Case study n°10:
Challenges and opportunities emerging from the climate change induced migration in the cities: the example of Paris

20/10/2021

What is the main narrative of the case?

- The CS considers the **transnational risks** of climate change through the specific analysis of migratory flows

- We explore the **climate-migration nexus** from global to local scales, looking more specifically at how international migration caused by CC can be anticipated and managed at the city level.

- The IC is calibrated :
    - To move from a linear representation of the risk to a dynamical approach
    - to examine the additional effect of CC on traditional and environment migration flows;
    - to look more precisely at an origin country which has a strong historical link with the welcoming city;
    - For further extension to other countries once calibrated (for a global picture)

- The focus is set on the Senegalese population which would move internationally towards France, and more precisely towards the City of Paris.

- We start from **climatic hazard in Senegal** to reach the **economic, social and political consequences in the City of Paris**, passing by the compounding hazard constituted by transboundary migration.

What ecological/ political/ managerial/ economic development(s) are on display in the case?

2 Impact Chains developed within the case

- The first one considers the international migration decision for rural Senegalese, accounting for hazards' occurrence as well as the exposure and vulnerability components, the result of the individual arbitrage being migration (internal or international), or immobility (willing or trapped).
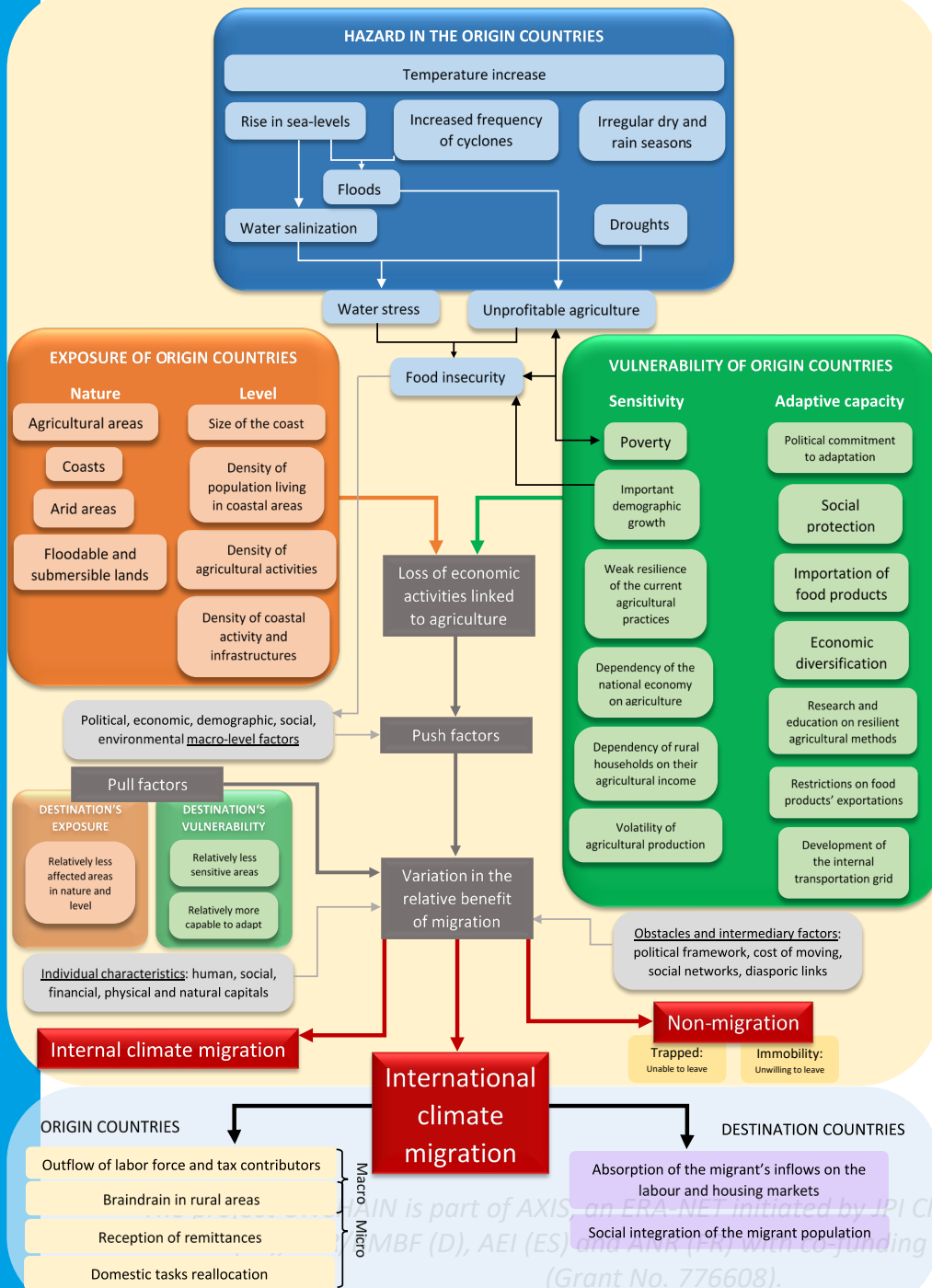
Linking hazards on agricultural lands to the departure of farmers from these unexploitable crops in Senegal

