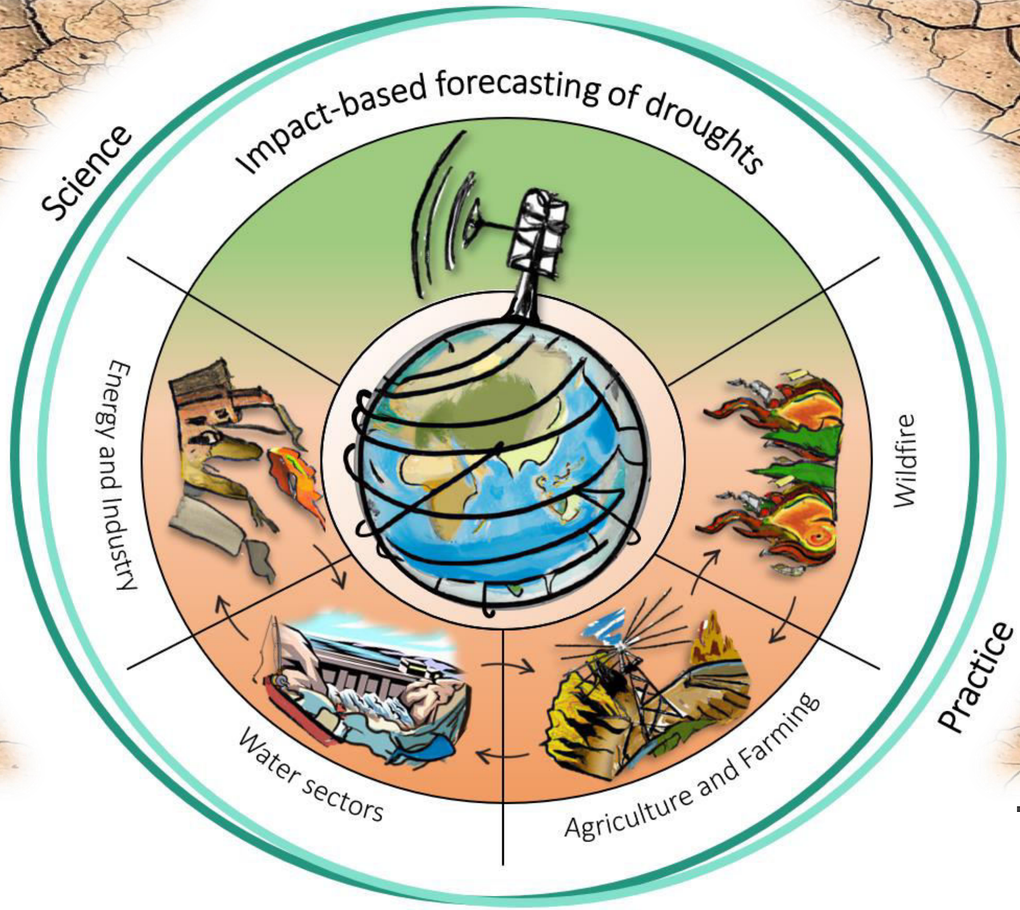
Advances and gaps in the science and practice of impact-based forecasting of droughts



Anastasiya Shyrokaya[1], Giuliano Di Baldassarre[1], Florian Pappenberger [2], Gabriele Messori [1], Ilias Pechlivanidis[3] , Sina Khatami [1], Maurizio Mazzoleni [4]

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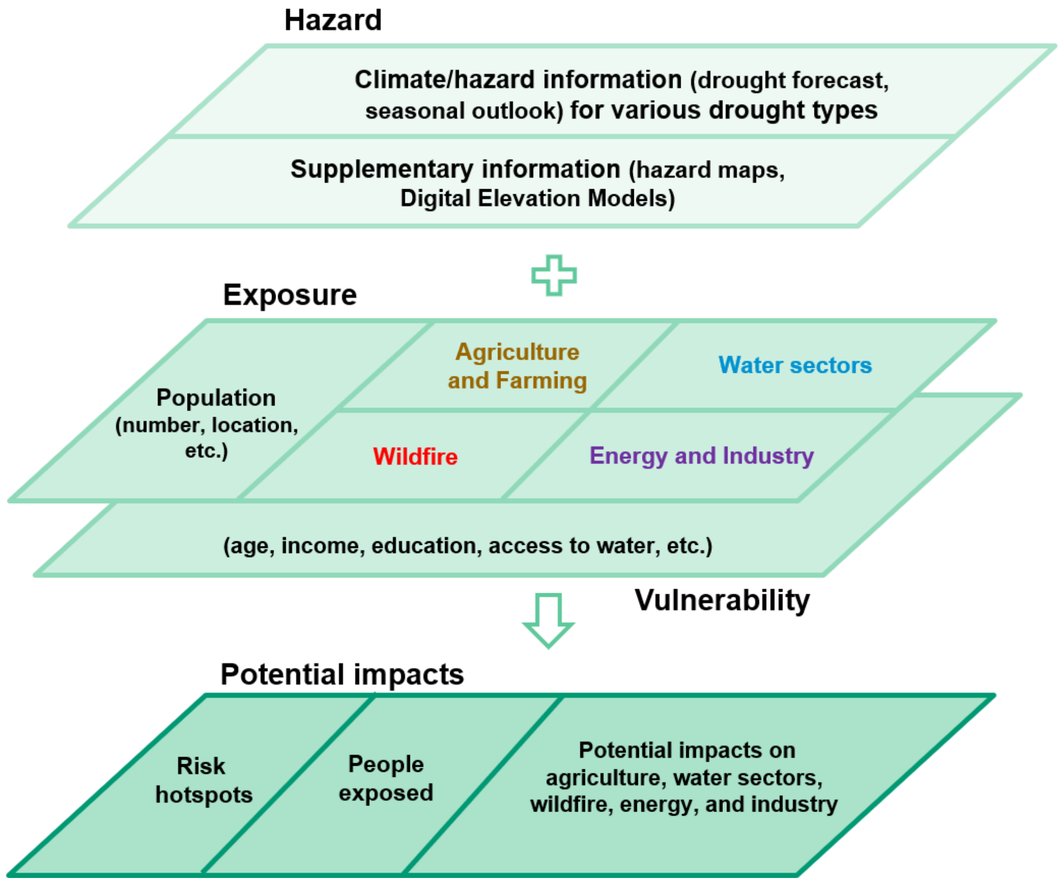
Introduction – drought IbF

