

33 YEARS OF LEAN CONSTRUCTION RESEARCH: ACADEMIA-INDUSTRY LINKS AND GLOBAL CONTRIBUTIONS

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ABSTRACT

This paper presents a quantitative analysis of institutional and geographical participation in Lean Construction (LC) research as reflected in the International Group for Lean Construction (IGLC) proceedings over a 33-year period (1993–2025). Based on a dataset of all 2,413 conference papers, the study examines (i) the affiliation composition of papers (academia-only, mixed, industry-only), (ii) the most contributing organisations and countries, and (iii) patterns of (inter)national co-authorship. Results show that 65% of papers are authored exclusively by academia-affiliated authors, 27% are co-authored by academia and industry, and 9% are authored exclusively by industry. Country participation broadens over time, reaching contributions from 58 countries by 2025, while publication activity remains concentrated in a relatively small set of organisations and countries. At the continental level, Europe accounts for the largest share of contributions, followed by North America and South America. International co-authorship has also increased over time: internationally co-authored papers account for 21% of the full period and exceed 20% in most years since 2015, peaking at 37% (2021). Overall, the study provides a descriptive baseline of the institutional and national contexts from which LC research at IGLC primarily originates and of how cross-domain and cross-country collaboration is reflected in the conference.

KEYWORDS

Research, collaboration, practitioners, organisations, countries.

INTRODUCTION

Since its inception in 1993, the International Group for Lean Construction (IGLC) conference has provided an annual forum for presenting and discussing research on Lean Construction (LC). Each year, the conference convenes contributors from a range of organisational and geographical contexts to exchange new ideas, experiences, and perspectives. Across its 33-year

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publication record (1993–2025), IGLC has hosted several thousand contributions that address a broad set of topics related to LC. This body of knowledge reflects both the development of LC as a research field and the conference’s role as a platform where responses to persistent challenges faced by the construction industry are discussed.

While journals (e.g. LCJ) and regional conferences (e.g. EGLC) also contribute to LC research, they do not provide the same scope, continuity, and global representation as IGLC. In addition, a substantial share of LC research output is (first) presented at IGLC. Combined with the conference’s continuity, international reach and the scope of contributions, this positions the conference as the central platform for global LC research. Accordingly, IGLC provides a useful empirical basis for analysing not only individual contributions, but also broader structural patterns related to institutional participation and the geographical distribution and contexts from which research in this field originates. For reasons of analytical clarity and comparability, this study thereby focuses exclusively on the IGLC conference.

Despite this, there is no comprehensive analysis of IGLC’s publication record that systematically addresses these institutional and geographical dimensions, including collaboration across domains and countries. A structured overview of these aspects can support reflection on the evolution of LC research and on how collaboration and knowledge syntheses are organised within the community across academia and industry and across national contexts.

This paper addresses this gap by analysing institutional and geographical characteristics of LC research at IGLC. Specifically, it examines the representation of academia- and industry-affiliated papers, the extent to which contributions involve collaboration across these domains, and the organisations that are most frequently represented in the proceedings. In addition, the study explores the geographical distribution of contributions and the prevalence of national and international co-authorship, thereby providing insights into patterns of collaboration across countries. Accordingly, the objective of this paper is to provide a descriptive overview of how LC research at IGLC is distributed across institutional settings and countries, and how collaboration is reflected in the conference’s publication record. By doing so, it makes visible from which institutional and national contexts the IGLC body of knowledge primarily originates, thereby providing a basis for reflecting on how the field is shaped by particular organisational, geographical, and practice-related perspectives.

In a complementary paper (John et al., 2026), the focus is placed on authorship patterns at the individual level, including recurring contributors, continuity within the community, and the role of students in contributing to LC research. Together, the two papers provide an overview of structural characteristics of LC research as reflected in 33 years of IGLC. Through this effort, we aim to support reflection on the development of the research community and to inform discussions on how research is organised, disseminated, and connected to practice.

