change

Marina Batalini de Macedo [1,*], Marcus Nóbrega Gomes Júnior [1], Vivian Jochelavicius [2], Thalita Raquel Pereira de Oliveira [1] and Eduardo Mario Mendiondo [1]

[g]: https://doi.org/10.3390/su14116799

Example VI: online, in-situ water quality monitoring[h]

Description	Research Findings
Used a fluorescent optical sensor to monitor *E. coli* and *Legionella* in drinking water.	The equipment had a good performance, with a detection limit equal to 1.4×10^3 CFU/mL.
Used a Tryptophan-Like Fluorescent (TLF) technique to monitor *E. coli* in drinking water.	The results showed a close correlation between TLF and *E. coli* in model waters and proof of principle with a sensitivity of 4 CFU/mL for *E. coli*.
Developed the Mobile Water Kit (MWK) to detect microorganisms in water based on the colorimetric method.	The device was able to detect the total coliform and *E. coli* bacteria in water samples within 30 min or less.
Presented a quick screening and alerting of coliform and *E. coli* contamination in water samples using a device attached to a smartphone.	The system was able to measure coliforms and *E. coli* contamination and issued an alert when contamination was detected.
Presented a cost-effective and automated device to monitor coliforms and *E. coli* in water based on fluorescent techniques.	The system can automatically detect the presence of both *E. coli* and total coliforms in drinking water within ~16 h, down to a level of one colony-forming unit (CFU) per 100 mL.

Description	Research Findings
Built a remotely operated underwater vehicle with an ORP sensor.	The proposed hardware and software designs can monitor ORP in water.
Used a commercial ORP sensor to monitor water quality.	Mahalanobis distance method with DW quality sensors has a good potential to be applied in warning systems (EWS).
Developed a mobile buoy for water quality assessment, with the ORP parameter, operated remotely.	The device was able to measure the ORP parameter and transmit the water quality reading data in real-time.
Described the development of a low-cost unmanned surface vehicle to monitor water quality.	The system has the capability to perform water quality assessment (including the ORP parameter) missions on inland water resources.

Cooperative EH-NbS related to:
Water Quality Variables,
Physically-based Methods,
Sensors,
Empirical Evidences
Lab tests,
Calibration & Validation

Description	Research Findings
Developed a portable, 3D-printed device with a smartphone and opto-electrowetting to measure algae in water.	The device offers a highly portable, user-friendly, low-cost tool that enables simple on-chip sample preparation and the detection of viable algae.
Used a microbiological potentiometric sensor to measure algae in water by electrical signal patterns.	The very low NRMSE <3% for algal and chlorophyll concentrations demonstrated that these and similar biological parameters could be monitored in natural waters with extremely high precision.

sustainability

Review

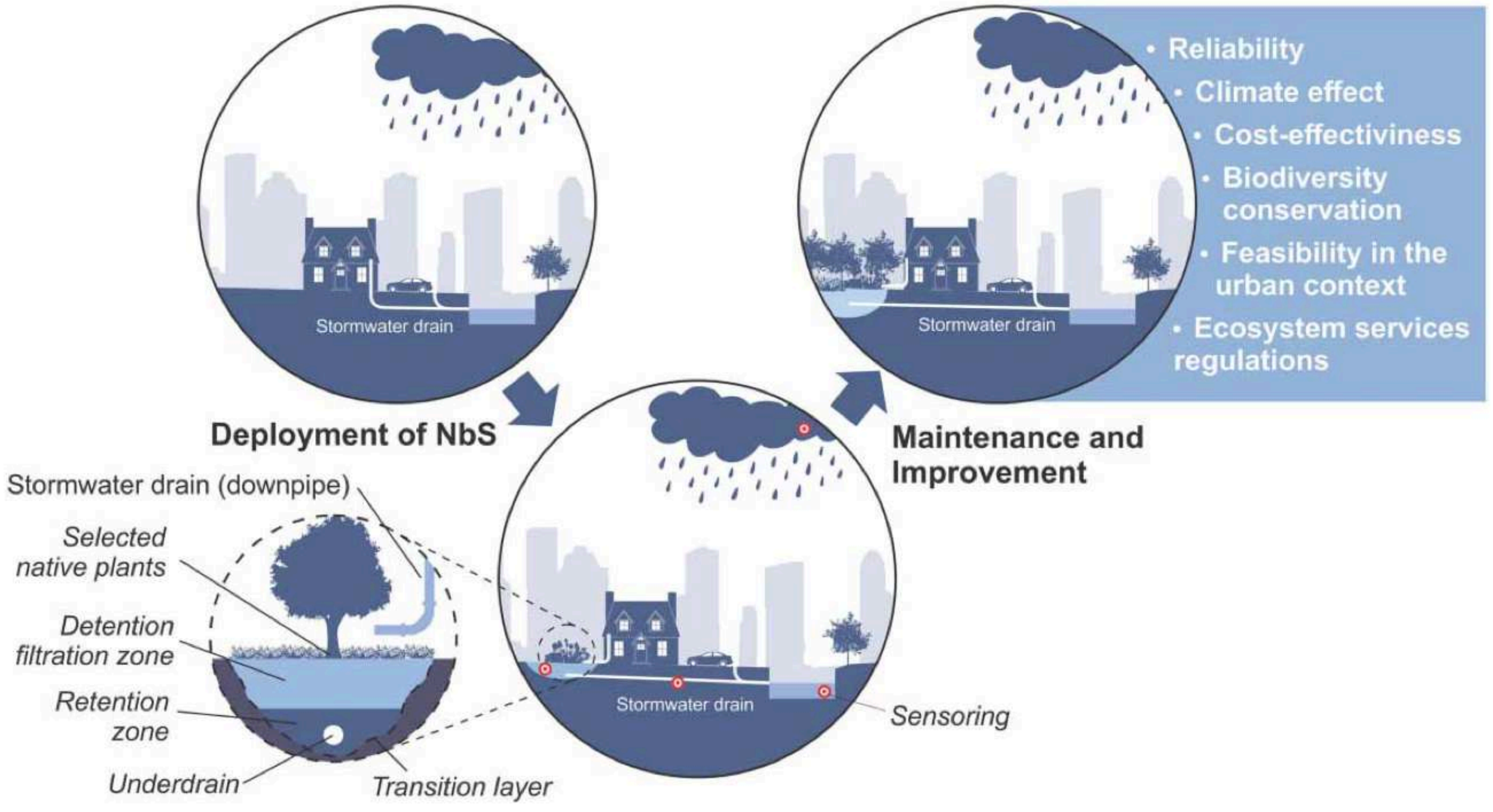
Advances in Technological Research for Online and In Situ Water Quality Monitoring—A Review

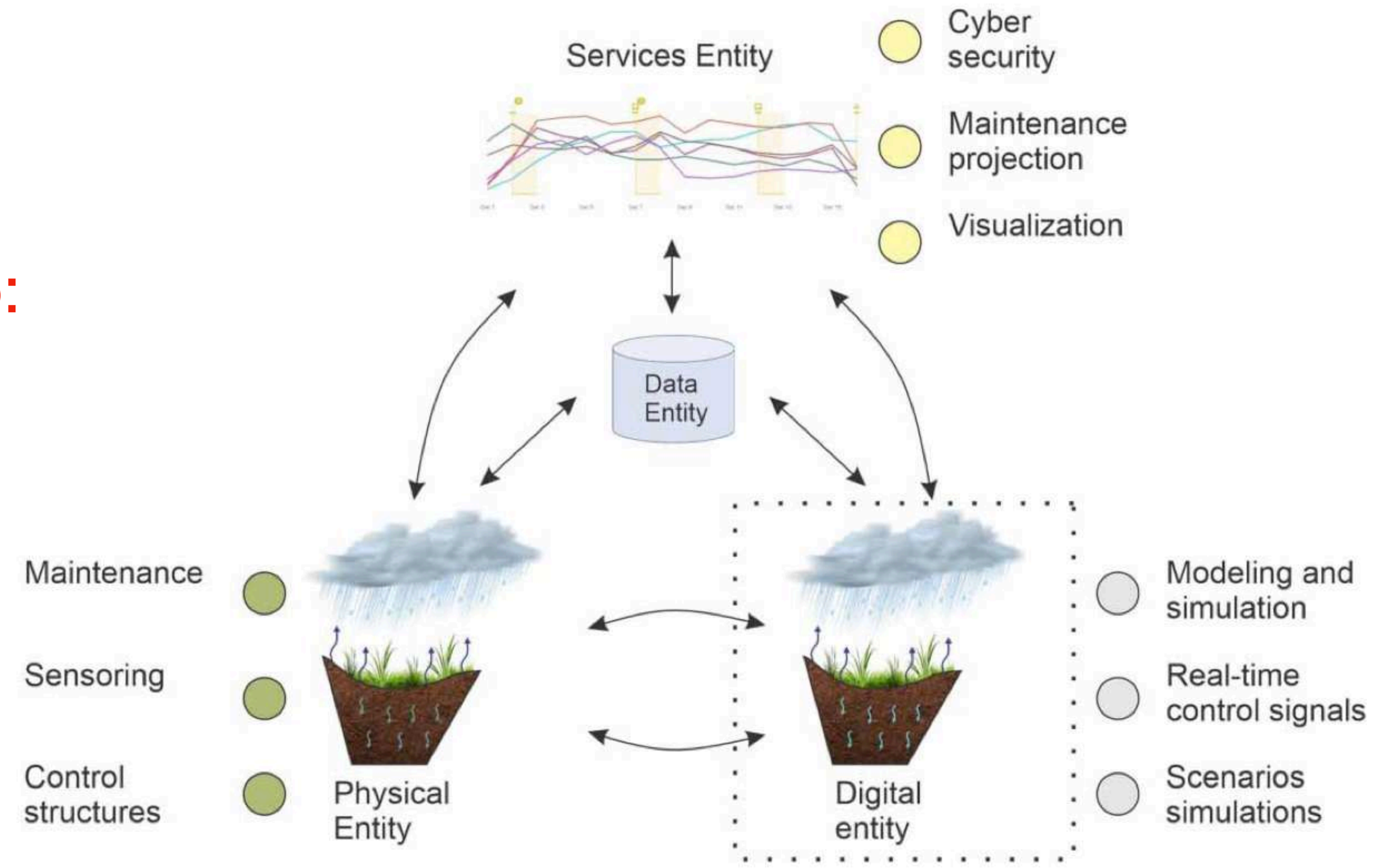
Gabriel Marinho e Silva [1,*], Daiane Ferreira Campos [1], José Artur Teixeira Brasil [2], Marcel Tremblay [3], Eduardo Mario Mendiondo [1] and Filippo Ghiglieno [4,*]