Impact-based forecasting (IbF) of droughts:

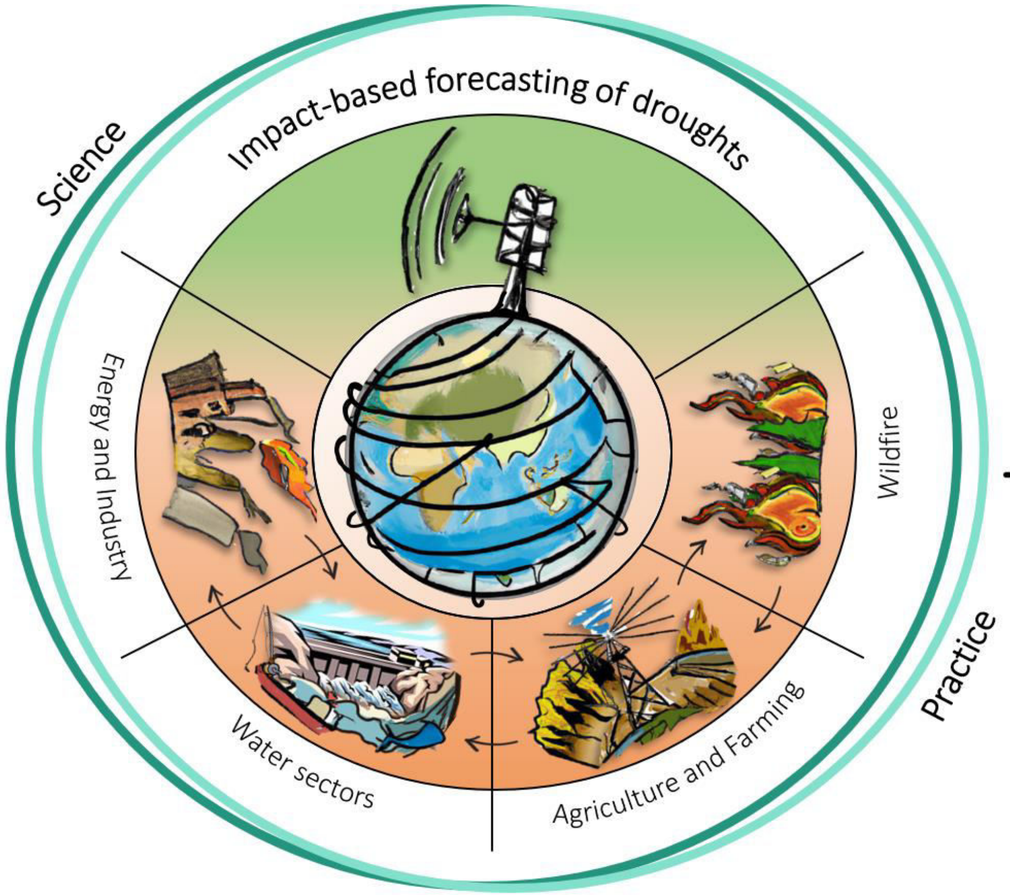
- forecasting impact, not only hazard;
- identify most vulnerable areas and prioritize the aid;
- forecasting of drought impacts is still lacking in DEWSs (Drought Early-Warning Systems);
- IbF emerging field in science & practice;



[Fig.1, Shyrokaya, A., Pappenberger, F., Pechlivanidis, I., Messori, G., Khatami, S., Mazzoleni, M., Di Baldassarre, G. Advances and gaps in the science and practice of impact-based forecasting of droughts, WIREs Water (*in review*)]