We consider the probability of occurrence of short and long determinant factors linked, specific exposure (in nature and level) and vulnerability (considering sensitivity and adaptive capacities) of the country

We acknowledge the limitations brought by both the geographic focus and the underlying hypotheses on unobservable factors (question of migrating or not, capacity to move etc.)

It is primordial to perceive ICs as tools serving scientific research, more than seeing them as final objects

What ecological/ political/ managerial/ economic development(s) are on display in the case?

2 Impact Chains developed within the case

- The second impact chain considers the integration process of international migrants, accounting for the exposure and vulnerability of Paris in the different dimensions allowing a full integration for migrants (economic, social, cultural, linguistic, residential).
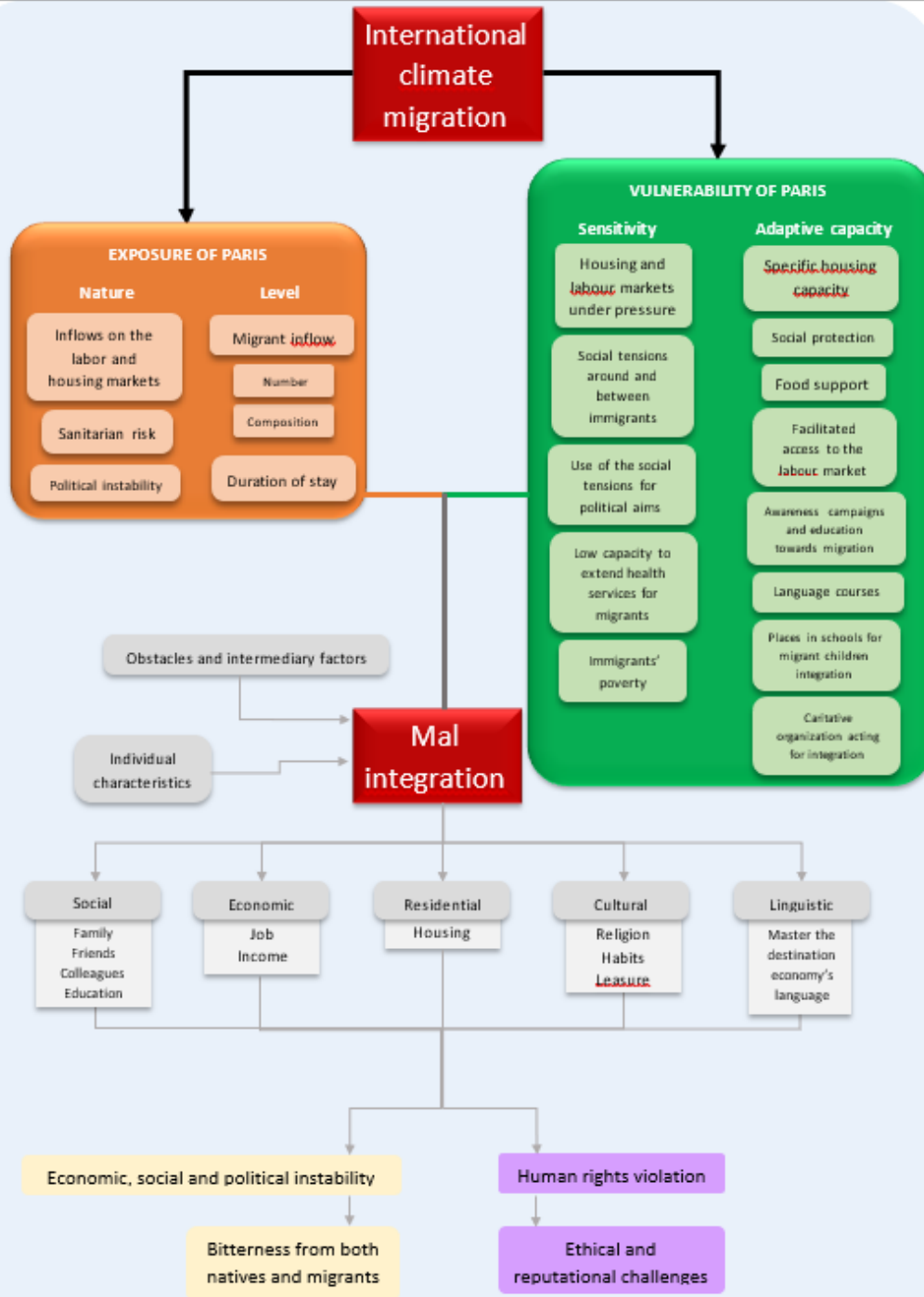
The transition between the two ICs relies on important assumptions.