[h]: https://doi.org/10.3390/su14095059

Example VII: digital twins [i]

Cooperative EH-NbS related to:
Digital Twins,
Scaled NbS,
Sensors,
Citizen Data,
Entities,
Flexible Topology of Problems





Journal of Hydroinformatics

IWA PUBLISHING

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Journal of Hydroinformatics Vol 00 No 0, 1 doi: 10.2166/hydro.2022.142

Can we scale Digital Twins of Nature-based Solutions for stormwater and transboundary water security projects?

José Artur Teixeira Brasil[a,*], Marina Batalini de Macedo[b], Thalita Raquel Pereira de Oliveira[a], Filippo Giovanni Ghiglieno[c], Vladimir Caramori Borges de Souza[d], Gabriel Marinho e Silva[a], Marcus Nóbrega Gomes Júnior[a], Felipe Augusto Arguello de Souza[a] and Eduardo Mario Mendiondo[e]

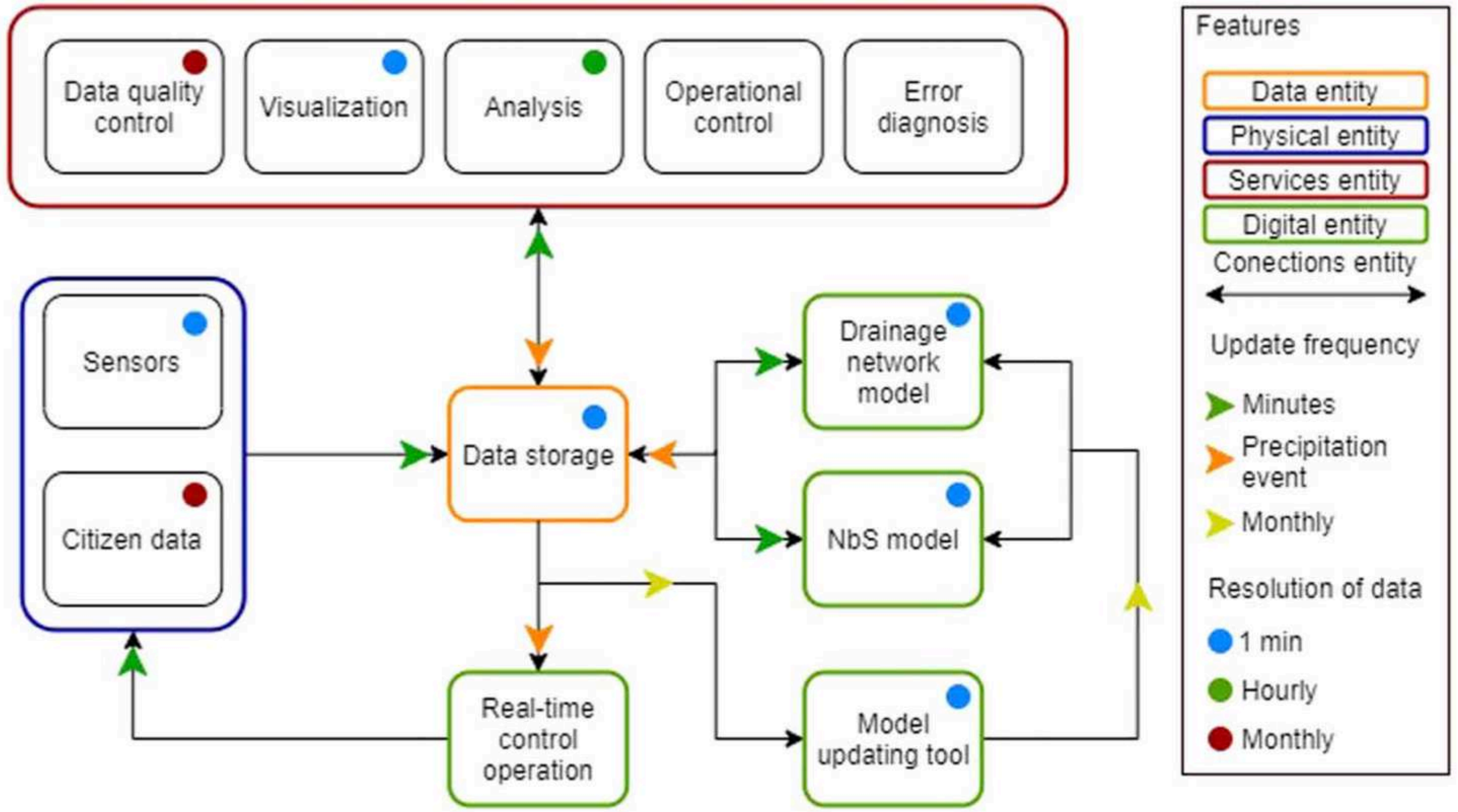
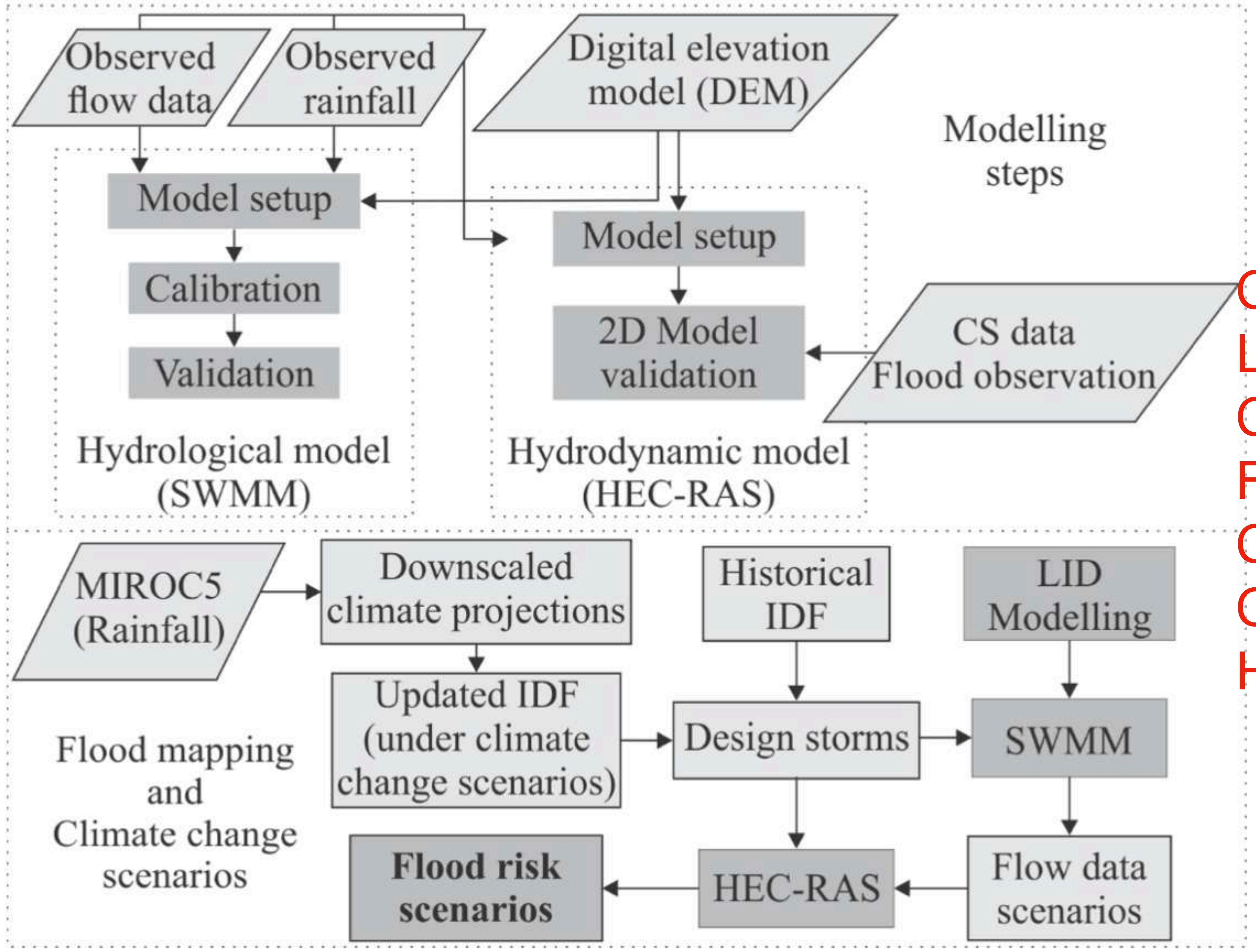


Figure 3 | Flowchart of data flow. The data resolution and update frequency can be adapted for different NbS or different modeling techniques. *Source*: Adapted from Pedersen *et al.* (2021).