Overview – drought IbF

Scientific papers
and
Practical reports

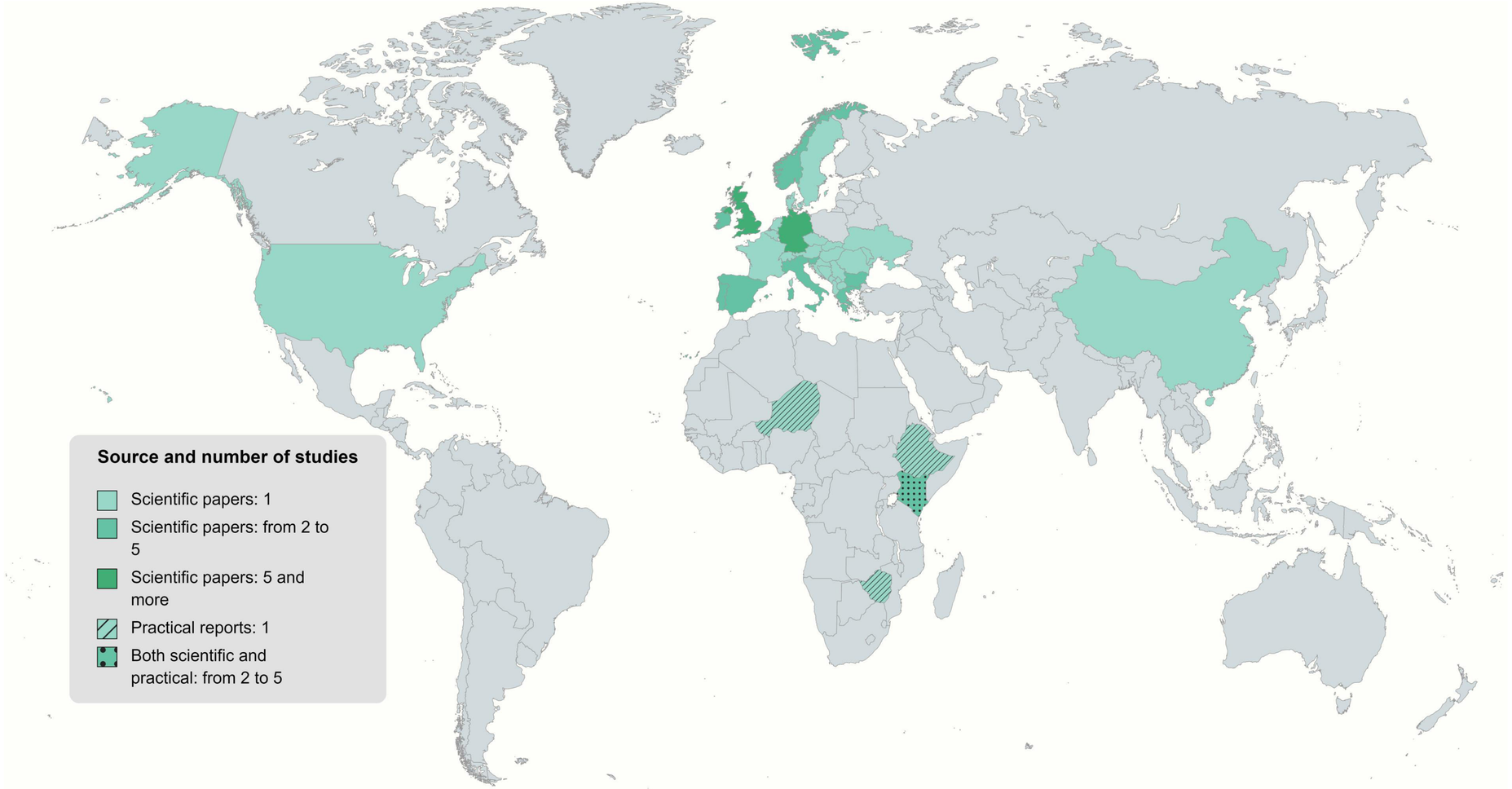


7 challenges & limitations and the way forward

- Contextual challenge
- Human-water feedbacks challenge
- Typology challenge
- Model challenge
- Data challenge
- Sectoral limitation
- Geographical limitation

Overview – drought IbF

The evolution of the drought IbF in scientific and practical literature across multiple criteria (geographical distribution, temporal scale, sectors, IbF methods, drought indices)



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Overview – drought IbF

The evolution of the drought IbF in scientific and practical literature across multiple criteria (geographical distribution, temporal scale, sectors, IbF methods, drought indices)

Legend

Sectors considered

Wildfires
Agriculture & Livestock
Water-related
Energy & Industry

Methods

BLG	Binary Logistic Regression
CES	Cohen's d effect size
GAM	Generalised Additive Models
LG	Logistic Regression
RC	Rank Correlation
RF	Random Forest

Indicators

CI	Climate Indices
NDVI	Vegetation Index
SM	Soil Moisture
SPEI	Stand. Precip. Evapotrans. Index
SPI	Stand. Precipitation Index
SRI	Stand. Runoff Index
SSI	Stand. Streamflow Index
SSWI	Stand. Soil Water Index
S&G P	Streamflow and Groundwater Percentiles

