

## BACKGROUND

It is crucial to develop a comprehensive understanding of the economic impacts of floods, including indirect impacts, which have been very often overlooked.

For this reason, this study adopts a systematic quantitative review of the recent scientific literature in the fields of economy and engineering on the socio-economic impacts of floods.

### WHY INDIRECT ECONOMIC IMPACTS?

- No standard methodology to assess indirect impacts
- No common terminology exists between engineering and social-sciences
- Flood risk assessment studies usually include only direct impacts leading to an underestimation of the full range of impacts

## METHODOLOGY

### Identification of studies via databases and registers

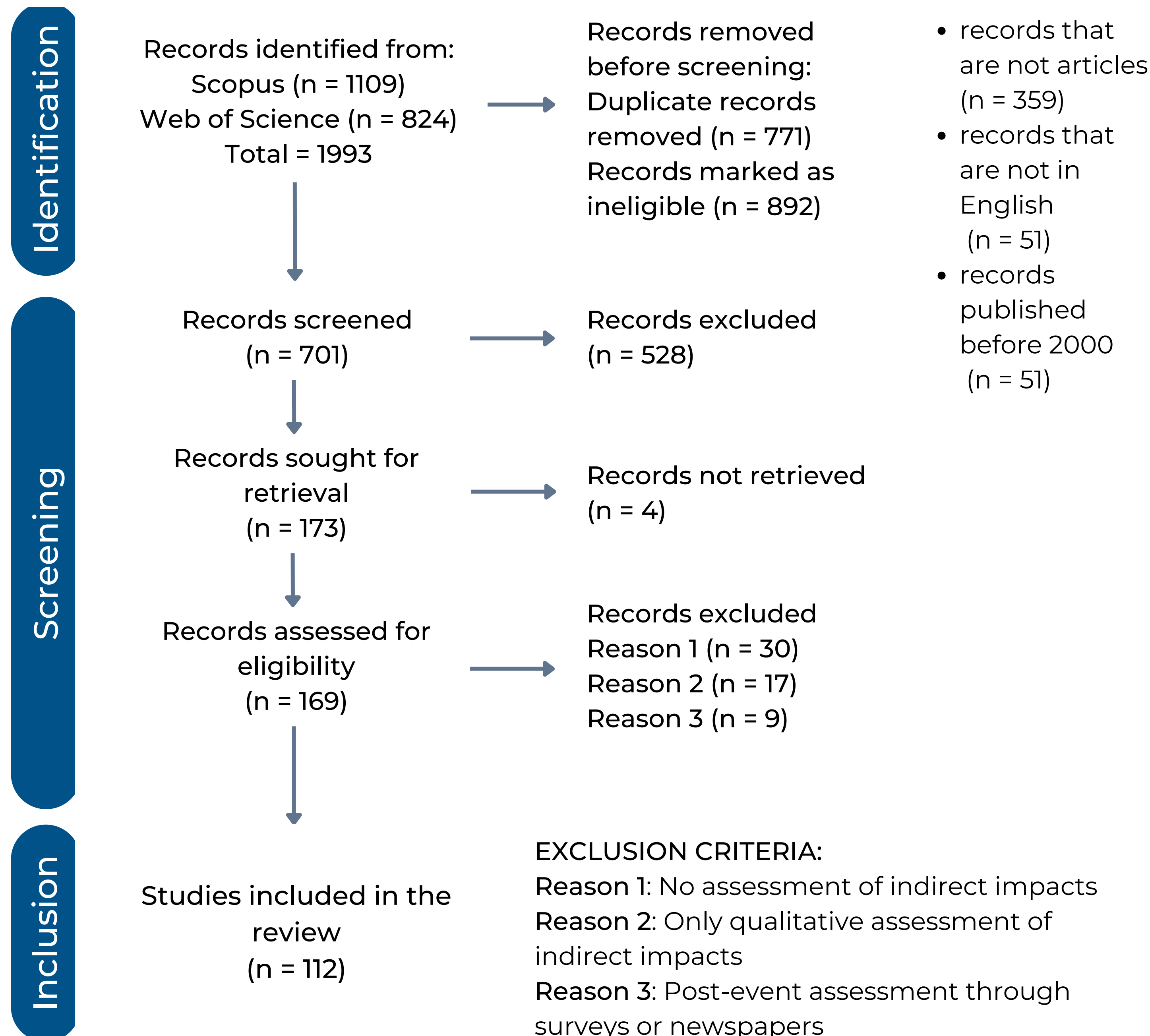


Fig. 1 - Prisma flow diagram for systematic reviews [Page et al., 2021]