[i]: https://doi.org/10.2166/hydro.2022.142

How Can EH-NbS Reimagine Habitats, Restore Landscapes and Recreate Job Market for Vulnerable Communities?

Example VIII: citizen science and low impact development [j]



Cooperative EH-NbS related to:
Low Impact Development (LID),
Citizen Science Data,
Flood Observation,
Climate Change Scenarios,
Corrected IDF,
Historical-Future changes.

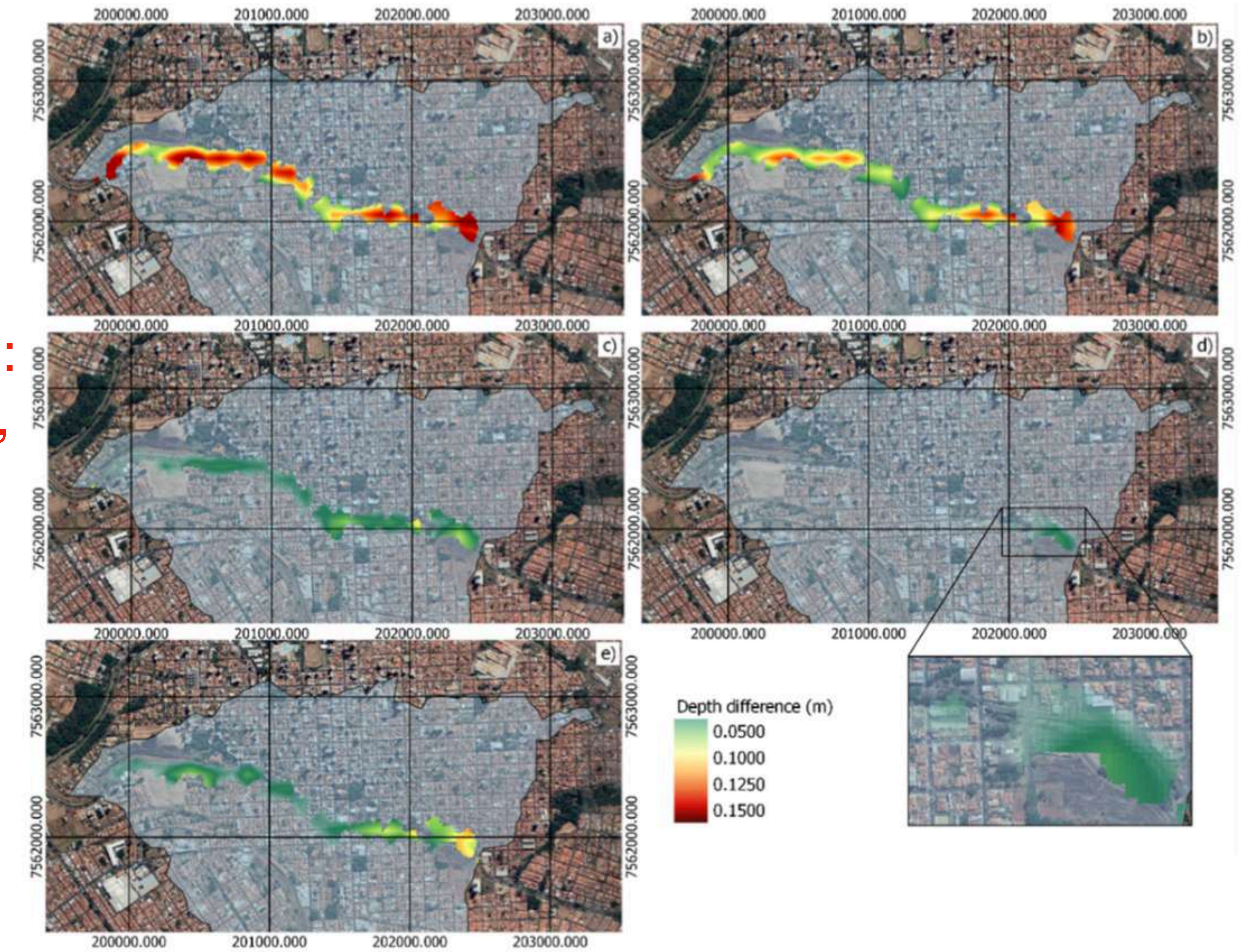
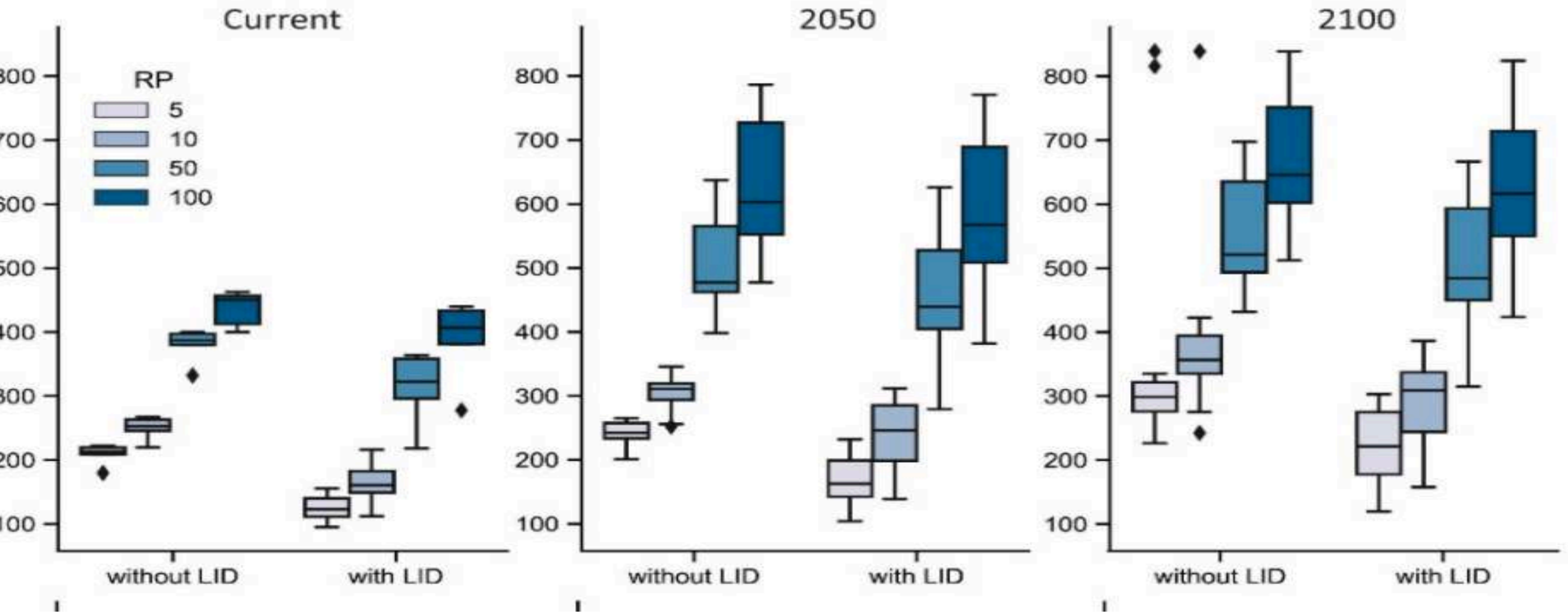


Figure 8. Maximum water depth difference between catchment conditions with and without LID practices for the future climate conditions. Hydrodynamic simulations with: (**a**) a weak rainfall input, (**b**) a moderate rainfall input, (**c**) a strong rainfall input, (**d**) an extreme rainfall input, and (**e**) the average of all rainfall inputs for the future scenario.