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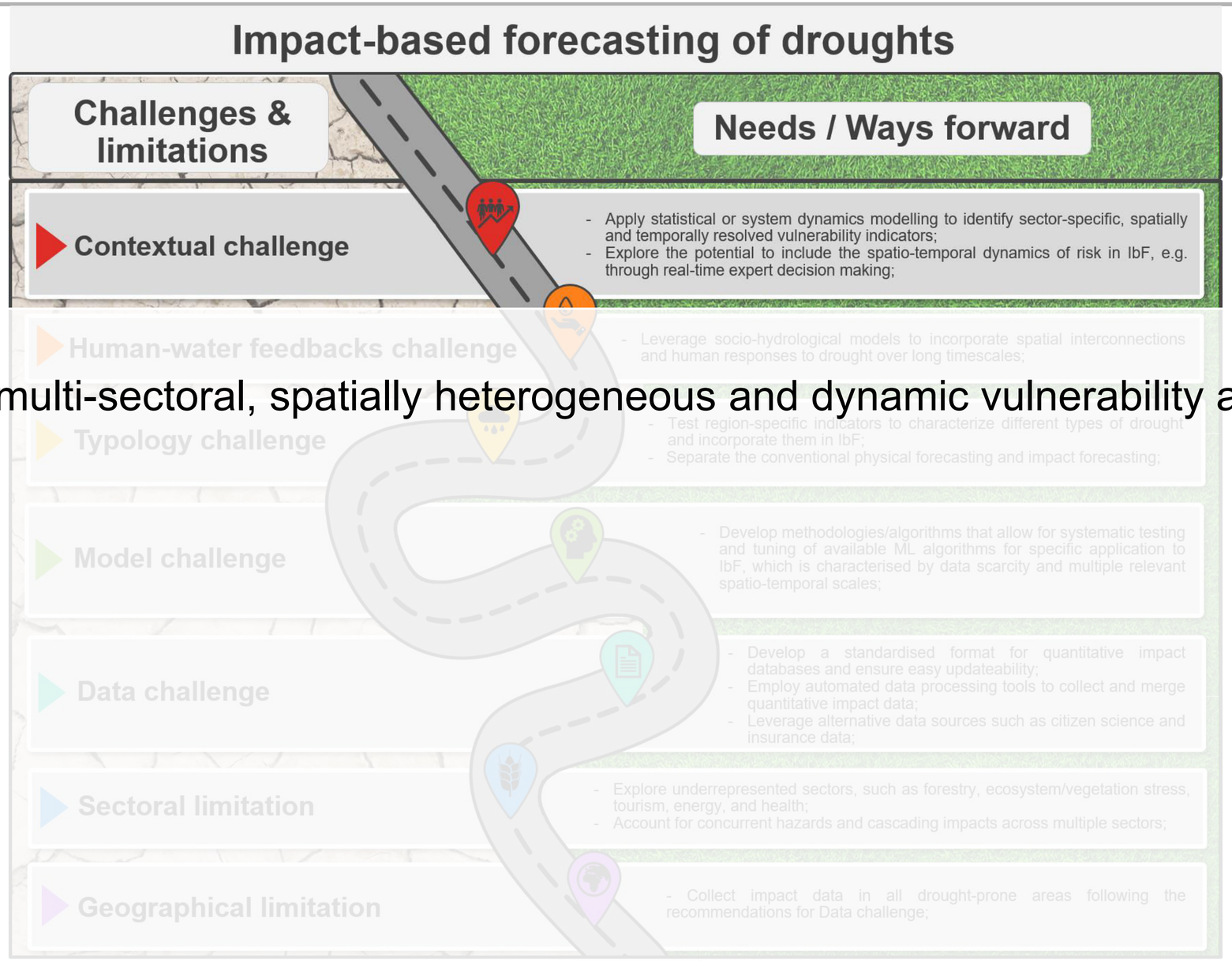
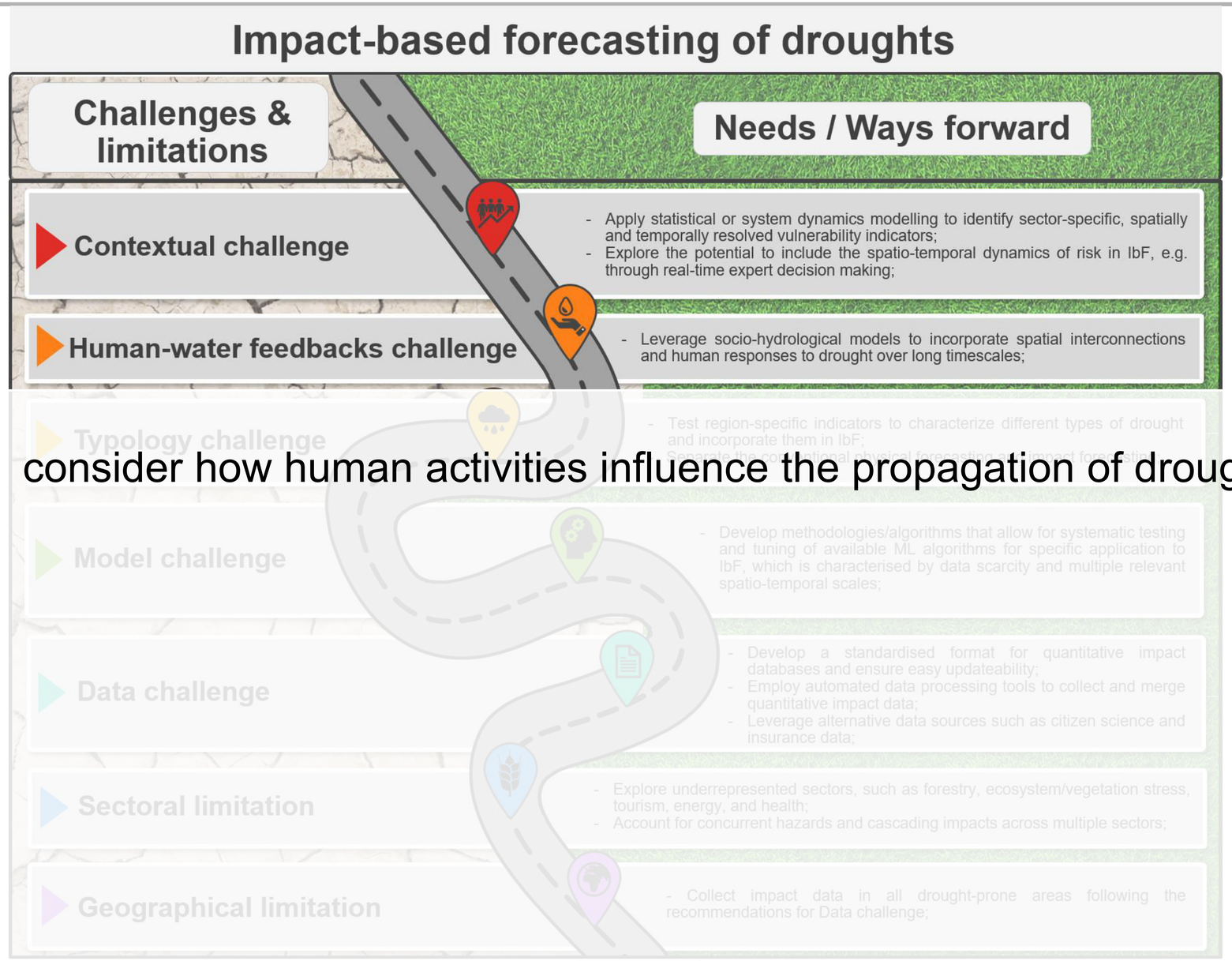
Challenges & ways forward – drought IbF



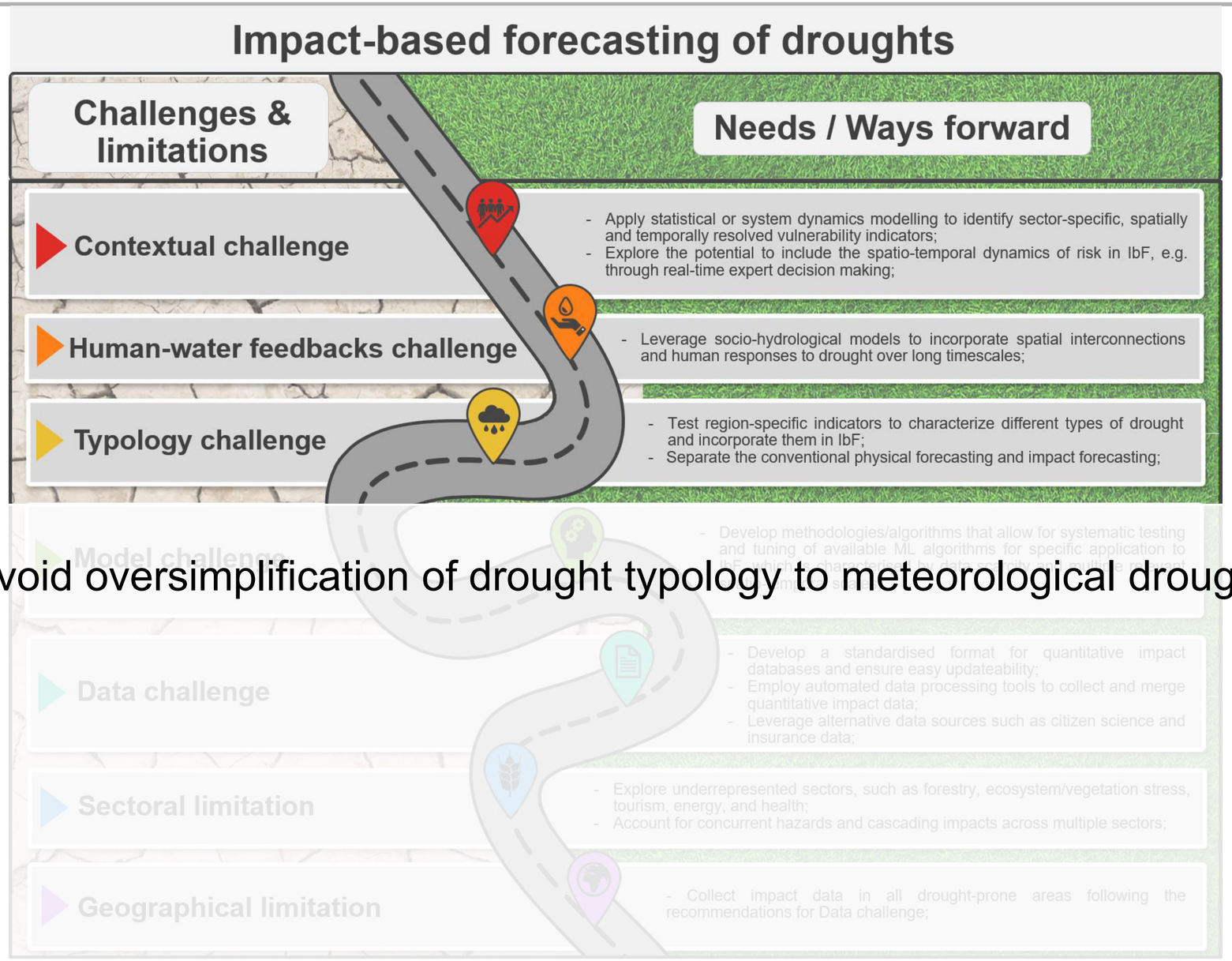
- account for multi-sectoral, spatially heterogeneous and dynamic vulnerability and exposure

