



78th Jubilee LCA Discussion Forum  
Life Cycle Thinking = Lower Environmental Footprint?  
13 and 14 September 2021



# A geography of Life Cycle Assessment

Myriam Saadé  
Ecole des Ponts ParisTech

# General idea

Conducting LCA   changes in the governance of contextualized socio-environmental systems?

Who applies LCA? Where? For what purpose?

**Spatial redistribution of LCA scientific production at country and city levels since the 1990s**

# Basic statements

## Objectives of LCA:

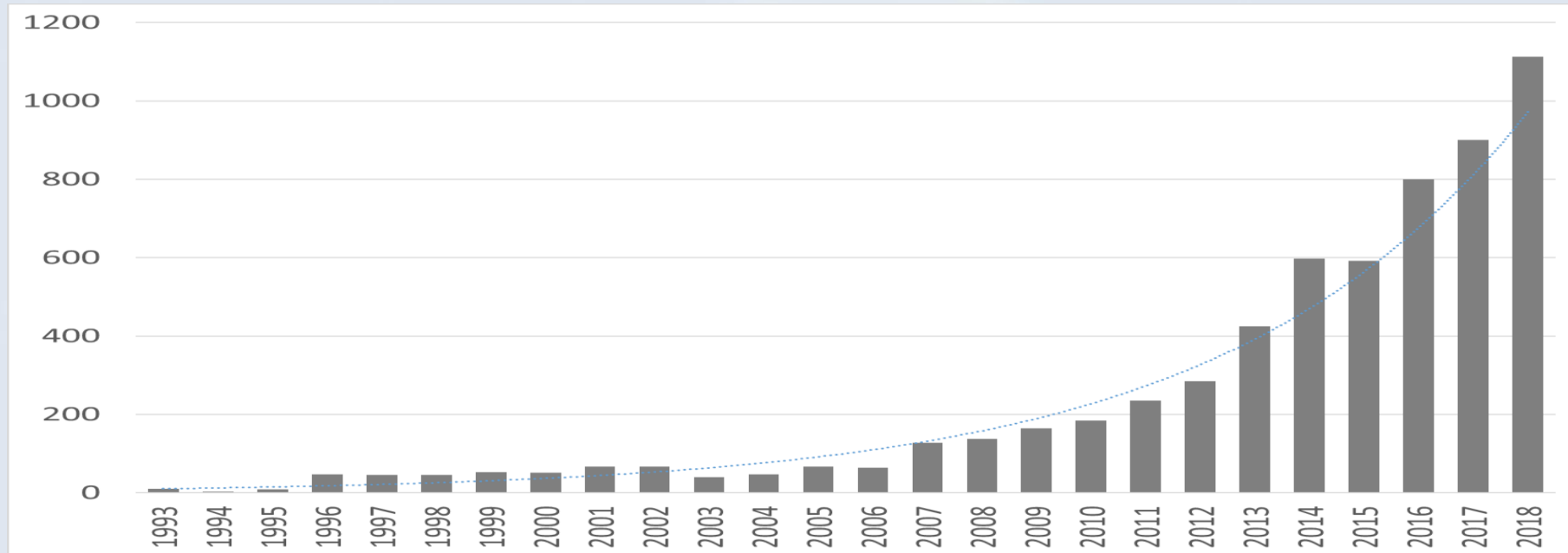
- Improve the environmental performance
- Avoid impacts transfer between life cycle stages, environmental categories and geographical areas (ideally)



[https://commons.wikimedia.org/wiki/File:Life\\_Cycle\\_Thinking\\_Product\\_System.jpg](https://commons.wikimedia.org/wiki/File:Life_Cycle_Thinking_Product_System.jpg)

# Number of peer-reviewed articles (1993-2018)

Source: IJLCA, JIE, JCP



LCA "code of practice" published by SETAC

Creation of Int J of Life Cycle Assessment

Release of ISO 14040 on LCA principles and framework

Launch of the UNEP-SETAC Life Cycle Initiative

Global guidelines for LCA databases by UNEP-SETAC Life Cycle Initiative

PEF guide (v1)

4th meeting on LCM in Cape Town, South Africa

PEF guide (v2)

# Methodology

Bibliometric data analysis at country and city levels (extracted metadata: title, authors, affiliations, journal information, publication year, abstract, keywords...)