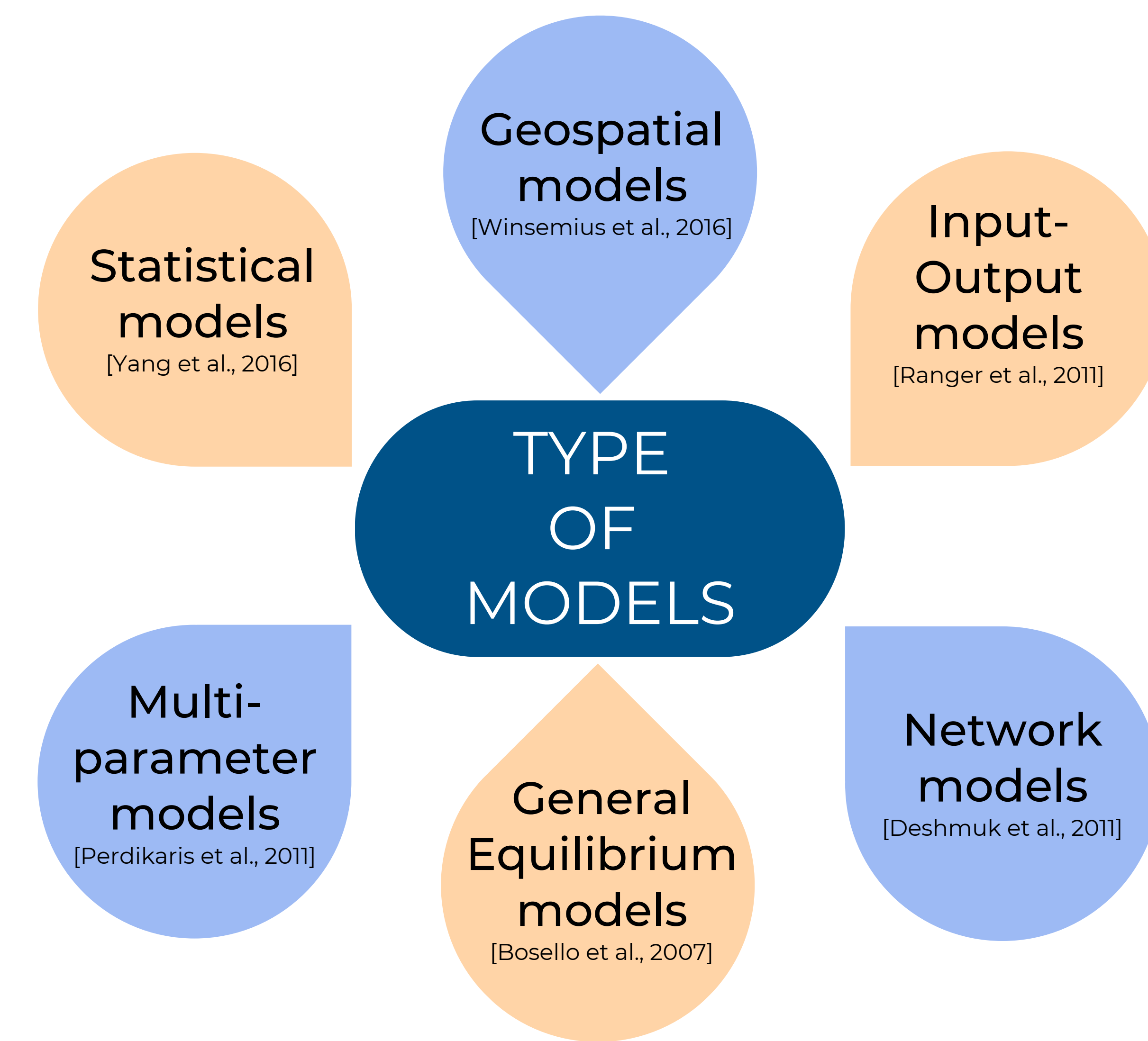


Fig. 2 - Some of the most used types of models present in literature to estimate the indirect economic impacts of floods

SECTORS VS METRICS	Economic indicators				Adimensional index	People	Space	Time	Points
	(e.g. gross domestic product, global value added)	(e.g. consumption levels, import and export volume)	(e.g. employment loss, revenue loss, production loss, demand loss)	(e.g. average annual loss, \$)	(e.g. performance loss, serviceability)	(e.g. workers, visitors, people affected)	(e.g. disruption length, travel distance)	(e.g. recovery time, travel time)	(e.g. nodes affected, hotspots)
Economic sectors	[12;15;16;20;22;30;31;34;35;36;39;40;43;53;54;60;63;70;75;77;78;80;86;87;89;94;96;98;104;105;107]	[10;16;21;22;34;35;36;39;40;43;45;48;52;63;66;70;83;91;92;96;98;111]	[10;15;75;76;111]	[17;18;44;46;47;49;58;61;62;71;93;99;106;100;101]	[25;49;68;101]	[16;45;46;111]		[46;100]	[90]
Firms	[28]	[73]	[2;13;72]	[13;24;38;44;57;67;69;85;88]	[4;5;26;28;69]			[85;88]	[19;28]
Households	[3;95]	[29]	[2;27;37]	[24;37;74;93]	[4;5;37;68]	[79]			[19;81]
Transportation system			[6]	[8;11;14;23;24;32;42;50;56;108;109]	[4;4;112;113]	[8;42;55]	[8;42;50;55;84;97;109]	[11;14;32;56;84;97]	[6;11;33;81;110]
Water distribution system	[94]	[92]		[8;11;42]		[9]		[8;11;42]	[11;19;103]
Electric power system	[94]		[6;37]	[11;24;37;82]	[37;82]			[11]	[6;11;33;81;82;103]
Cultural heritage			[72]	[7]		[7]		[7]	
System of systems			[6]	[11;65]	[5;41;64]			[11]	[6;11;41;103]

Fig 4 - Quilt plot representing the frequency and combination of identified variables and the corresponding sectors, where from white to red colour means low to high frequency. Numbers refer to the indexed literature available using the link or the QR code

## RESULTS

This study adopts the PRISMA methodology for systematic quantitative reviews (Fig.1) and a total of 112 articles were extracted.