RESEARCH ON LEAN CONSTRUCTION RESEARCH

Over the past three decades, LC has grown into an increasingly mature research field, and several studies have examined its development from different perspectives. These contributions generally fall into two categories: (1) analyses of LC literature within the IGLC community and (2) studies exploring intersections with related domains. Early syntheses (e.g., Alves and Tsao, 2007; Jacobs, 2010; Etges et al., 2012) were primarily qualitative, while later works adopted bibliometric approaches to map trends, thematic evolution, and theoretical foundations (e.g., Engebø et al., 2017; Saygili et al., 2019; Li et al., 2019; Mano et al., 2021; León and Guevara, 2023). Complementing these general analyses, numerous theme-specific reviews have emerged on topics such as project culture, waste, trust, VDC, Last Planner System, and takt production. Beyond LC-focused studies, broader reviews have examined links to sustainability (Sarhan et al., 2019; Wibowo and Ammar, 2025; Garcés et al., 2025), offsite construction (Daniel et al., 2024), and leadership (Santos et al., 2024). Collectively, these efforts have contributed to the

maturation of LC research by synthesising thematic developments, mapping bibliometric patterns in selected venues, and reviewing LC's intersections with related domains.

Building on these studies, it is also important to consider how LC knowledge is produced, particularly at the interface between academia and industry. Although research that explicitly examines academia-industry collaboration in LC remains limited, many studies point to strong industry involvement. In particular, action research appears to be a mechanism for academia-industry collaboration in IGLC, used to: (i) implement and adapt LC methods at the company level (e.g., Alarcón et al., 2002; Cerveró-Romero et al., 2013), (ii) support project-based implementations (e.g., Kalsaas et al., 2009; Hackett et al., 2019; Moura et al., 2024), (iii) extend Lean planning and control into design management (e.g., Khan and Tzortzopoulos, 2015, 2016), (iv) develop and improve practical solutions together with practitioners (e.g., Barth and Formoso, 2008; Singh et al., 2020), and (v) support and study organisational learning and change during LC adoption, including capability-building and reflective change work (e.g., Seymour and Rooke, 2001; Tillmann et al., 2014; Koskela et al., 2003).

At the same time, IGLC research suggests that academia-industry collaboration is rarely context-neutral. Many contributions are embedded in a national setting and are based on the assumption that local context and culture influence what LC becomes in practice. Recent country-focused studies make this point explicitly by linking LC implementation to local conditions such as regulation and collaboration norms (John et al., 2025), and to national procurement and delivery arrangements (Malvik et al., 2020). Similar arguments are visible in research where implementation experiences are presented as context-sensitive, for example in Saudi Arabia (AlSehaimi et al., 2009) and in the “ten-year” diffusion story of Last Planner in Finland (Koskenvesa and Koskela, 2012). Cross-country collaborations and comparisons in this context are less common, but they make these context effects visible, for example by comparing how Lean ideas diffuse in the UK and the Netherlands (Johansen et al., 2002), analysing adoption drivers in Indonesia and Australia (Abduh and Shang, 2025), examining differences in communication across Norway and Germany (Aasrum et al., 2016), contrasting Lean and green industrialised construction across Europe and the United States (Scagliotti et al., 2024), synthesising multi-country expert perspectives across several European contexts (Tetik et al., 2025), and reporting cross-national results within a multinational firm through supplier development work spanning Skanska Sweden and Skanska Finland (Ballard and Elfving, 2020).

Together, these studies show a maturing and increasingly diverse LC knowledge base, but they also highlight an unresolved knowledge gap: the field has stronger syntheses of what is studied than of who contributes and from where. Because academia-industry collaboration and national context both shape LC knowledge production, it is important to make the institutional and geographical profile of IGLC contributions visible. This motivates the present study's analysis of academia-/industry-affiliated papers, collaboration across these domains, and the organisations and countries most frequently represented in the proceedings.

METHODOLOGY

The descriptive quantitative analyses presented in this paper are based on the full set of papers published at IGLC (1993–2025). The underlying database was assembled through a multi-step process that combined automated extraction of available metadata, manual completion of missing information, and additional desk research to achieve a consistent and analysable dataset.

For the period 1996–2025, reference information was obtained from the IGLC online repository (www.iglc.net/papers), which provides basic bibliographic metadata. For the first three conference years (1993–1995), which are not available digitally, the same information was manually extracted from the printed proceedings compiled by Alarcón (1997).