## Corpus and search strategy

- Scopus & Lens.org
- Fixed sample of journal: 3 scientific journals contributing to ~30% of the total LCA literature (peer-reviewed articles) : International Journal of LCA (IJLCA), Journal of Industrial Ecology (JIE), and Journal of Cleaner Production (JCP)
- Topic search: “life cycle”, “lca”, “lci”, “lca”, “life cycle assessment”, “life cycle inventory”, “life cycle energy”, “life cycle impact assessment”, “life cycle initiative” *and variants*

→ 4311 publications

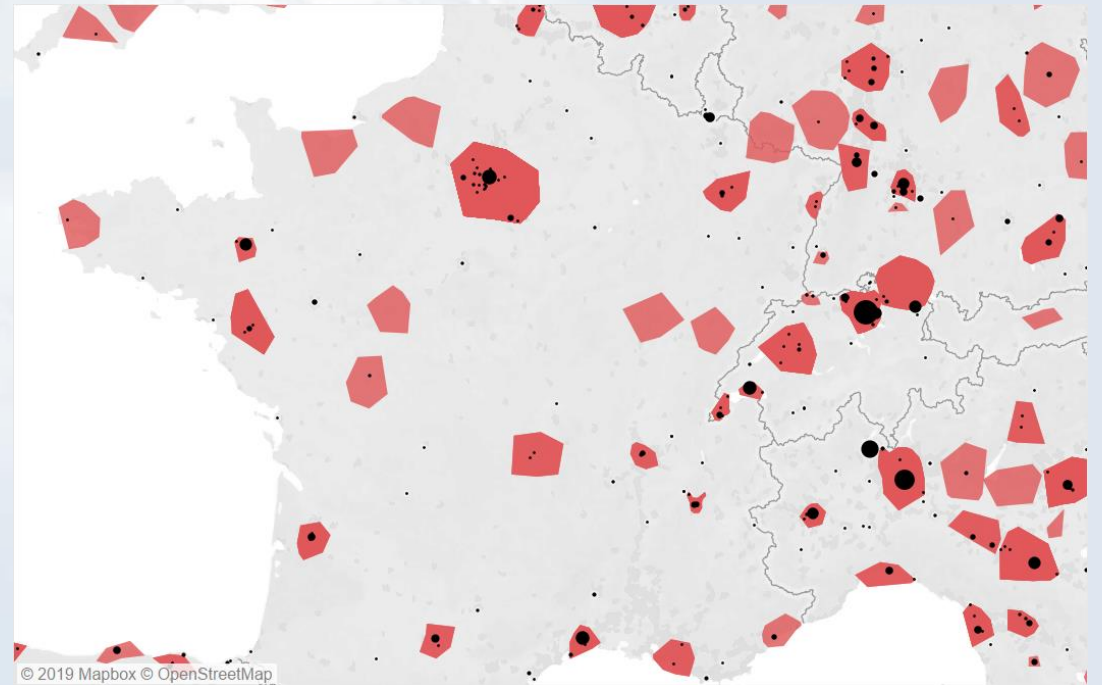
Table 6 The 20 most productive journals during 1998–2013

Journal name	Rank	TP (%)	IF 2012
International Journal of Life Cycle Assessment	1	638 (12.97)	2.773
Journal of Cleaner Production	2	443 (9.01)	3.398
Environmental Science & Technology	3	249 (5.06)	5.257
Journal of Industrial Ecology	4	176 (3.58)	2.276
Resources Conservation and Recycling	5	135 (2.75)	2.319
Energy	6	119 (2.42)	3.651
Waste Management	6	119 (2.42)	2.485
Energy Policy	8	95 (1.93)	2.743
Biomass & Bioenergy	9	86 (1.75)	2.975
Applied Energy	10	82 (1.67)	4.781
Bioresource Technology	11	76 (1.55)	4.75
Journal of Environmental Management	12	73 (1.48)	3.057
Waste Management & Research	13	63 (1.28)	1.047
Science of The Total Environment	14	58 (1.18)	3.258
Building and Environment	15	56 (1.14)	2.43
International Journal of Hydrogen Energy	16	55 (1.12)	3.548
Energy and Buildings	17	46 (0.94)	2.679
Renewable Energy	17	46 (0.94)	2.989
Water Science and Technology	19	45 (0.92)	1.102
Environmental Research Letters	20	38 (0.77)	3.582