the Global Risk Score obtained as a result of the first IC has no intrinsic value but gets signification only when its variation through time and scenarios is interpreted.

The second impact chain, however, does not directly present any climatic hazard, but rather the anthropological hazard of migration, which constitutes the compounding hazard of the first IC.

The second IC does not especially focus on Senegalese immigrants, but on the global migrant inflow in the City of Paris.

What's the policy relevance to be extracted from your case, with regard to CC risk?

- Climate-induced migration flows affect urban communities, infrastructure, services and socio-economic health.

- Local action to mitigate or adapt to the climate crisis have the potential to advance the inclusion of migrants and displaced people or further entrench their marginalisation and exposure to inequality and risk (C40 and Mayor Migration Council, 2021).

➢ Inclusive and integrated approach to policymaking

➢ Leading inclusive communications and community engagement strategies

➢ Ensuring inclusive and equitable service provision

- a number of potential entry points for cities alongside national and international bodies that address mobility in the context of CC: Global Compact for Safe, UNFCCC Task force on Displacement, Sendai Framework etc.

Scientifically important findings?
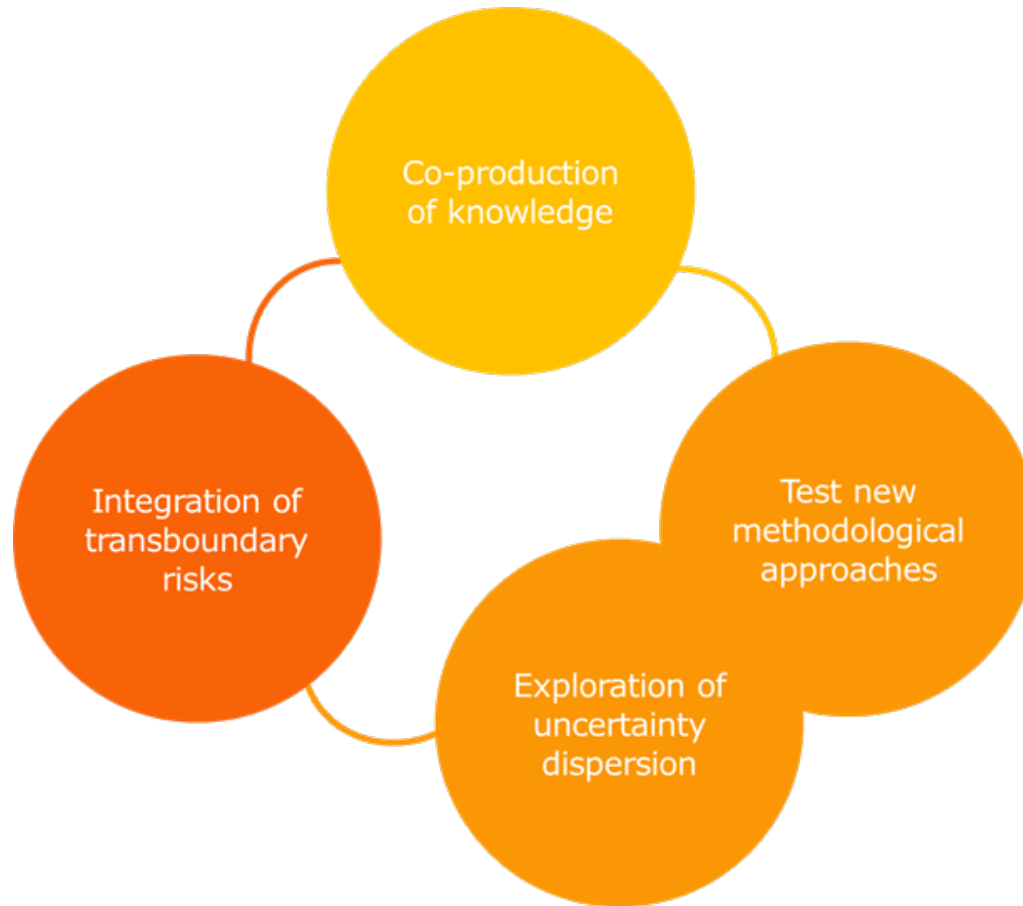
Scientifically important findings?