All records were consolidated into a paper-level database, including author names, year, title, and, where available, affiliation and country information. All affiliations reported on a

paper were assigned to that paper, including cases where authors listed multiple affiliations. The analysis therefore assumes that reported affiliations adequately reflect the organisational perspective of the respective contribution, while recognising that additional affiliations may not have been reported on the paper. To improve completeness, missing or unclear affiliation details were researched for the time of publication using institutional webpages, professional profiles and networks (e.g., LinkedIn, ResearchGate), and other publicly available online sources.

To enable consistent aggregation, organisation names were harmonised manually to account for abbreviations, spelling variants, and naming conventions. For example, entries such as “KIT” and “Karlsruhe Institute of Technology” were standardised to a single organisation label. Subsequently, each organisation was classified into one of two domains using the following definitions: Academia (universities and dedicated research institutions) and Industry (companies and other non-academic organisations, including public agencies and NGOs).

The coding and harmonisation were carried out by the first and second author and were subjected to iterative quality checks, including manual review of harmonised organisation names and domain assignments, joint discussion of coding decisions, random cross-checks of selected papers, and verification of coding decisions for ambiguous cases. Such cases were rare and mainly concerned organisations whose institutional role was not immediately apparent. In these instances, additional desk research was conducted to clarify the organisation’s function.

After data collection, enrichment, and cleaning, the final dataset comprised 2,413 papers. Descriptive statistical analyses were conducted to examine academia-industry representation and collaboration, institutional participation, and country-level contributions, including patterns of national and international co-authorship. These analyses were based on a full-count approach, whereby a paper was assigned to an organisation, domain, or country if at least one reported affiliation was linked to the respective category, with each category counted at most once per paper. All analyses cover the full dataset across the 33-year period.

RESULTS AND DISCUSSION

ACADEMIA-INDUSTRY PARTICIPATION AND LINKAGES (1/3)

Across all IGLC papers, 65% are authored exclusively by authors from academia, 27% are mixed papers (co-authored by academia and industry authors), and 9% are authored exclusively by authors from industry. Figure 1 illustrates in this context the share of annual conference papers by authors’ affiliation composition. Linear trend lines (ordinary least squares (OLS)) are included to support interpretation of longer-term directions.

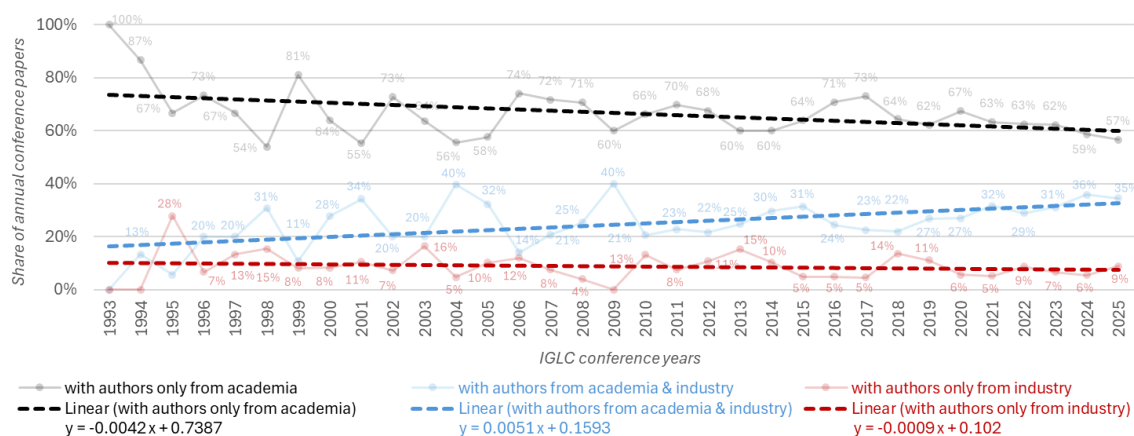


Figure 1: Share of annual papers by author affiliation composition per conference year

At the annual level, the shares show stronger fluctuations in the earlier years of the conference, while variation becomes comparatively smaller from around 2010 onwards. Across the full

period, academia-only papers account for the largest share, with annual values since 2010 mostly ranging between 60% and 70%, and a slightly declining trendline. The mixed category shows more pronounced year-to-year variation, fluctuating between 21% and 36% since 2010, with an upward trend over time. By contrast, industry-only papers remain the smallest category, varying between 5% and 15% since 2010, and displaying a downward trend.