water

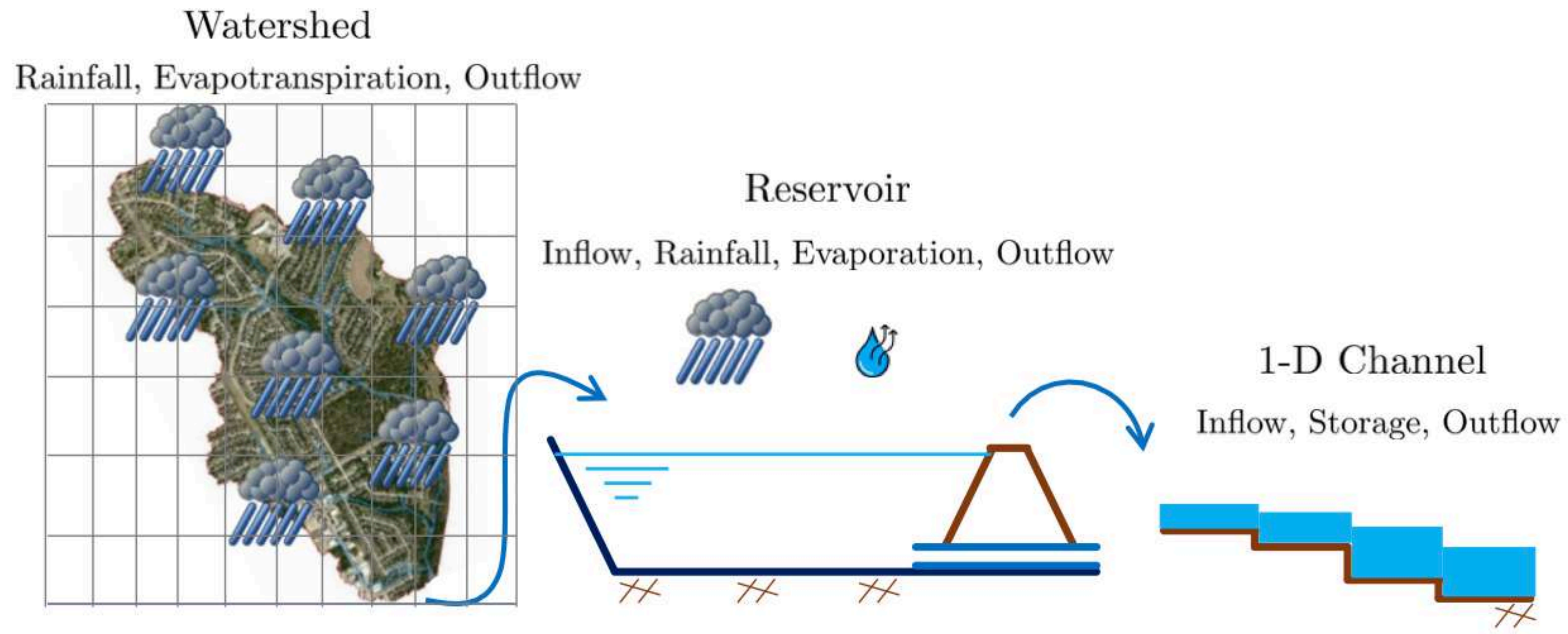
Article

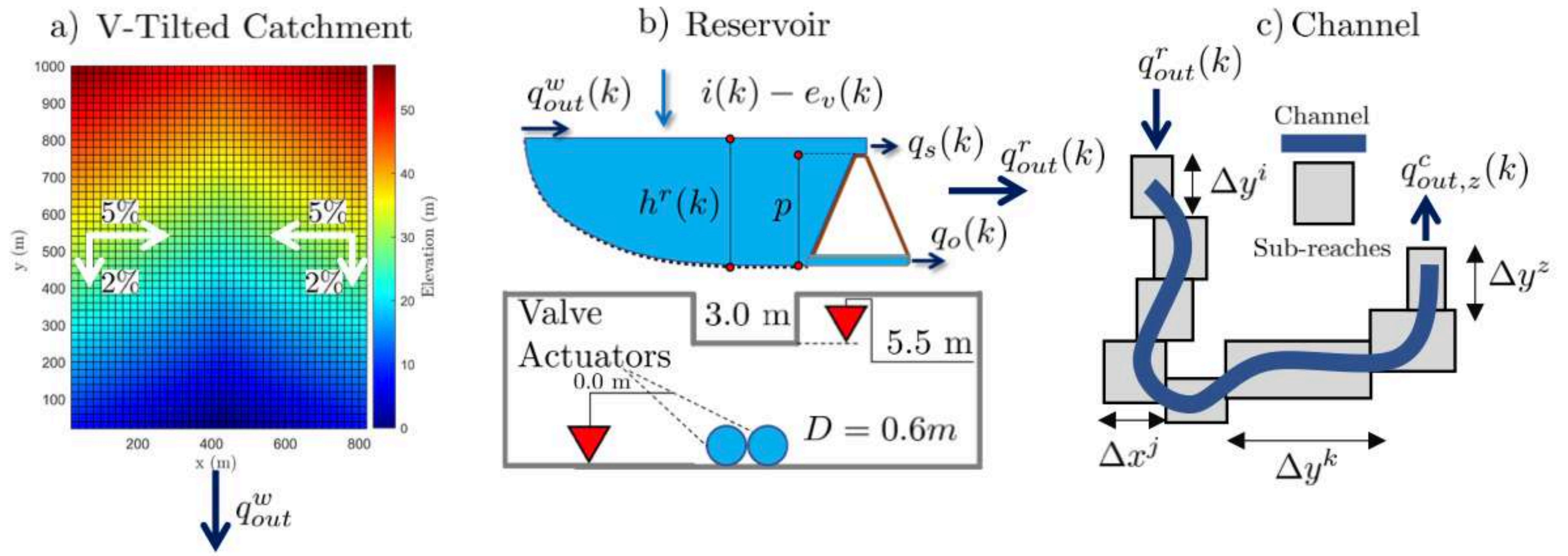
Linking Urban Floods to Citizen Science and Low Impact Development in Poorly Gauged Basins under Climate Changes for Dynamic Resilience Evaluation

Maria Clara Fava [1,*], Marina Batalini de Macedo [2], Ana Carolina Sarmento Buarque [3], Antonio Mauro Saraiva [4], Alexandre Cláudio Botazzo Delbem [5] and Eduardo Mario Mendiondo [3]

[j]: https://doi.org/10.3390/w14091467

Example IX: stormwater systems optimization [k]



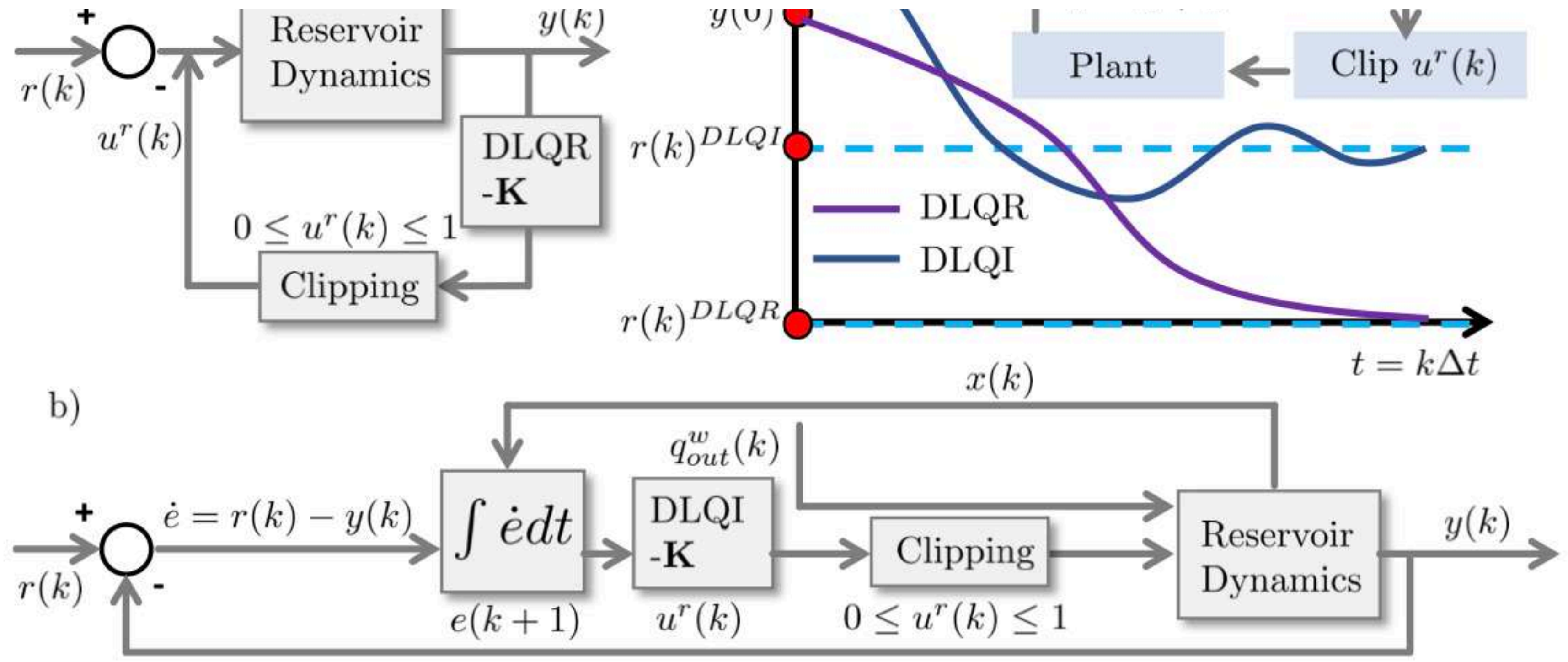


JOURNAL OF WATER RESOURCES PLANNING AND MANAGEMENT, IN PRESS, MAY 2022

Flood Risk Mitigation and Valve Control in Stormwater Systems: State-Space Modeling, Control Algorithms, and Case Studies