Challenges & ways forward – drought IbF



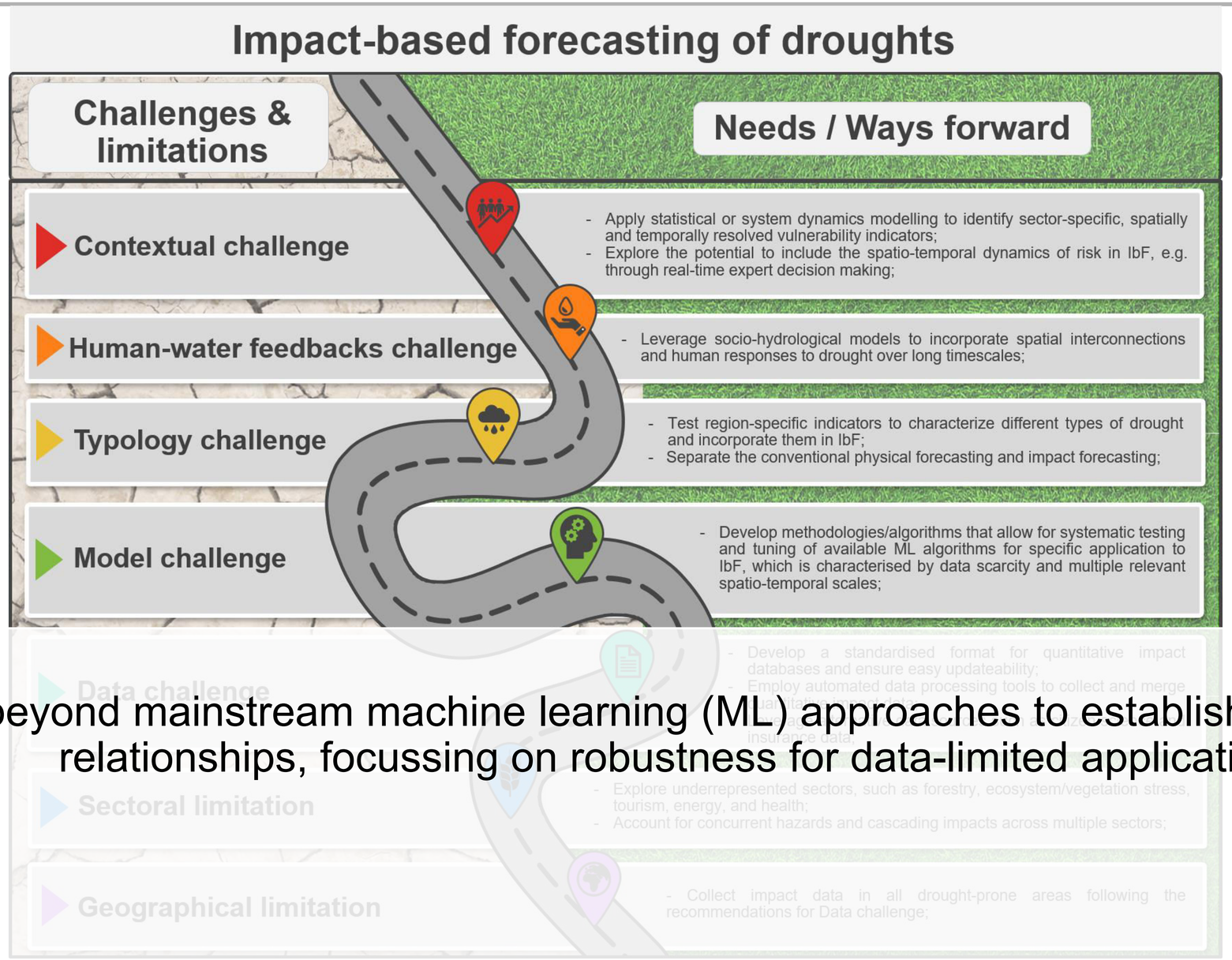
- consider how human activities influence the propagation of drought