Still, industry participation shows a slight upward tendency overall. This increase, however, is not attributable to a rise in industry-only papers, but to the growing share of mixed papers, suggesting that industry involvement is becoming more visible primarily through collaboration with academia rather than through standalone practitioner-led contributions.

While Figure 1 summarises the affiliation composition over time, an organisational view helps to identify which institutions are most frequently represented at IGLC and how participation differs between academia and industry. In total, 875 organisations were identified as contributors at the IGLC: 412 (47%) academic organisations, accounting for 3,061 paper participations, and 463 (53%) industry organisations, accounting for 1,171 paper participations. This distribution indicates that, although slightly more organisations originate from industry, academic organisations are involved in a markedly larger share of paper participations.

Table 1 further lists the 20 most contributing organisations across the full period, including their domain classification, the number of affiliated contributing authors, and publication output. In addition, the table reports indicators of temporal coverage (active years and active IGLC participations), and contrasts long-term output with the most recent decade (papers since 2016).

Table 1: The 20 most contributing organisations of the last 33 years of the IGLC conference

Rank	Organisation (country)	Domain	Contributing authors	IGLC papers all-time	Active at IGLC between	Active IGLC participations	IGLC papers since 2016 (rank)	Change in rank vs. 2016–2025
1	University of California at Berkeley (USA)	Academia	61 (2.14%)	214	1993–2025	33	61 (6)	↓ - 5
2	Federal University of Rio Grande do Sul (Brazil)	Academia	91 (3.20%)	159	1996–2025	29	74 (4)	↓ - 2
3	Pontificia Universidad Católica de Chile (UC) (Chile)	Academia	72 (2.53%)	129	1993–2025	33	60 (7)	↓ - 4
4	Norwegian University of Science and Technology (NTNU) (Norway)	Academia	97 (3.41%)	111	2011–2025	15	90 (1)	↑ + 3
	University of Salford (UK)	Academia	60 (2.11%)	111	1993–2018	23	8 (45)	↓ - 41
6	Aalto University (Finland)	Academia	47 (1.65%)	109	1993–2025	20	76 (3)	↑ + 3
7	University of Huddersfield (UK)	Academia	31 (1.09%)	87	2014–2025	12	78 (2)	↑ + 5
8	Lean Construction Institute (USA)	Industry	6 (0.21%)	76	1998–2022	18	2 (156)	↓ - 148
9	Karlsruhe Institute of Technology (KIT) (Germany)	Academia	59 (2.07%)	70	2006–2025	19	46 (9)	→ 0
10	University of Alberta (Canada)	Academia	70 (2.46%)	68	2007–2025	11	65 (5)	↑ + 5
11	DPR Construction (USA)	Industry	55 (1.93%)	66	2001–2025	16	49 (8)	↑ + 3
12	Federal University of Ceará (UFC) (Brazil)	Academia	51 (1.79%)	64	2002–2022	19	19 (23)	↓ - 11
13	American University of Beirut (Lebanon)	Academia	98 (3.44%)	50	2012–2025	14	35 (10)	↑ + 3
14	Technion – Israel Institute of Technology (Israel)	Academia	29 (1.02%)	49	2003–2025	22	23 (16)	↓ - 2
15	San Diego State University (USA)	Academia	18 (0.63%)	43	2003–2025	17	17 (27)	↓ - 12
16	Veidekke Entreprenør AS (Norway)	Industry	18 (0.63%)	42	2006–2024	16	24 (14)	↑ + 2
17	University of Agder (Norway)	Academia	18 (0.63%)	40	2009–2025	16	21 (18)	↓ - 1
18	Nottingham Trent University (UK)	Academia	22 (0.77%)	39	2010–2025	13	22 (17)	↑ + 1
19	Luleå University of Technology (Sweden)	Academia	29 (1.02%)	38	2004–2025	16	7 (53)	↓ - 34
20	Texas A&M University (USA)	Academia	34 (1.19%)	37	2010–2025	15	25 (13)	↑ + 7

The upper ranks are largely dominated by academic institutions. Across the full period, publication output among the top-20 ranges from 37 to 214, with several organisations showing sustained participation across many years (e.g., *UC Berkeley*: 33; *Pontificia Universidad Católica de Chile*: 33). Others appear as more recent entrants with a shorter activity window but comparatively high recent output (e.g., *NTNU*, active since 2011). Collectively, the top-20

account for 1,349 contributions (56%), indicating that a substantial share of the IGLC publication record is associated with a limited set of recurring organisational hubs.