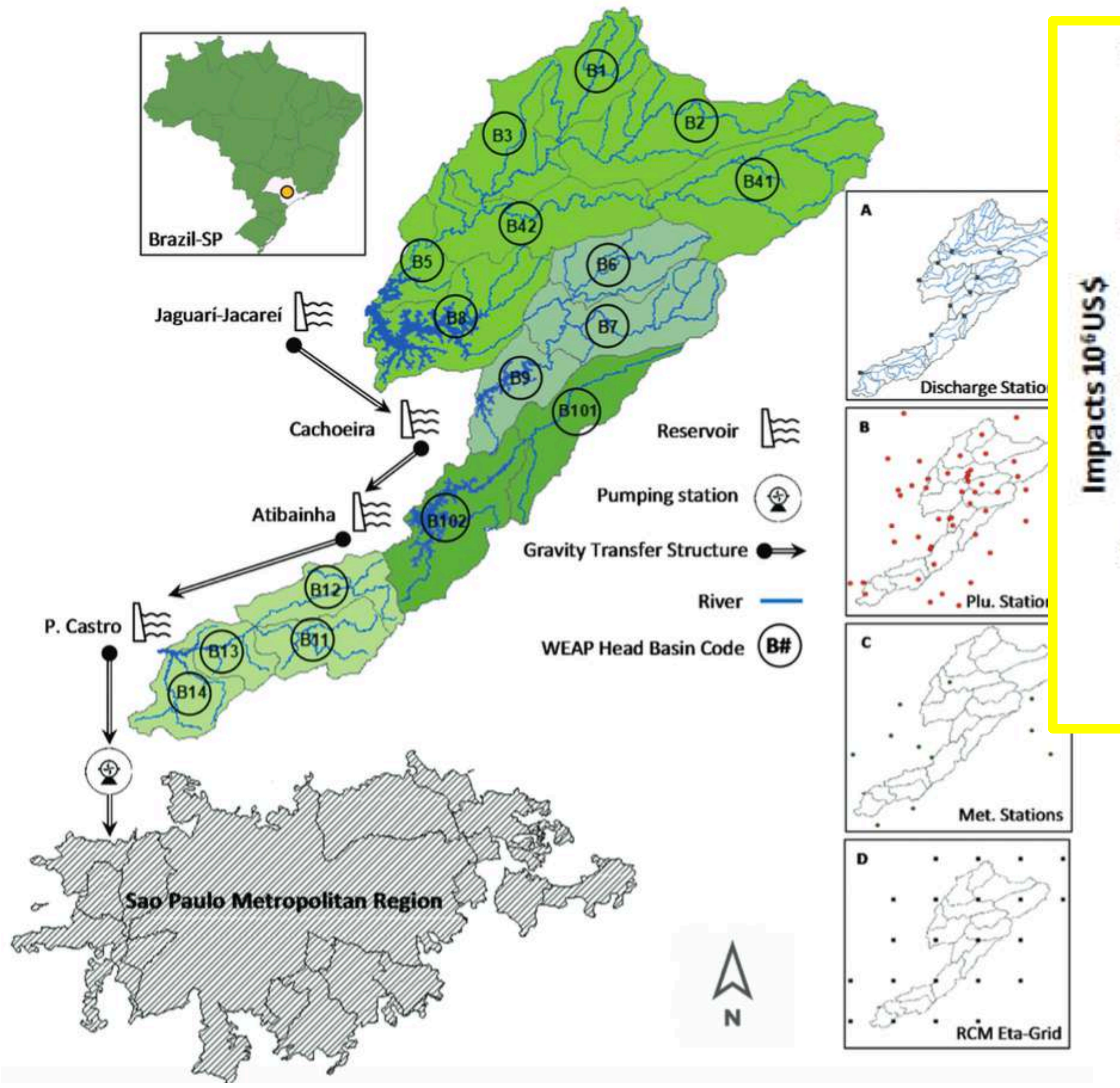
Marcus N. Gomes Júnior†,*, Marcio H. Giacomoni‡, Ahmad F. Taha††, and Eduardo M. Mendiondo§

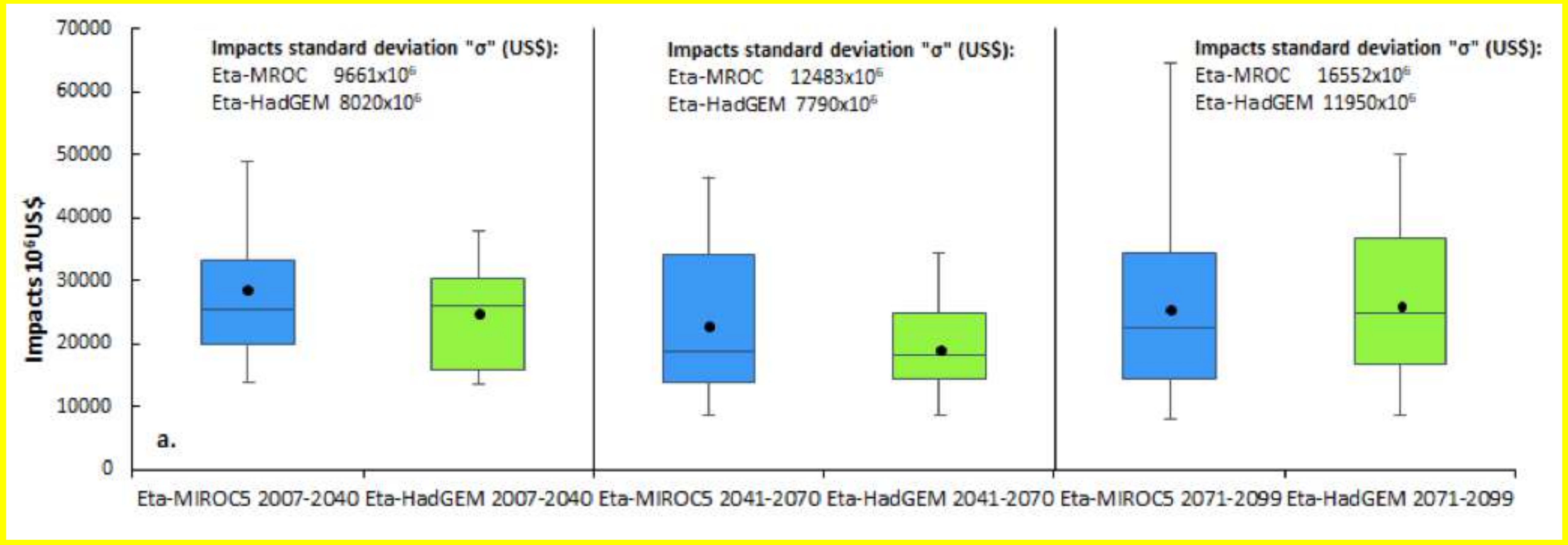
Cooperative EH-NbS related to:
Real-time control,
Smart urban drainage systems,
Control theory,
Model predictive control,
Linear quadratic regulator,
Ruled-based control.