Challenges & ways forward – drought IbF



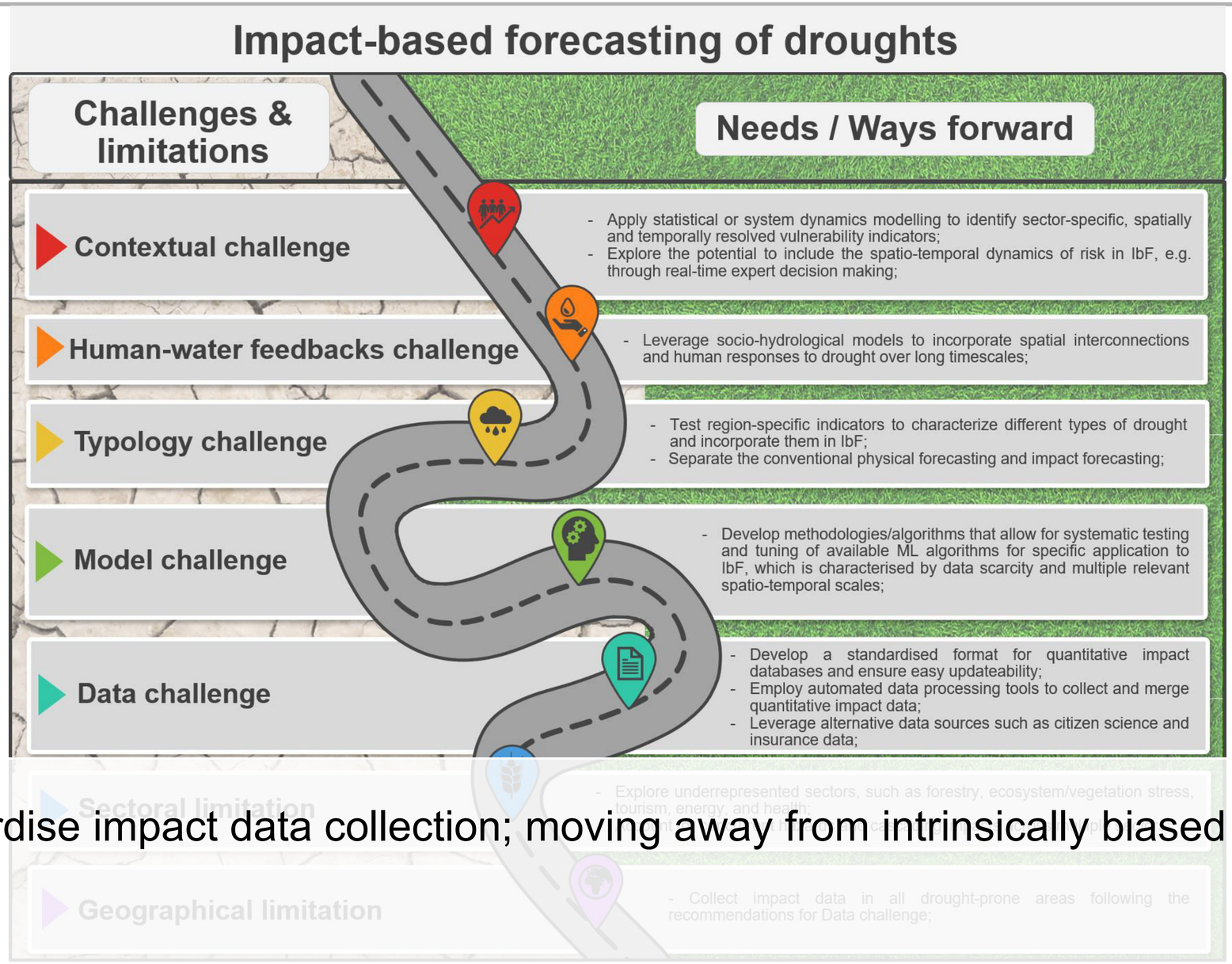
- avoid oversimplification of drought typology to meteorological drought

Challenges & ways forward – drought IbF



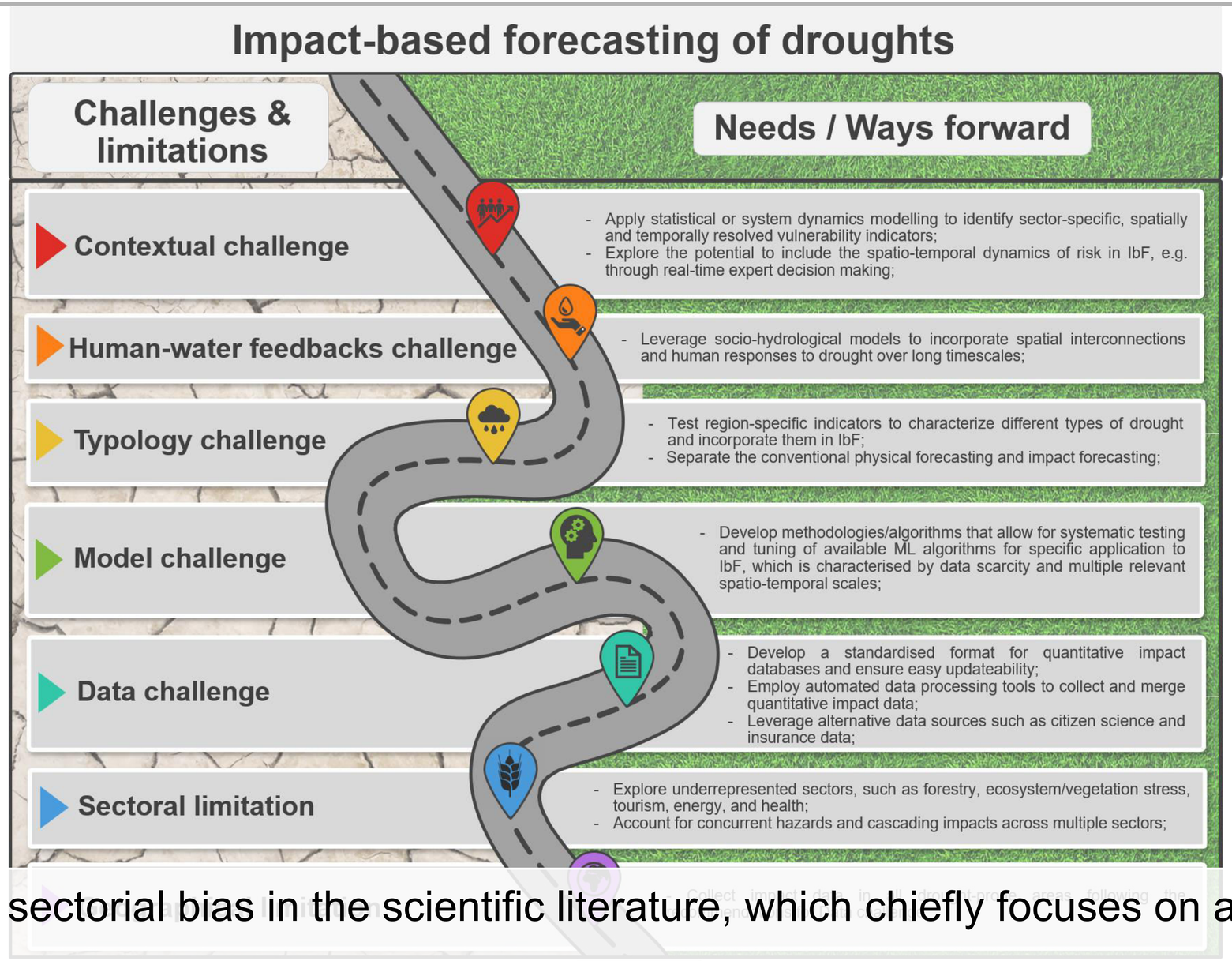
- go beyond mainstream machine learning (ML) approaches to establish functional relationships, focussing on robustness for data-limited applications