A comparison with the most recent decade (papers since 2016) indicates shifts in organisational prominence. *NTNU* records the highest output since 2016 (90 papers; rank 1), followed by the *University of Huddersfield* (78; rank 2), and *Aalto University* (76; rank 3). In contrast, some organisations that are highly ranked over the full period show substantially lower publication counts in the recent decade (e.g., *University of Salford*: 8 papers since 2016; rank 45; *Lean Construction Institute*: 2 papers since 2016; rank 156), which is in some cases closely tied to recurring contributors changing institutional affiliation, reducing their activity, or discontinuing it altogether. Other organisations remain stable across both perspectives (e.g., *KIT* ranks 9th both overall and since 2016).

From a community perspective, these insights may invite reflection on how practitioner knowledge and experience could be made more visible within the IGLC conference, for example through complementary formats alongside conventional academic papers such as an industry contribution format with less formal submission requirements. In this way, practitioners could be given a more direct channel into the LC research community, rather than relying primarily on collaboration with academics to make their concerns and experience visible.

GLOBAL DISTRIBUTION OF CONTRIBUTIONS (2/3)

Building on the domain- and organisation-level perspective, the analysis now turns to the geographical distribution of IGLC contributions. Figure 2 summarises country participation over time by showing (i) the number of countries represented in each year and (ii) the cumulative number of countries represented, capturing newly participating countries over time. Linear trend lines (OLS) are included to support interpretation of longer-term directions.

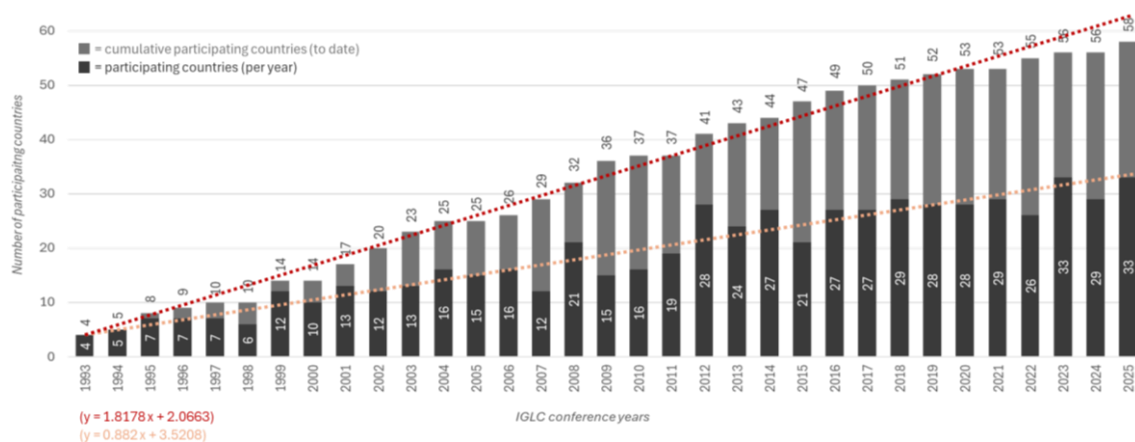


Figure 2: Participating countries per conference year and cumulative participating countries

At the annual level, the number of participating countries varies from year to year. However, in the most recent decade it has remained at 26 or more, reaching 33 in 2023 and 2025. Over the longer term, the trend indicates a gradual broadening of the geographical base of contributions, with later conference years involving more participating countries than the early years. The cumulative series increases steadily across the timeline, capturing newly participating countries over time and documenting the expanding set of countries that have contributed to the IGLC at least once. By 2025, 58 countries had contributed to the IGLC.

To complement Figure 2, Table 2 provides a more detailed country-level view by ranking the 20 most contributing countries across the full period (1993–2025). In addition to total paper output, the table reports years of activity and number of IGLC participations, distinguishes between papers authored within a single country and internationally co-authored papers, and contrasts long-term rankings with those of the most recent decade (papers since 2016).