Methodology's steps / Innovations	1. Prepare vulnerability assessment	2. Develop impact chains	3. Identification and selection of indicators	4. Data acquisition and management	5. Normalisation	6. Weighting	7. Aggregation	8. Results
2. Co-production of knowledge by implication and confrontation of the stakeholders, ownership for improved adaptation decision-making processes	X	X	X	X				X
4.a. Test new methodological approaches (quantitative/qualitative) within the Impact Chain framework for better integration of the dynamic aspects of transboundary risks						X	X	
4.b. Explore dispersion of uncertainty within the IC approach				X			X	
5. Expand the logic of Impact Chain by integrating transboundary impacts		X						X

2.Co-production of knowledge

- A more systematic approach towards the inclusion of expert's judgment and SH narratives in the IC development and along the whole transboundary IC

- Targeted consultation (in-depth interviews, workshop on solutions) for ownership and improved adaptation decision-making processes

Table 13: Normalization by expert's judgment and/or literature

Country	Indicator	Initial value	Final value	Justification
Senegal	% of population living under $3.20/day 2011 PPP	67,5%	0,67	https://atlasocio.com/cartes/economie/pauvrete/carte-monde-taux-de-pauvrete-en-2018_atlasocio.png
	Food insecurity prevalence	49%	0,8	https://fr.wikipedia.org/wiki/Liste_des_pays_par_taux_de_malnutrition
	Agricultural Value Added	17,5%	0,7	Expert judgment
Paris	2017 bilateral migrant stock	119 661	1	Expert judgment (France is the first Northern country in terms of Senegalese migrants stock)
	Difference in GDP per capita (PPP, 2017 constant US$, 1991-2005 mean)	35 036	0,9	Expert judgment
	Poverty rate (Paris)	16,1%	0,167	https://atlasocio.com/cartes/economie/pauvrete/carte-monde-taux-de-pauvrete-en-2018_atlasocio.png
	Number of health infrastructures available linked to migrants welcoming centres	13	0,2	Expert judgment