Challenges & ways forward – drought IbF



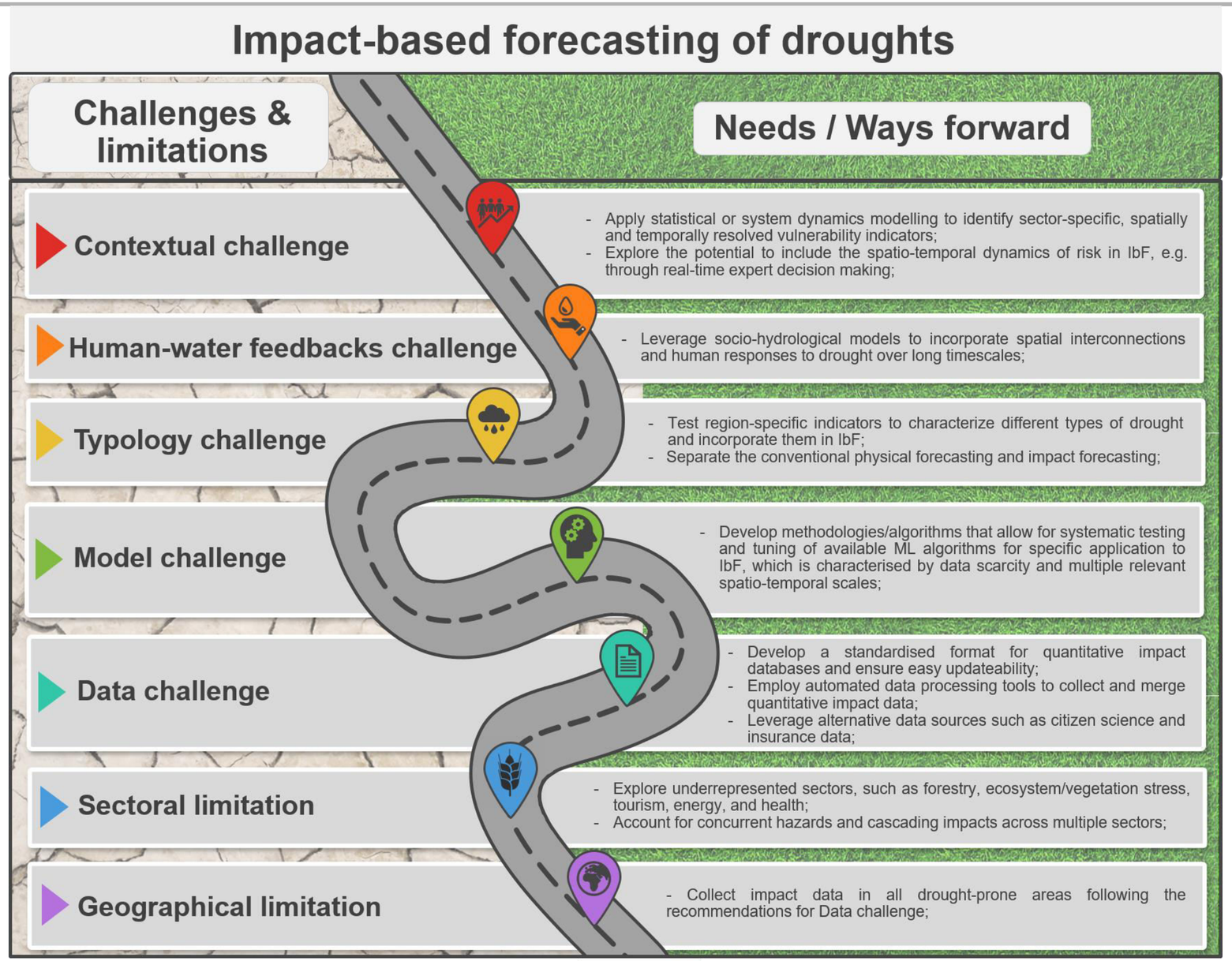
- standardise impact data collection; moving away from intrinsically biased impact data