Table 2: The 20 most contributing countries of the last 33 years of the IGLC conference

Rank	Country	Contributing organisations	Contributing authors	IGLC papers all-time	Active at IGLC between	Active IGLC participations	National papers (quota)	International papers (quota)	IGLC papers since 2016 (rank)	Change in rank vs. 2016–2025
1	USA	190 (21.71%)	553 (19.43%)	653	1993–2025	33	449 (68.8%)	204 (31.2%)	246 (1)	➡ 0
2	UK	89 (10.17%)	261 (9.17%)	359	1993–2025	33	196 (54.6%)	163 (45.4%)	161 (2)	➡ 0
3	Brazil	101 (11.54%)	390 (13.7%)	358	1996–2025	30	264 (73.7%)	94 (26.3%)	153 (3)	➡ 0
4	Finland	36 (4.11%)	110 (3.87%)	179	1993–2025	30	95 (53.1%)	84 (46.9%)	89 (6)	⬇ - 2
	Norway	31 (3.54%)	162 (5.69%)	179	2006–2025	19	139 (77.7%)	40 (22.3%)	121 (4)	➡ 0
6	Chile	30 (3.43%)	117 (4.11%)	156	1993–2025	33	86 (55.1%)	70 (44.9%)	84 (7)	⬇ - 1
7	Germany	36 (4.11%)	128 (4.5%)	126	1999–2025	20	83 (65.9%)	43 (34.1%)	93 (5)	⬆ + 2
8	Denmark	25 (2.86%)	71 (2.49%)	92	1995–2025	22	57 (62%)	35 (38%)	43 (11)	⬇ - 3
9	Canada	21 (2.4%)	111 (3.9%)	87	2007–2025	13	53 (60.9%)	34 (39.1%)	82 (8)	⬆ + 1
10	Australia	27 (3.09%)	84 (2.95%)	78	1995–2025	26	50 (64.1%)	28 (35.9%)	38 (12)	⬇ - 2
11	Peru	24 (2.74%)	109 (3.83%)	74	1997–2025	15	55 (74.3%)	19 (25.7%)	58 (9)	⬆ + 2
12	Sweden	15 (1.71%)	67 (2.35%)	64	1995–2025	24	55 (85.9%)	9 (14.1%)	14 (20)	⬇ - 8
	India	30 (3.43%)	95 (3.34%)	64	2009–2025	14	44 (68.8%)	20 (31.3%)	56 (10)	⬆ + 2
14	New Zealand	6 (0.69%)	50 (1.76%)	58	2001–2025	19	19 (32.8%)	39 (67.2%)	35 (13)	⬆ + 1
15	Lebanon	2 (0.23%)	87 (3.06%)	50	2012–2025	14	32 (64%)	18 (36%)	35 (13)	⬆ + 2
16	Israel	9 (1.03%)	34 (1.19%)	48	2003–2025	22	27 (56.3%)	21 (43.8%)	23 (15)	⬆ + 1
17	South Africa	7 (0.8%)	32 (1.12%)	27	2008–2025	13	22 (81.5%)	5 (18.5%)	20 (16)	⬆ + 1
	Colombia	12 (1.37%)	44 (1.55%)	27	2008–2025	16	15 (55.6%)	12 (44.4%)	18 (17)	➡ 0
19	Netherlands	5 (0.57%)	18 (0.63%)	26	1994–2023	17	12 (46.2%)	14 (53.8%)	8 (27)	⬇ - 8
20	Singapore	11 (1.26%)	26 (0.91%)	22	1999–2025	11	15 (68.2%)	7 (31.8%)	6 (29)	⬇ - 9

The ranking shows that the *USA* has contributed the largest number of papers since 1993 (653), followed by the *UK* (359) and *Brazil* (358). *Finland* (179) and *Norway* (179) form the next group, while *Chile* (156) and *Germany* (126) also appear among the top-7. Across the top-ranked countries, nationally authored papers account for the larger share of output, although the balance between national and international papers differs by country. A comparison between the all-time ranking and the period since 2016 indicates a high degree of continuity: the top-3 countries remain unchanged, while some countries improve their relative position slightly in the recent decade (e.g., *Germany* (from rank 7 up to rank 5)), and others move down somewhat. Overall, the results also indicate a concentration of publication activity, with the top-7 countries alone accounting for 73% (1,769) of all contributions, suggesting that a substantial share of the publication record is generated within a limited set of national contexts.