[k]: https://doi.org/10.48550/arXiv.2205.01017; https://doi.org/10.1061/(ASCE)WR.1943-5452.0001588

Example X: DRR-insurance for water utilities under climate change [1]





Ecological Economics 140 (2017) 66–78
Contents lists available at ScienceDirect
Ecological Economics
journal homepage: www.elsevier.com/locate/ecolecon

Economic indicators of hydrologic drought insurance under water demand and climate change scenarios in a Brazilian context

Guilherme Samprogna Mohor *, Eduardo Mario Mendiondo

Open Access Article

Multi-Year Index-Based Insurance for Adapting Water Utility Companies to Hydrological Drought: Case Study of a Water Supply System of the Sao Paulo Metropolitan Region, Brazil

by Diego A. Guzmán 1,*, Guilherme S. Mohor 2 and Eduardo M. Mendiondo 3

Cooperative EH-NbS related to:
Water Utility Business Interruption Cost,
Premium (economic risk-aversion),
Climate Change Scenarios
Flexible Water Demand Management

URBAN WATER JOURNAL
https://doi.org/10.1080/1573062X.2022.2058564
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RESEARCH ARTICLE

Check for updates

Multi-driver ensemble to evaluate the water utility business interruption cost induced by hydrological drought risk scenarios in Brazil

Diego A. Guzmán a, Guilherme S. Mohor b and Eduardo M. Mendiondo c

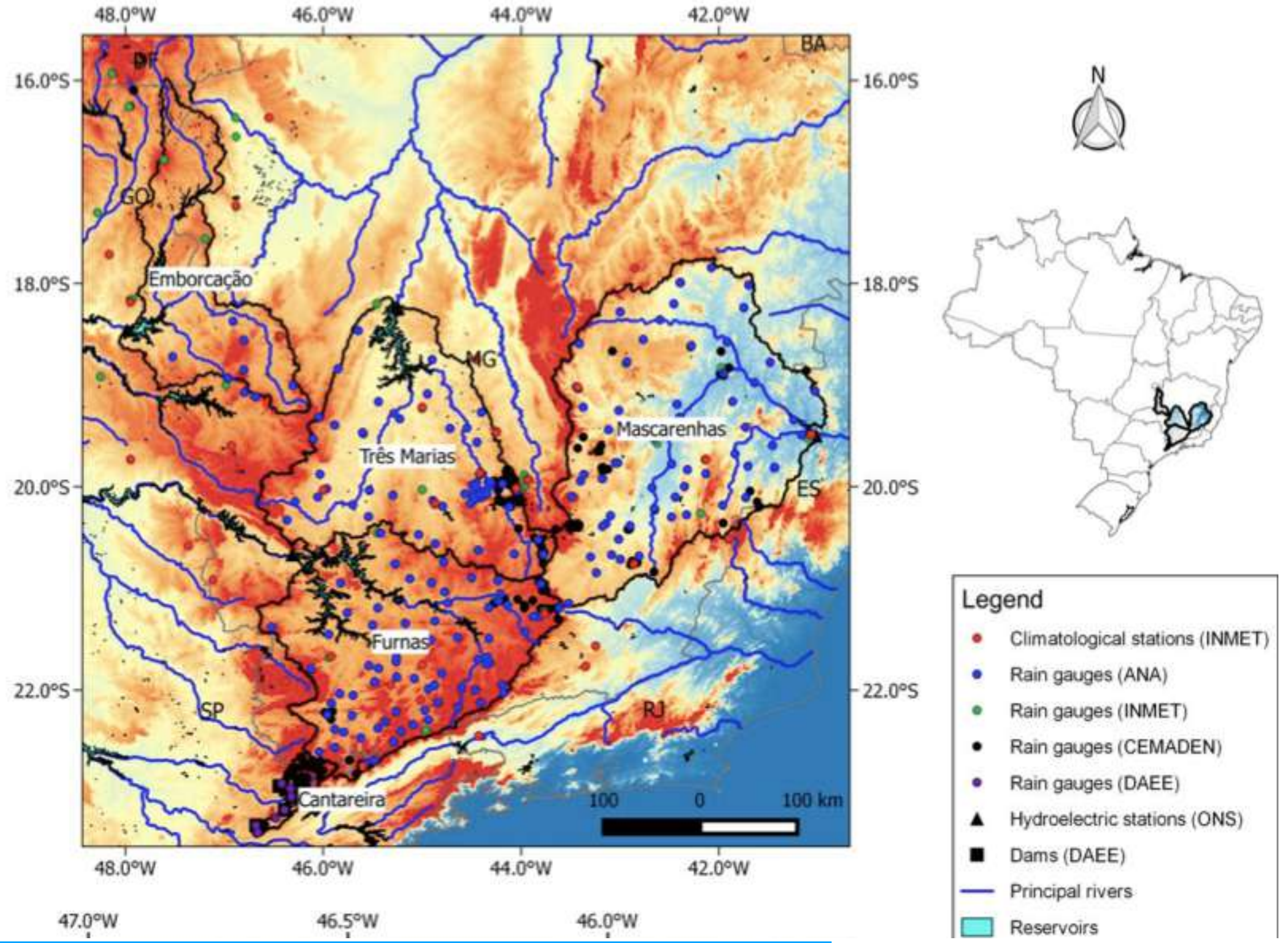
Hydrological Processes

RESEARCH ARTICLE

Season-based rainfall–runoff modelling using the probability-distributed model (PDM) for large basins in southeastern Brazil

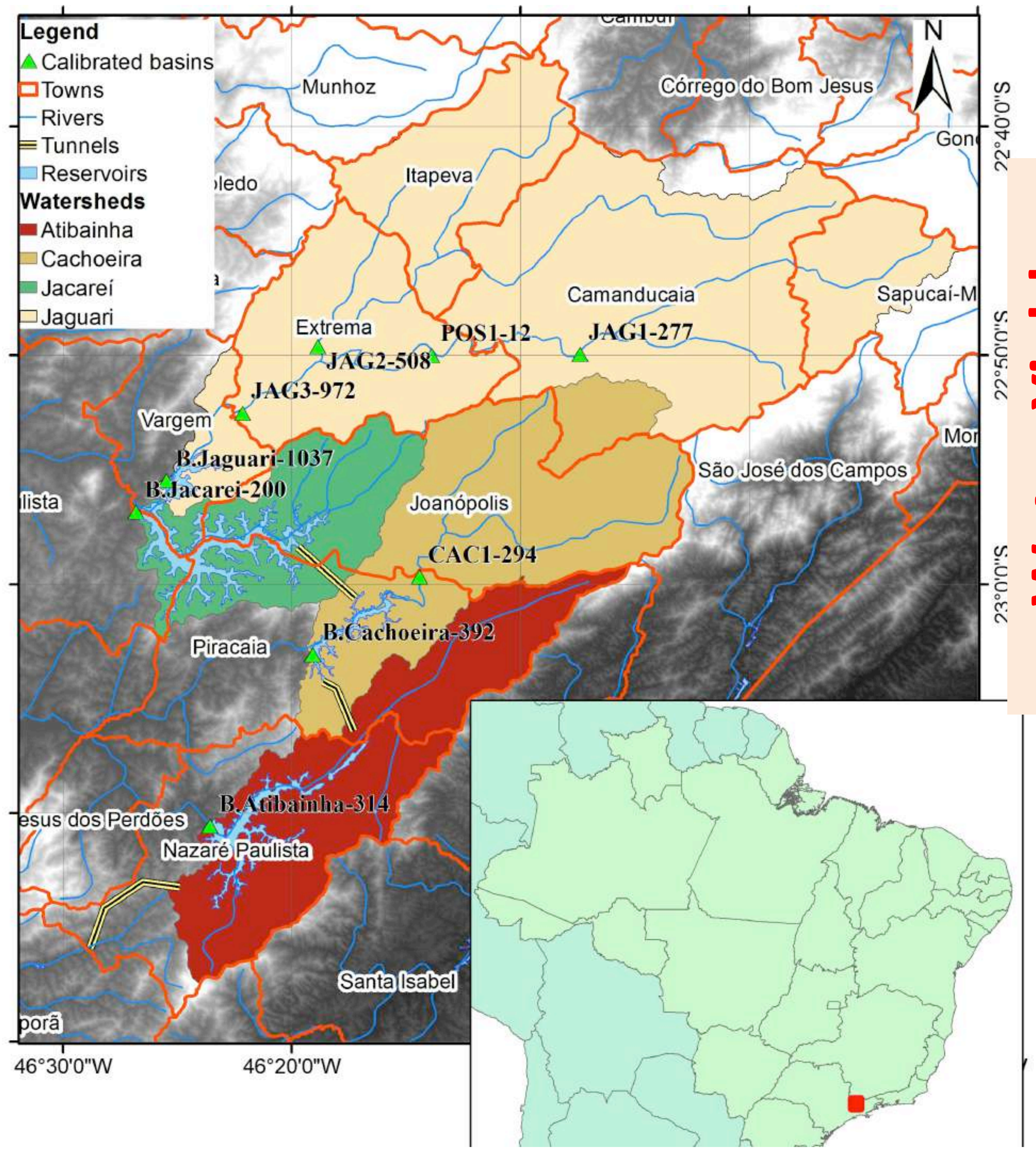
Rong Zhang, Luz Adriana Cuartas, Luiz Valerio de Castro Carvalho, Karinne Reis Deusdará Leal, Eduardo Mário Mendiondo, Narumi Abe, Stephen Birkinshaw, Guilherme Samprogna Mohor, Marcelo Enrique Seluchi, Carlos Afonso Nobre