TP the number of total publications, TP (%) the number of total publications and the ratio of the number one journal's publications to the total number of publications during 1998–2013, IF impact factor

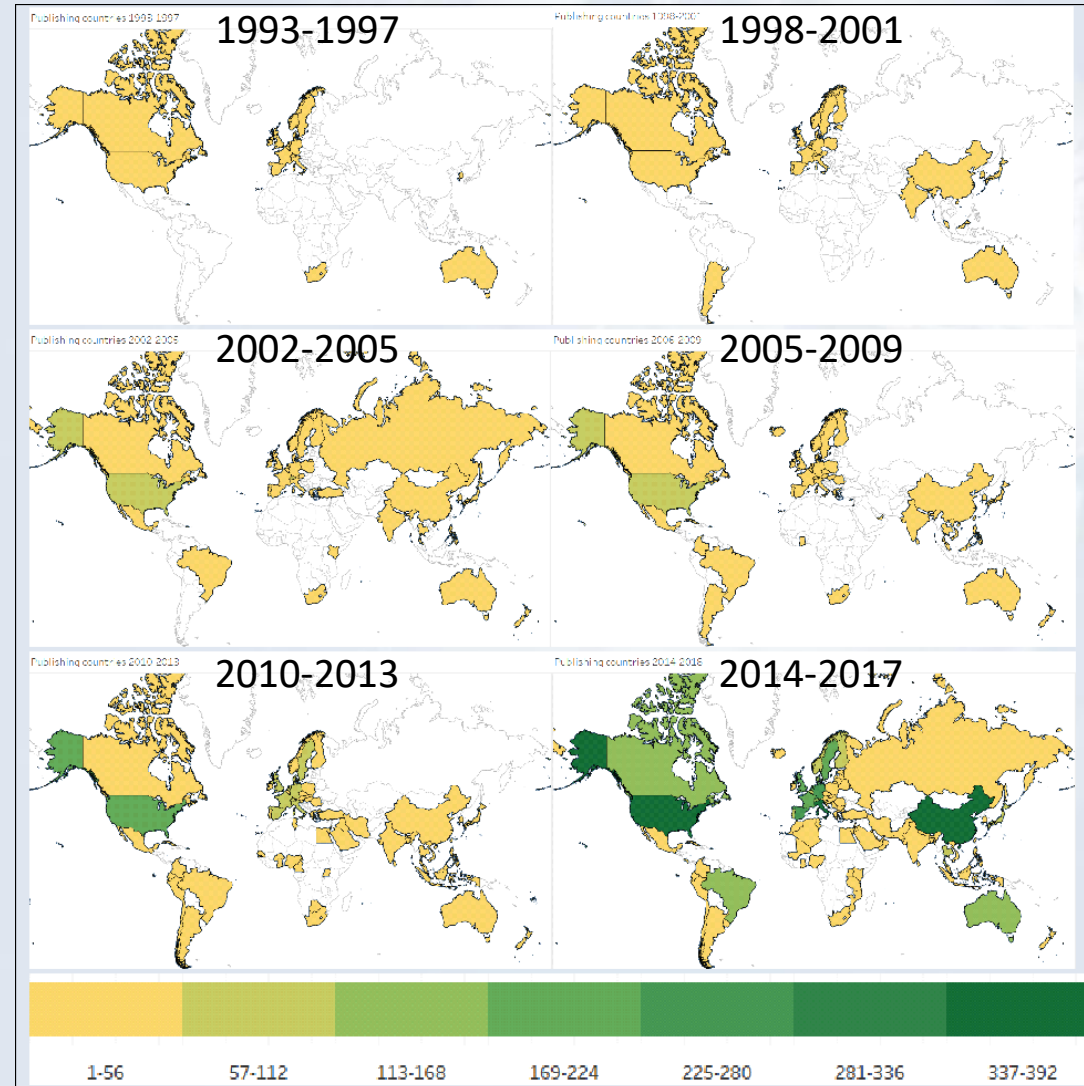
# Methodology: corpus constitution

1. Lens.org: collect DOIs
2. Scopus: Query JSON metadata
3. Tableau Software: extract metadata fields and convert to CSV
4. Excel: filter relevant publications, data processing and cleaning of affiliations
5. Geonames: query cities geographical coordinates. Used Geonames countries over Scopus
6. Tableau Software: data visualization, aggregation in agglomerations (Maisonobe et al 2018)