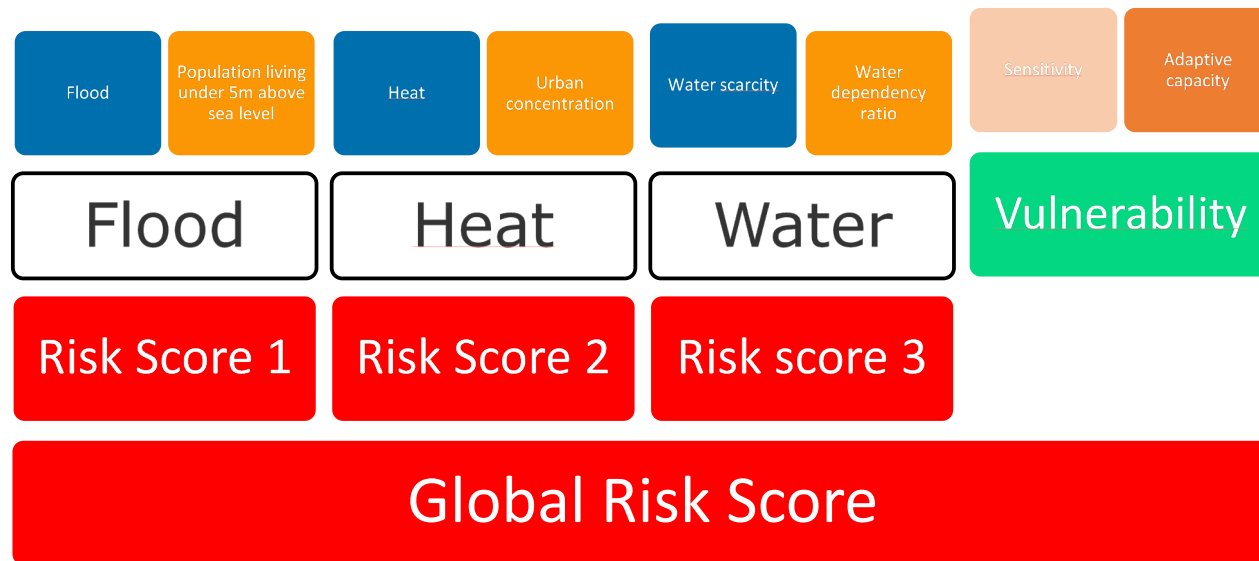# 4a. Test for new methodological approaches

- We use different **aggregation methods** as well as different **aggregation moments**, in order to capture the sensitivity of the results.

- The aggregation methods used are arithmetic, weighted product and geometric. The justification of the use of these different methods are that, while arithmetic aggregation allows for components substitutability, **geometric aggregation sanctions high risks**. Parallelly, weighted product is known for being the best information preserver. All methods give different results, even if the obtained scores are really close.

- The aggregation moments aim to avoid the loss of accuracy/the increase in uncertainty in the aggregation process. As we categorise our hazard components, we find the corresponding aggravating factors that are related to exposure.
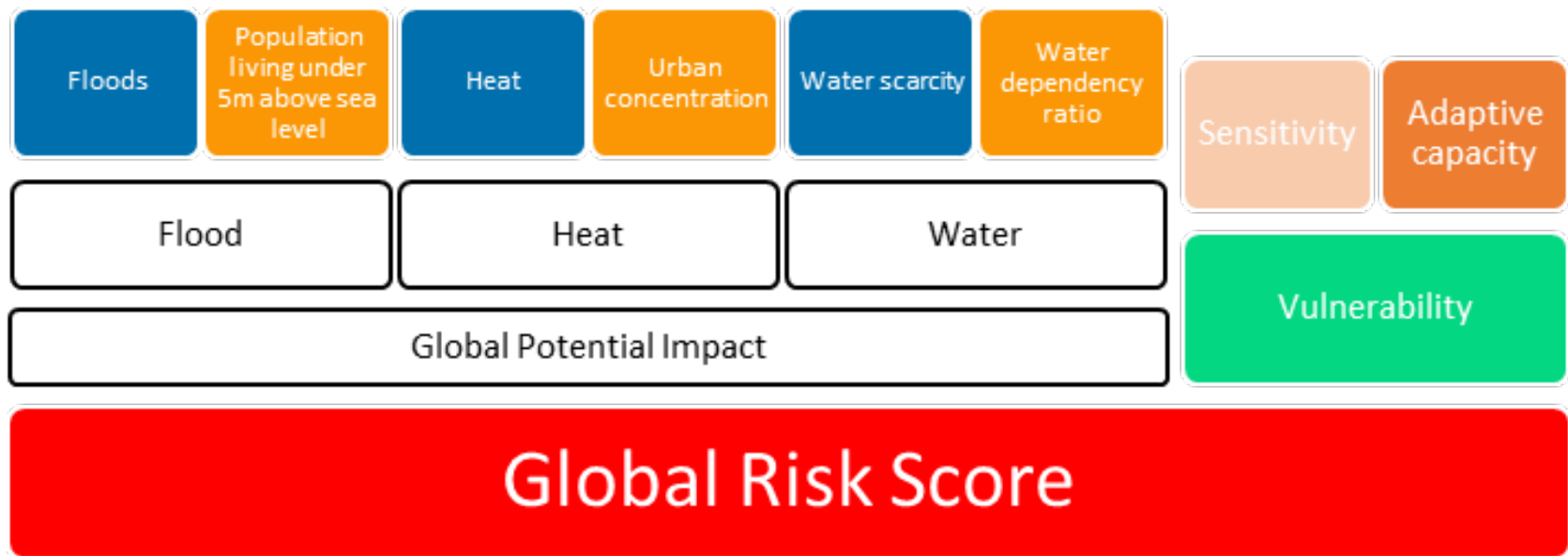
- We then choose either:

Results

Risk score for different aggregation methods

12
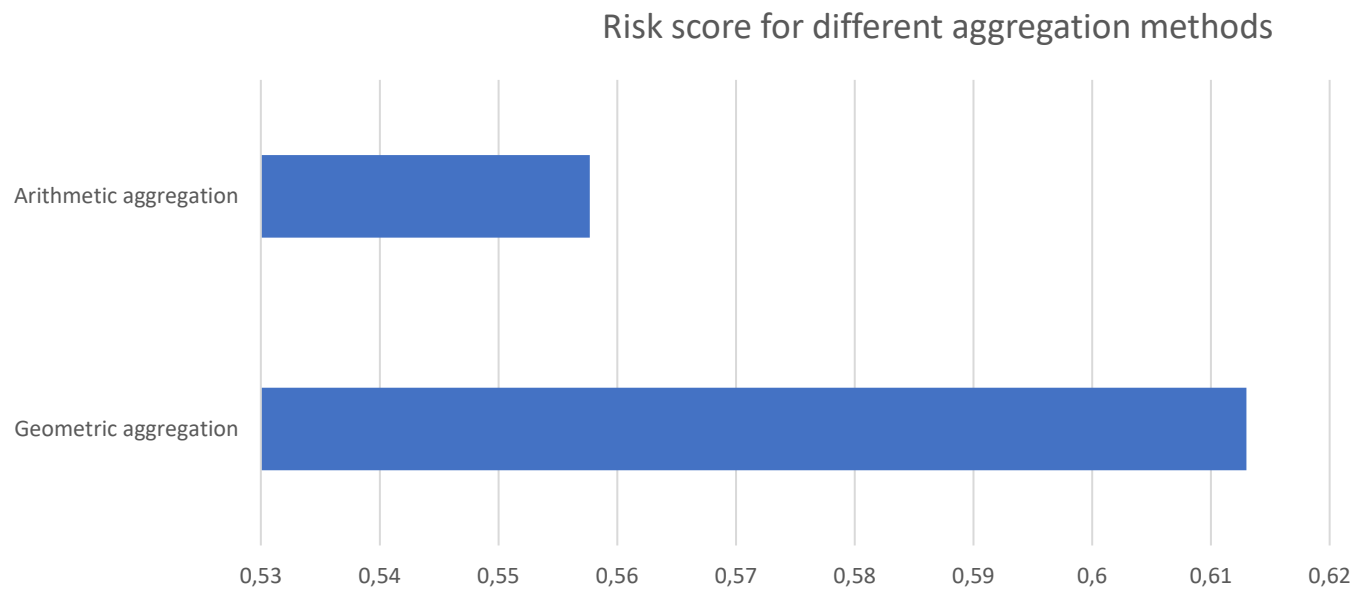
Test for new methodological approaches

- to keep these hazard/exposure pairs as far as possible in the aggregation process

| Flood | Population living under 5m above sea level | Heat | Urban concentration | Water scarcity | Water dependency ratio | Sensitivity | Adaptive capacity |