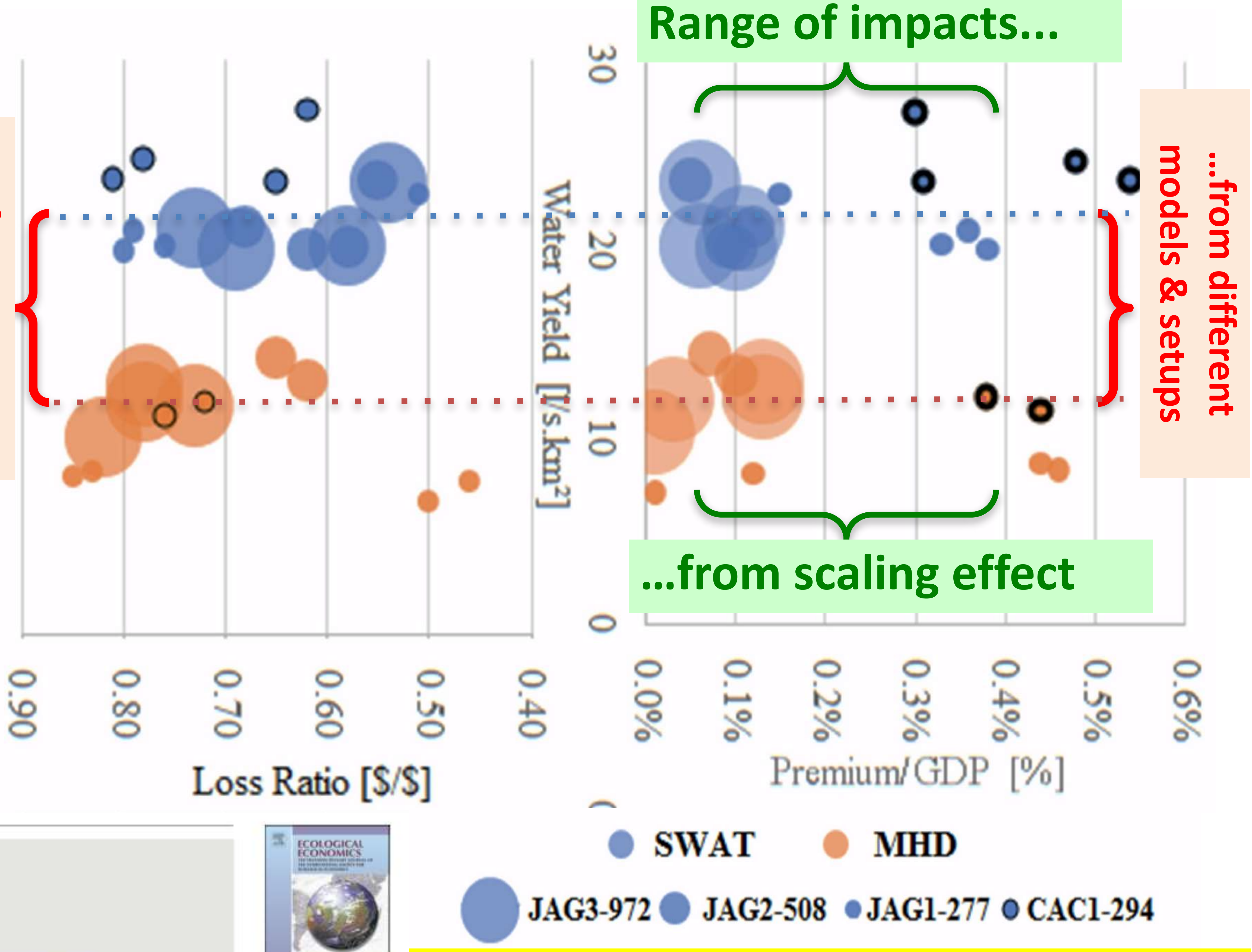
First published: 20 May 2018 | https://doi.org/10.1002/hyp.13154



[1]: https://doi.org/10.1080/1573062X.2022.2058564

Water Yield Uncertainty: Brazilian nested catchments* draining to water supply utilities under climate change scenarios between 2010-2099 show more dependence on outputs from different hydrological models (i.e. SWAT/TAMU and MHD/INPE) than on scales….





Ecological Economics 140 (2017) 66–78

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Economic indicators of hydrologic drought insurance under water demand and climate change scenarios in a Brazilian context

Guilherme Samprogna Mohor *, Eduardo Mario Mendiondo

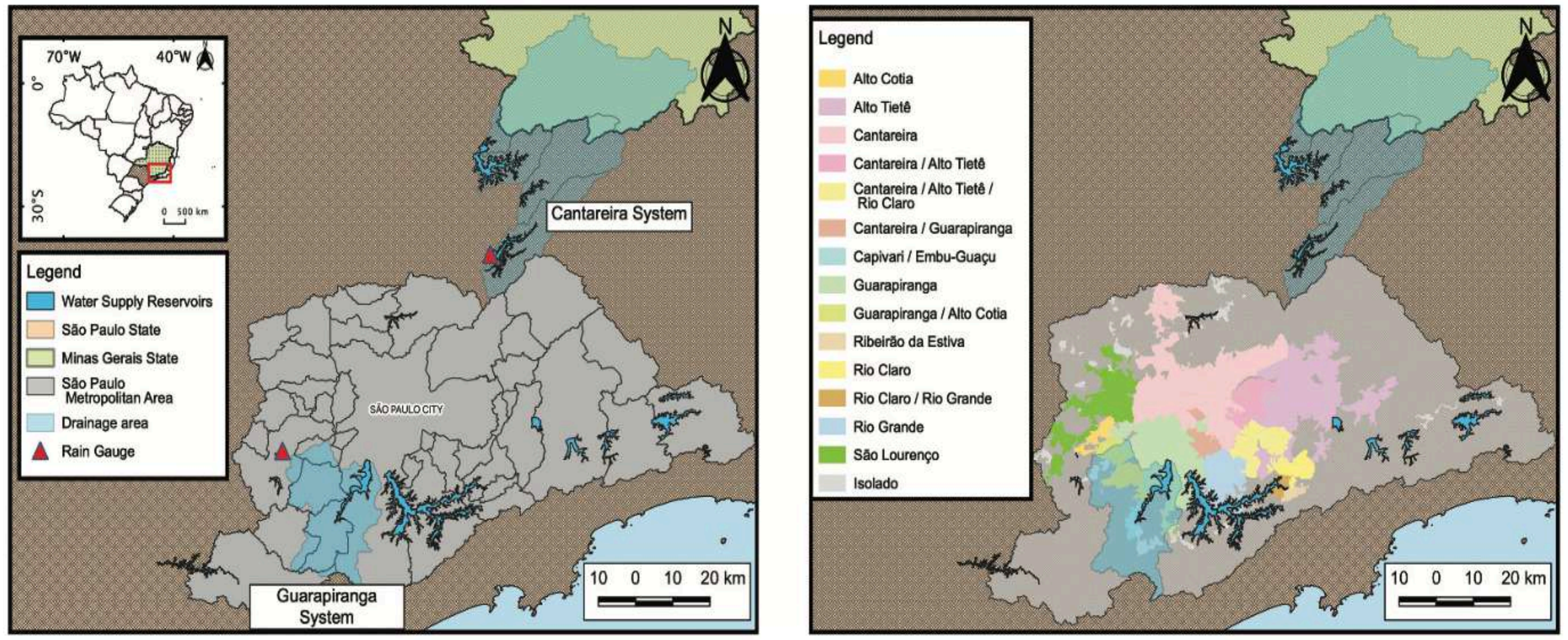
Department of Hydraulic Engineering and Sanitation, Sao Carlos Engineering School, University of Sao Paulo, Sao Carlos, SP, Brazil
National Center for Monitoring and Early Warning of Natural Disasters, Sao Jose dos Campos, SP, Brazil