To complement the country ranking in Table 2 with a more intuitive overview, Figure 3 visualises the geographical distribution of contributions across the globe. The map shows country-attributed paper counts, i.e., the number of papers with at least one author affiliated with a given country. Within each continent, the listed countries are ordered by descending paper output, with the respective number of paper contributions shown in parentheses. The colour shading reflects publication volume, with countries contributing more papers shown in darker tones and countries with fewer shown in lighter tones. Continental totals are not equal to the simple sum of the country counts, because papers involving multiple countries from the same continent were counted only once at continental level. Thus, for example, the European total of 1,032 refers to IGLC papers with at least one European affiliation.

This map also indicates that contributions remain concentrated in a limited number of regions. Europe accounts for the largest share of papers (1,032; 43%) and includes contributions from 21 countries. At the same time, 26 European countries have not yet been actively participating in the conference, indicating remaining potential for a broader diffusion of LC research within the continent. North America follows with 749 papers (31%) from four countries (19 countries not yet participating), while South America contributes 593 papers (25%) across six countries (7 not yet participating). Asia comprises a comparatively broad set of participating countries (19) but a smaller share of papers (300; 12%) (28 not yet participating).

Oceania accounts for 133 papers (6%) from two countries (12 not yet participating), and Africa shows the smallest share (42; 2%) across six countries (48 not yet participating).

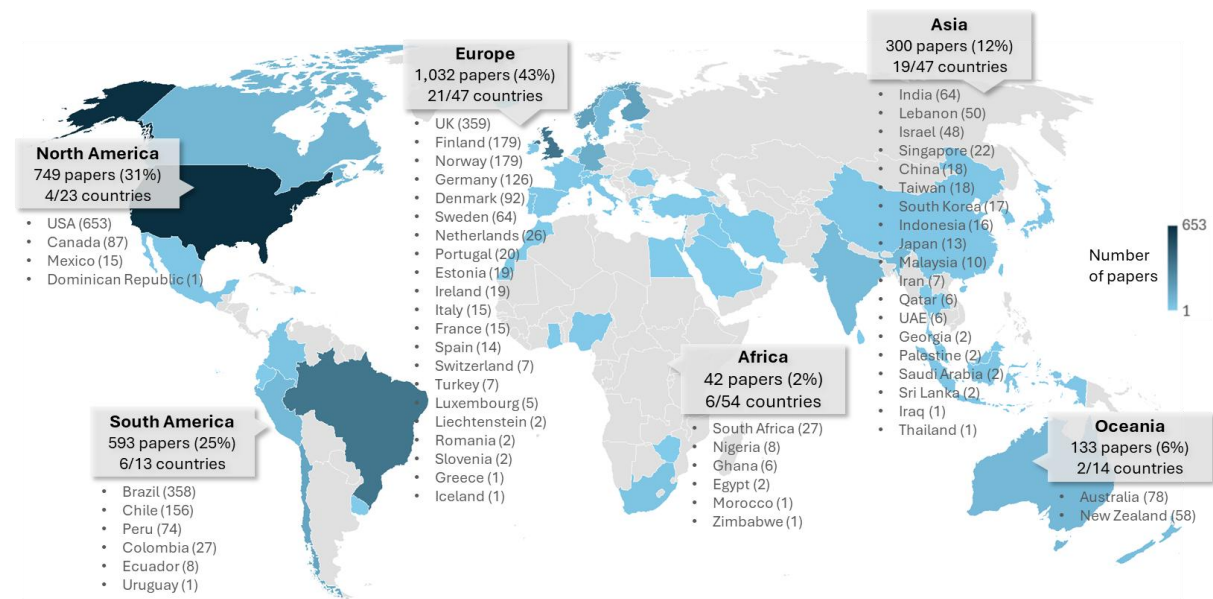


Figure 3: Global distribution of IGLC countries by continent

Taken together, the findings point to a dual dynamic in the geographical development of the IGLC community. On the one hand, the steadily increasing number of participating countries indicates that the conference has broadened its international reach over time and continues to attract contributions from new countries. On the other hand, this broadening has not displaced the strong concentration of publication activity in a limited number of countries. While the top-7 countries alone account for 73% of all contributions, and each of them has contributed to more than 100 papers, many countries remain only marginally represented: 25 of the 58 participating countries have been represented in only a single-digit number of papers (3.5% of all contributions), and 38 in fewer than 21 papers (11.7% of all contributions). In this sense, the internationalisation of IGLC remains uneven in depth and continuity across national contexts.