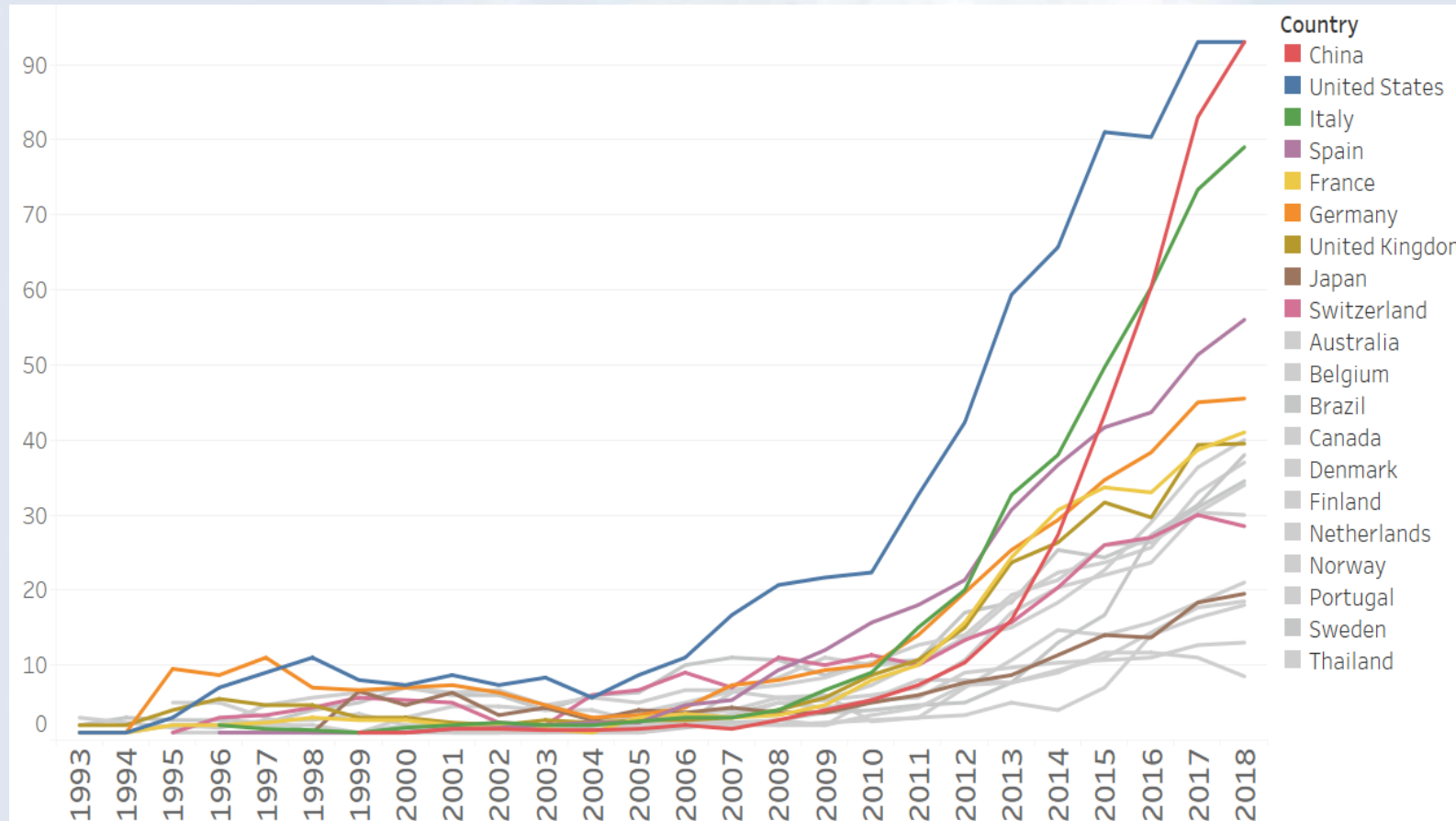


Source: Boistel (2019)

# Redistribution of LCA publications at global scale (1993-2018)



# Evolution of the number of publications (based on a 3-year moving average) for the 20 most productive countries (1993-2018)





# Evolution in global share of LCA publications and ranking for the 30 most productive countries (1997-2017)

Country	Country / World share			Rank		
	1997	2007	2017	1997	2007	2017
United States	20,83%	19,31%	14,30%	2	1	1
China		1,65%	14,13%		23	2
Italy	4,22%	3,73%	11,20%	10	13	3
Spain	2,11%	4,67%	8,11%	15	11	4
Germany	28,31%	9,03%	7,62%	1	5	5
United Kingdom	10,69%	6,27%	6,62%	4	7	6
France	5,24%	4,38%	6,05%	9	12	7
Canada	3,74%	5,37%	5,45%	11	9	8
Sweden	5,90%	9,23%	5,31%	8	4	9
Netherlands	12,19%	12,30%	5,26%	3	2	10
Denmark	7,37%	8,59%	5,15%	7	6	11
Brazil		2,12%	4,91%		19	12
Switzerland	9,91%	9,71%	4,78%	5	3	13
Australia		3,47%	4,77%		14	14
Belgium	7,58%	2,98%	2,84%	6	16	15
Portugal		1,51%	2,65%		24	16
Japan	2,00%	6,13%	2,48%	17	8	17
Thailand		5,22%	2,47%		10	18
Norway	2,63%	3,44%	2,26%	12	15	19
Finland		2,39%	2,02%		18	20
Iran			1,70%			21
India		0,72%	1,61%		35	22
Malaysia		0,79%	1,43%		31	23
Poland		0,76%	1,36%		34	24
Mexico		1,83%	1,14%		21	25
Hong Kong			1,13%			26
South Africa	2,63%	2,58%	0,99%	12	17	27
Austria	2,00%	2,10%	0,90%	17	20	28
Taiwan			0,87%			29
Luxembourg			0,87%			30