| Flood | Heat | Water | Vulnerability |

| Risk Score 1 | Risk Score 2 | Risk score 3 |

| Global Risk Score |

Test for new methodological approaches
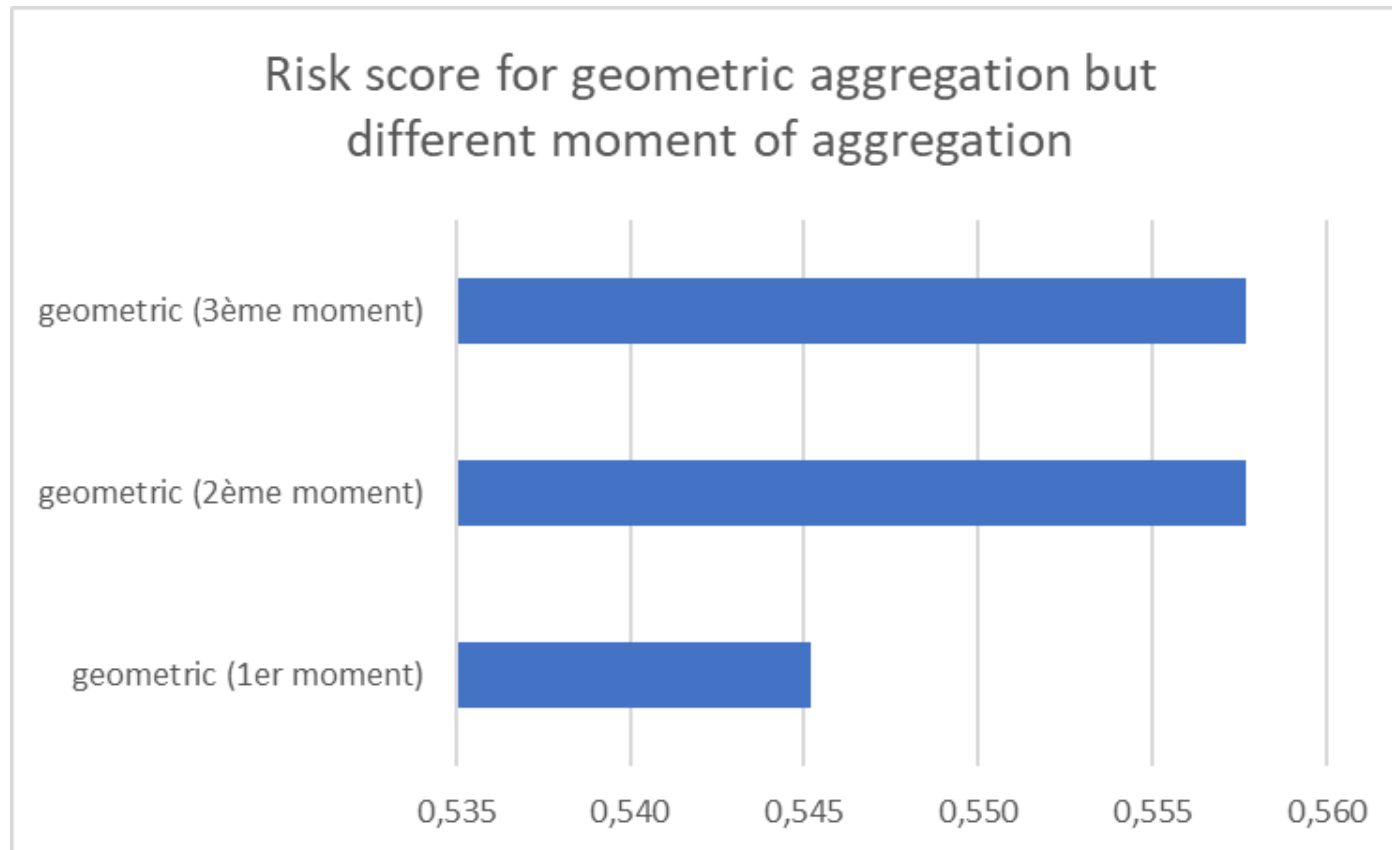
- to release them in the middle of the process,