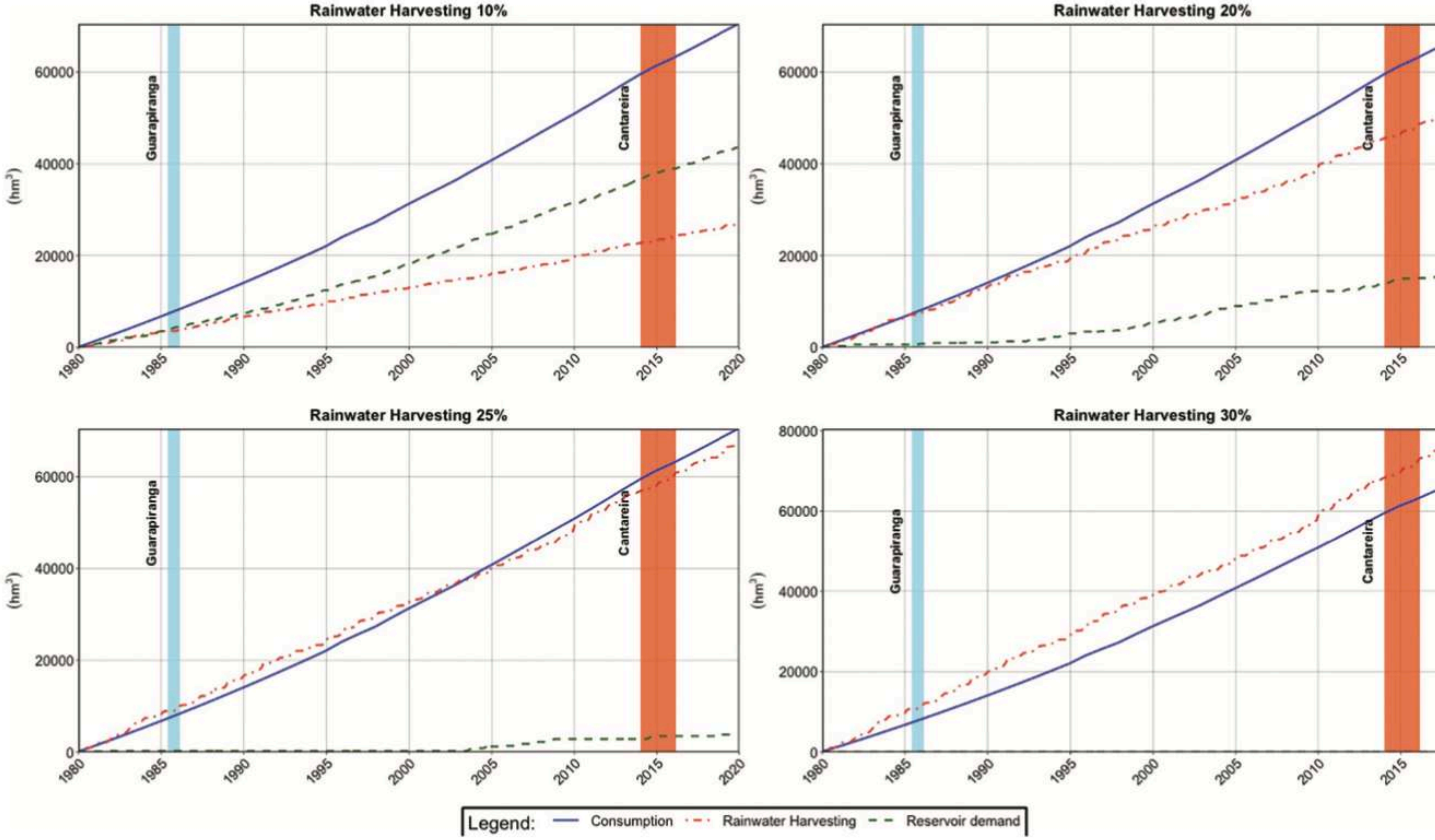
…but **resilient mechanisms** (i.e. insurance) depict evidences of heavy influence of different spatial scales* (areas of: 294, 277, 508 and 972 km^2)

- A Indústria na Bacia do Rio Paranapanema: “A Indústria na Bacia do Rio Paranapanema – Uso da Água e Boas Práticas” mostrou que a Bacia do Paranapanema conta com mais de 20 mil indústrias, sendo 99 setores diferentes. O estudo, que é pioneiro, caracterizou o perfil de uso da água e estimou a carga efluente potencialmente poluidora da indústria, considerando as reduções geradas pelas ações sustentáveis de racionalização do uso da água e tratamento ou reuso de efluentes, ou seja, as boas práticas desenvolvidas.

Example XI: stormwater reuse [m].

Cooperative EH-NbS related to:
Historial trends,
Level of Rainwater Harvesting,
Concurrent water-allocation
Decentralized Water Consumption
Socio-Hydrological Values, Beliefs & Norms





URBAN WATER JOURNAL
https://doi.org/10.1080/1573062X.2022.2047735

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RESEARCH ARTICLE

Check for updates

Droughts in São Paulo: challenges and lessons for a water-adaptive society

Felipe Augusto Arguello Souza [a], Guilherme Samprogna Mohor [b], Diego Alejandro Guzmán Arias [c], Ana Carolina Sarmento Buarque [a], Denise Taffarello [a] and Eduardo Mario Mendiondo [a,d]

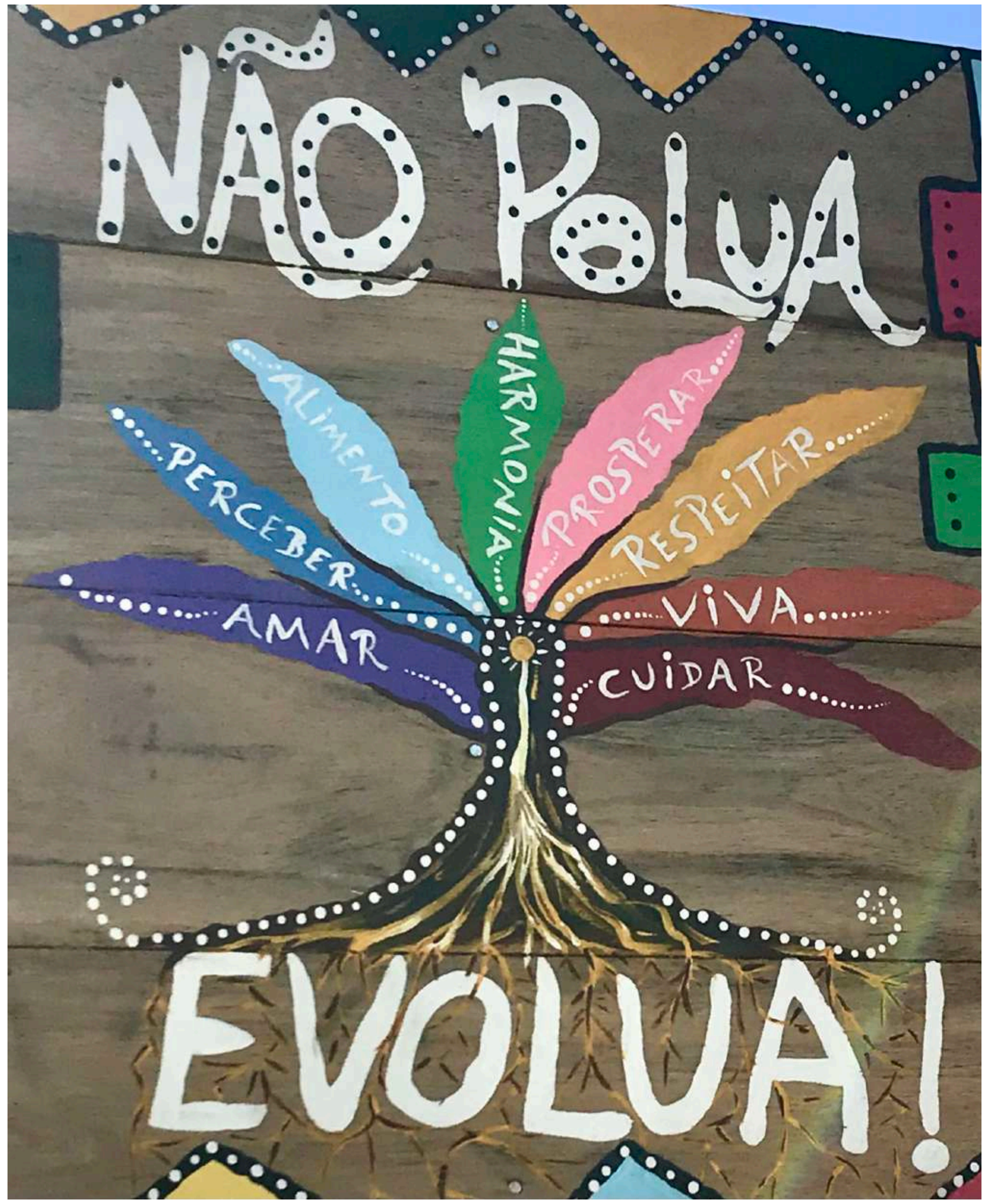
[m]: https://doi.org/10.1080/1573062X.2022.2047735

- Reservação de Água no Paranapanema: Em atendimento a uma das ações do Pirh Paranapanema, a Agência Nacional de Águas e Saneamento Básico (ANA) desenvolveu um inventário de reservação de água inédito, e como modelo utilizou a Unidade do Alto Paranapanema, na vertente paulista da Bacia Hidrográfica do Rio Paranapanema. Na região há vários pequenos reservatórios e, devido à vocação da área para a irrigação, existe também uma expressiva demanda para novas reservações. Contudo, os reservatórios existentes, que provavelmente ampliariam as garantias de água, não são considerados nas estimativas de oferta hídrica. Por meio do estudo, foi possível identificar o comportamento destes reservatórios durante o ano. Segundo levantamento, 40% deles tem pequena redução em seu volume no decorrer do ano e 56% reduzem cerca da metade de seu volume.

Cooperative EH-NbS —> Water, Biodiversity, ecosystem Services for society, Resilience to climate change, and Cultural heritage thrive circular economy, zero-net transition and peace towards the Agenda 2030

Final Remarks:

- With the augmenting inequality in the Global South, these feasible EH-NbS can be adapted:
- at low cost layouts,
- by participatory schemes and serious games,
- to thrive circular economy, zero-net transition and peace
- around the Agenda 2030.



Assoc of Local Dwellers - Toninhas Beach, Ubatuba-SP / EMM 2021

"Do not pollute, but evolve!"

Dziękuję

Thank you

谢谢 *obrigado* Спасибо

gracias **Chaltu** شكرا

yuum bo'otik *merci*

thank you aguyje

Añay!, sullpay!, pachi!

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#ScienceForPeace

emm@sc.usp.br

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@MendiondoMario
https://orcid.org/
0000-0003-2319-2773