# City scale 1993-1998



# City scale 1999-2003



# City scale 2004-2008



# City scale 2009-2013



# City scale 2014-2018



# City scale: Evolution in global share of LCA publications and ranking for the 35 most productive cities

Agglomeration	Year																
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
BEIJING					2,00		1,00	1,08	1,00	1,00	5,00	7,00	13,17	16,25	13,72	29,15	
COPENHAGEN			0,83	1,00	4,00	4,76	3,83	5,08	3,29	3,00	7,49	7,23	7,05	6,39	9,42	17,58	
GOTHENBURG	1,00	3,00	3,17	2,00	7,83	6,50	0,83	2,00	2,70	2,90	5,40	4,00	6,00	7,32	6,82	15,42	
BERLIN	1,00				0,25	1,50	0,50	2,00	4,09	3,33	1,98	5,33	6,19	4,67	7,08	12,06	
TOKYO	2,50	2,33	0,50	3,33	2,17	1,00	3,00	2,50	3,00	2,00	1,83	4,23	4,40	5,42	1,08	10,46	
BARCELONA		1,00		1,00	4,00	2,00	3,28	3,20	3,50	10,03	5,58	7,25	9,13	4,24	7,96	9,56	
HONG-KONG												2,00	1,67	3,92	4,81	9,45	
NAPLES	1,00										1,00	0,50	3,00	3,00	4,17	9,18	
MONTREAL			1,00	0,50	3,33	1,29	3,00	1,00	2,12	4,00	3,90	4,06	6,52	7,20	6,01	8,67	
ZURICH		2,00	11,00	1,75	6,25	4,92	6,33	2,33	7,42	5,17	4,55	7,31	6,57	14,84	6,91	8,54	
TEHERAN							0,67					1,50	3,42	1,25	3,00	5,17	7,83
MADRID	0,50							0,67	0,50		0,50	3,50	4,33	3,58	3,83	7,37	
ROTTERDAM-LEIDEN-...	2,67	2,33	2,50	1,83	4,33	1,17	2,83	4,00	0,75	3,08	2,96	9,50	2,00	6,58	5,51	6,88	
MILAN-PAVIA				1,00			2,00	1,00	1,09	2,00	3,83	5,00	3,33	6,00	11,33	6,83	
BOSTON		0,33	1,50	0,33	1,00	2,83	1,00	1,00	1,50	1,75	2,17	2,75	1,25	2,69	2,73	6,50	
STOCKHOLM	4,00		2,83	2,00	1,00	1,00	1,00	3,50	6,50	0,11	5,33	3,08	6,33	1,88	3,73	6,33	
SYDNEY			1,17	0,50	0,50	1,00	0,70	1,58	0,33	1,50	2,83	3,58	1,53	1,77	3,98	6,27	
BANGKOK					3,00	6,50	3,00		1,00	3,83	1,92	3,00	0,70	6,67	16,73	6,17	
MONTPELLIER							0,33	1,17		1,33	3,17	5,89	2,82	2,97	1,38	6,10	
SHANGHAI			0,33			1,00	1,00	1,00	1,50				3,67	5,33	7,06	6,03	
MELBOURNE			1,00		2,00	0,50	0,73	1,67	1,00	2,58	2,40	2,48	1,90	1,89	2,05	5,60	
SANTIAGO-DE-COMP..			0,50	1,00	1,00	1,00	2,20	3,00	2,50	2,20	2,83	6,70	1,12	3,00	6,70	5,42	
NANJING										1,00	2,00	0,50	3,83	5,33	2,56	5,33	
LONDON	0,50	0,33	1,00	1,00	1,75		0,78	0,70	0,33	0,95	2,42	2,14	1,83	4,92	6,04	5,23	
AALBORG		1,00				4,33	1,83	2,33	1,00	0,25	1,64	2,58	4,00	4,28	4,95	5,08	
JINAN								0,33	0,50	2,67	1,00	2,00	2,50	4,42	6,33	4,78	
LISBON					0,50	1,33	1,20	1,00	1,50		2,33	2,50	2,83	2,20	5,39	4,60	
PARIS					0,50	0,50	1,00	1,33	4,59	1,17	3,38	8,98	1,90	3,84	4,60	4,53	
LEIPZIG														0,20		4,50	
NIJMEGEN-WAGENIN..	0,83	0,33	1,50		1,33	0,92	0,83	1,50	3,74	2,00	2,36	4,40	2,32	3,23	6,28	4,48	
ROME			1,00					0,50			1,00	0,33	0,82	1,83	7,08	4,45	
TRONDHEIM			1,00		1,75	3,00	6,33	0,50	1,50	5,00	5,00	4,17	5,42	3,97	2,53	4,09	
SAO-PAULO	1,00		1,00		0,50			1,00				2,00	2,00	1,03	4,83	3,92	
LAUSANNE			0,50			0,09	3,95		0,25	0,33	1,19	0,20	2,22	1,26	0,55	3,91	

# Spatial diffusion of LCA scientific production



- Expansion of LCA scientific production
- Multiplication of production centers
- Emergence of places that are not historical LCA centers



# Conclusive questions



- Representativity?
- In these different places, who applies LCA and why?
- What implications for decision making in different contexts?



Thank you !