The results of the first analysis are represented by identifying some of the most used models (Fig. 2), as well as the different typologies of analysis present in the literature (Fig.3). Moreover, Fig. 4 depicts the frequency of studies divided for different sectors of interest and the associated indicator.

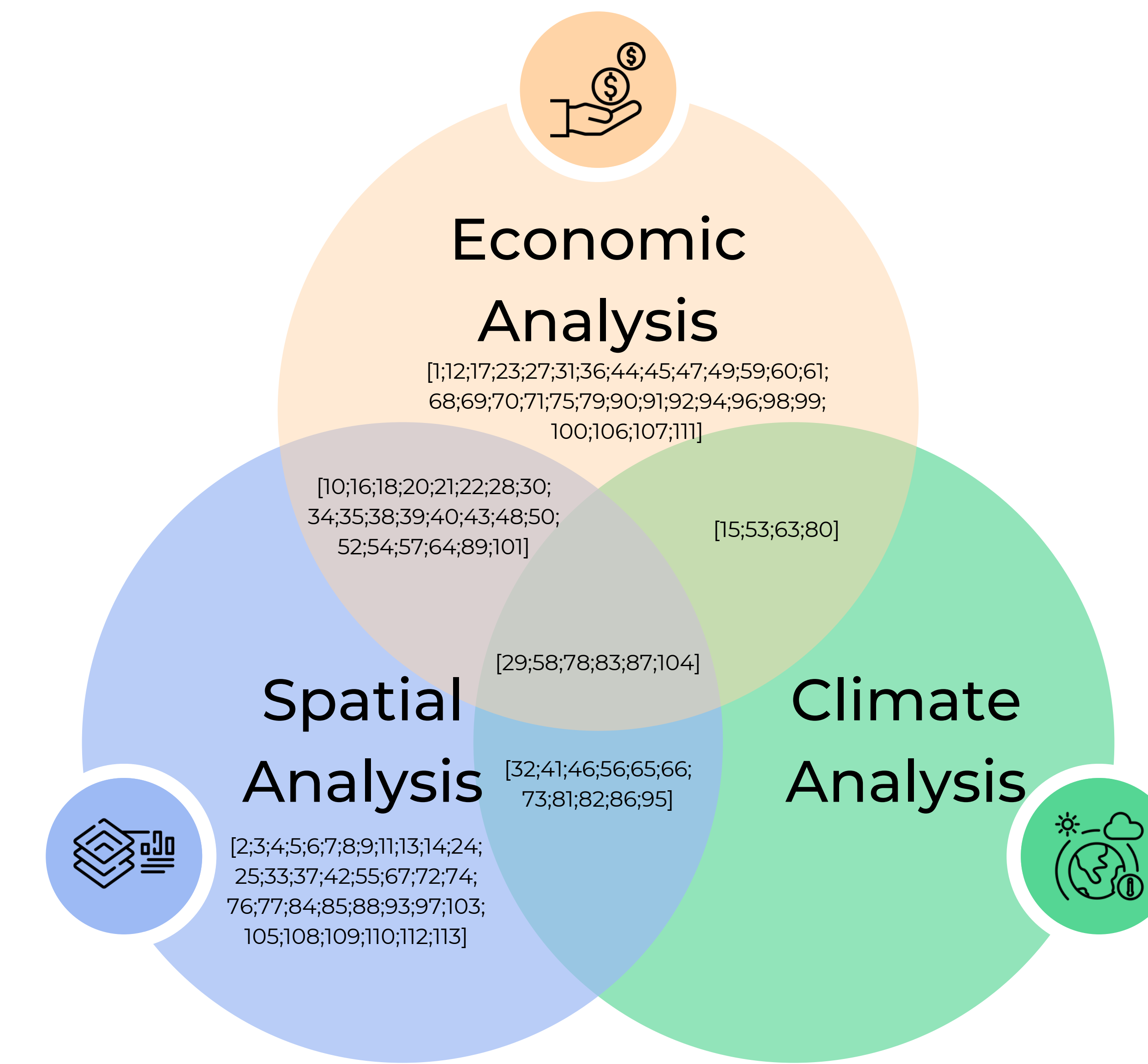


Fig. 3 - A qualitative description of the three main levels of analysis used to assess the socio-economic impacts of floods with the corresponding indexed literature

## CONCLUSIONS

From this systematic quantitative review it is possible to highlight some of the key features of this topic, as well some research gaps:

- interdisciplinary topic
- most of the works have addressed indirect impacts on a large-scale by using macroeconomic indicators
- very few works with a high-resolution spatial analysis and an economic analysis using climate scenario

## CONTACTS

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