Challenges & ways forward – drought IbF



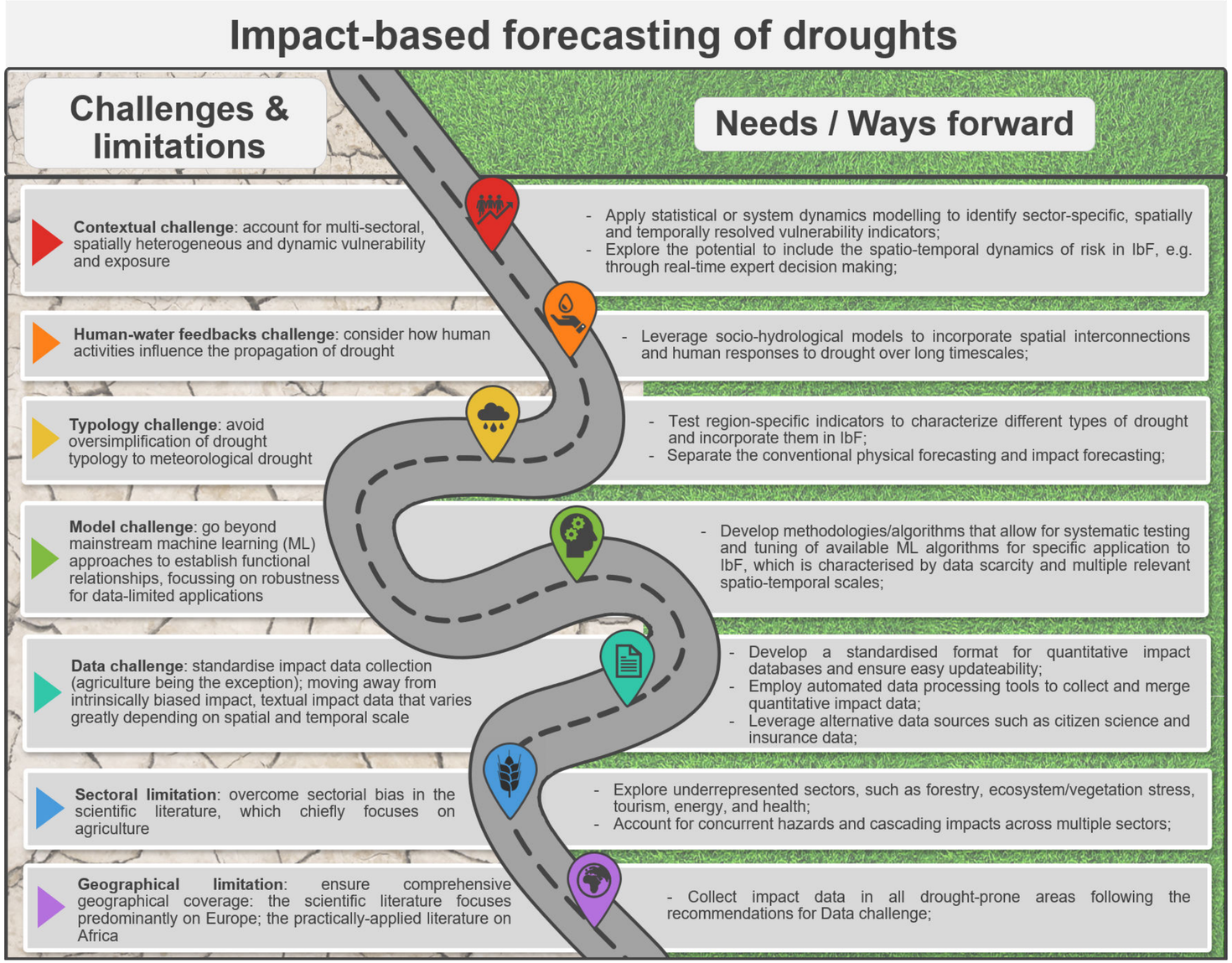
- overcome sectorial bias in the scientific literature, which chiefly focuses on agriculture

Challenges & ways forward – drought IbF



- ensure comprehensive geographical coverage

Implications – drought IbF



- bridge the gap between scientific and practical perspectives;
- co-develop prototypes for local IbF;
- cost-benefit analysis for efficient IbF;

develop and integrate IbF practices into DEWSs

[Fig.3, Shyrokaya, A., Pappenberger, F., Pechlivanidis, I., Messori, G., Khatami, S., Mazzoleni, M., Di Baldassarre, G. Advances and gaps in the science and practice of impact-based forecasting of droughts, WIREs Water (*in review*)]

Advances and gaps in the science and practice of impact-based forecasting of droughts

Thank you!

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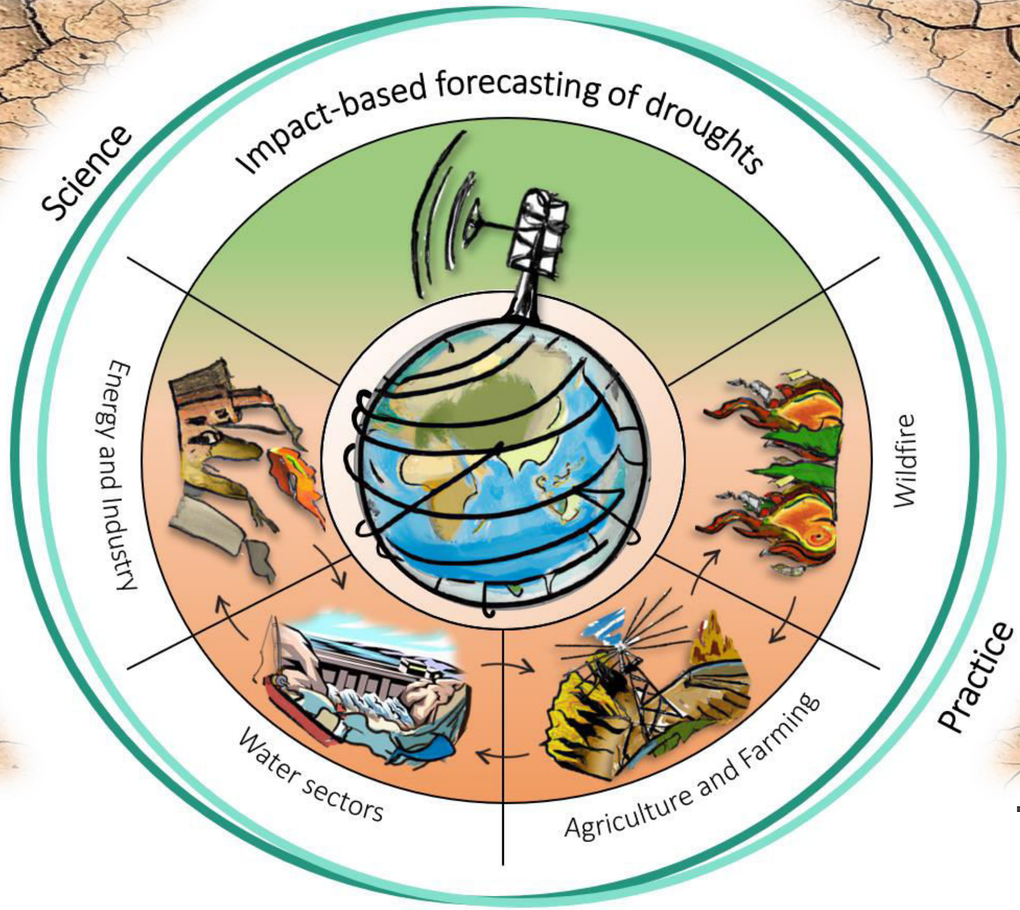

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