Test for new methodological approaches

to work on aggregated components from the beginning (only one score for hazard and one score for exposure).
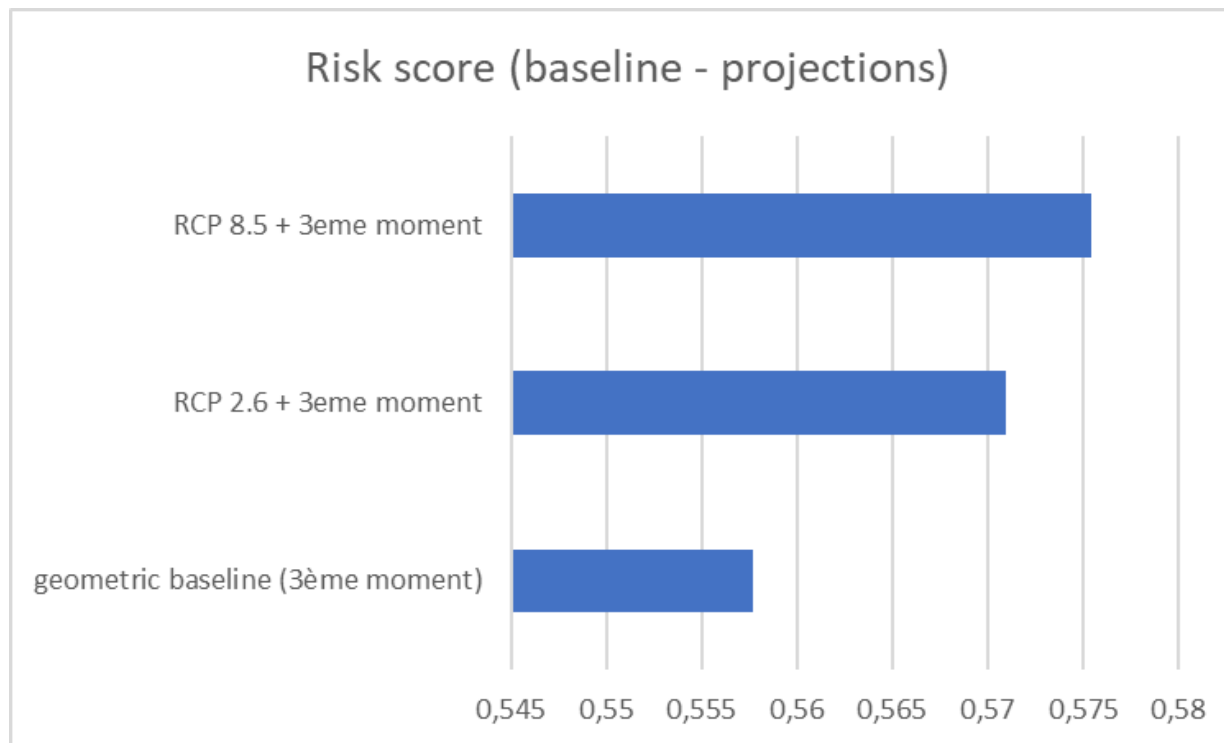

> These different aggregation moments give identical results for arithmetic and weighted product methods, but different ones for the geometric aggregation.

Results

Risk score for geometric aggregation but different moment of aggregation

Results

Risk score (baseline - projections)

4b.Uncertainty analysis

- The different aggregation methods help us to analyse quantitatively the uncertainty dispersion.

- uncertainty persist on climate measures and projections. To explore uncertainty on projections, we use a multimodel, multi scenario approaches and the median of the results obtained through the models used by the CCKP.

- We run projections with the different weighting, aggregation methods and moments, using **scenarios 2.6, 4.5 and 8.5**, allowing the different categories of hazard to vary. The variation is accounted as the difference between the baseline (1986-2005) and the projection (2040-2060). Other components (exposure and vulnerability) are considered unchanged.

Variations (%)	Scenario 2.6	Scenario 4.5	Scenario 8.5
Flood (change in amount of rainfall on very wet days)	+2.98%	+0,21%	1,21%
Temperature	+3,756%	+5,13%	6,791%
Drought	+6,277%	+12,975%	+16,862%

5.Integration of transboundary impacts of CC

- Methodological aspects: expanding the IC over time and space

We start from climatic hazard in Senegal to reach the economic, social and political consequences in the City of Paris, passing by the compounding hazard constituted by transboundary migration.

We developed the analysis over time taking into account a baseline and CPs at 2050 (2040-2070)

- Policy aspects and risk ownership

How can international impact of CC be managed locally?

Question of risk ownership: a reflection in terms of capacity rather than responsability

Relevance for the ambition to improve the Impact Chain methodology

- Presentation of additional methodological approaches (quantitative/qualitative): geometric, weighted product and different aggregation moments

- Inclusion of expert judgement and narrative alongside the developed IC

- Contribution to the improvement of the uncertainty analysis and dispersion with a focus on climate projections, scenarios, multi-model approaches, selection of indicators etc.

Potential contribution to articles

We would be interested in a joint article with

- Other cases on the improvement of IC framework (quantitative/qualitative approaches, uncertainty analysis etc.)

- Other cases on transboundary risks and governance aspects at local level