Across all continents, the number of countries that have not yet participated still exceeds the number that have been represented, pointing not only to established centres of LC research activity, but also to substantial untapped potential for wider participation. Strengthening the global reach of IGLC may therefore require not only attracting first-time contributions from additional countries, but also fostering sustained participation over time. In particular, established national hubs may be well positioned to support this process through broader cross-country collaboration and more deliberate inclusion of researchers from contexts in which LC research is still less institutionalised.

CROSS-COUNTRY COLLABORATION & INTERNATIONAL CO-AUTHORSHIP (3/3)

Beyond the distribution of contributions across countries, international co-authorship provides an additional perspective on how LC knowledge is produced and circulated within the IGLC community. Cross-country collaboration can serve several functions: it may facilitate the transfer of knowledge across different nations, support mutual learning between research groups, and thereby strengthen research capacity by connecting national communities to networks (Dusdal and Powell, 2021). Examining patterns of international co-authorship therefore helps to contextualise IGLC's geographical reach in terms of how countries are connected through joint research output. Figure 4 provides an overview of cross-country

collaboration among the 20 most contributing countries by displaying the number of internationally co-authored papers between each pair of countries.

	USA (40)	UK (30)	Brazil (18)	Finland (15)	Norway (14)	Chile (16)	Germany (18)	Denmark (12)	Canada (18)	Australia (11)	Peru (6)	Sweden (8)	India (7)	New Zealand (19)	Lebanon (6)	Israel (9)	South Africa (2)	Colombia (6)	Netherlands (7)	Singapore (4)
USA (40)	653	25	30	31	14	20	27	12	2	3	10	2	11	6	4	7	0	2	2	4
UK (30)	25	359	45	23	10	6	8	14	6	14	1	3	5	8	0	2	2	1	5	0
Brazil (18)	30	45	358	1	3	8	4	2	0	5	2	1	0	0	0	0	0	1	1	0
Finland (15)	31	23	1	179	3	1	1	5	0	0	0	1	0	2	2	6	0	0	0	0
Norway (14)	14	10	3	3	179	0	1	5	1	0	1	4	1	1	1	1	0	0	0	0
Chile (16)	20	6	8	1	0	156	5	2	4	0	8	0	0	14	0	1	0	7	0	0
Germany (18)	27	8	4	1	1	5	126	6	1	0	0	0	1	1	1	0	0	0	0	0
Denmark (12)	12	14	2	5	5	2	6	92	0	0	1	1	0	0	0	3	0	0	0	0
Canada (18)	2	6	0	0	1	4	1	0	87	1	0	1	0	6	12	0	0	0	0	0
Australia (11)	3	14	5	0	0	0	0	0	1	78	0	0	0	3	0	0	0	0	0	1
Peru (6)	10	1	2	0	1	8	0	1	0	0	74	0	0	0	0	0	0	0	0	0
Sweden (8)	2	3	1	1	4	0	0	1	1	0	0	64	0	1	0	0	0	0	0	0
India (7)	11	5	0	0	1	0	1	0	0	0	0	0	64	1	0	0	0	0	0	1
New Zealand (19)	6	8	0	2	1	14	1	0	6	3	0	1	1	58	0	1	0	0	1	0
Lebanon (6)	4	0	0	2	1	0	1	0	12	0	0	0	0	0	50	0	0	0	0	0
Israel (9)	7	2	0	6	1	1	0	3	0	0	0	0	0	1	0	48	0	0	0	0
South Africa (2)	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0	0
Colombia (6)	2	1	1	0	0	7	0	0	0	0	0	0	0	0	0	0	0	27	0	0
Netherlands (7)	2	5	1	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	26	0
Singapore (4)	4	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	22

Figure 4: Cross-country co-authorship matrix for the 20 most contributing countries

The diagonal entries represent each country's total paper output, while the off-diagonal cells indicate the number of internationally co-authored papers between country pairs⁷. In addition, the country labels report, in parentheses, the number of distinct international co-authorship links across the full set of 58 IGLC countries. Within the top-20 set, the ten most contributing countries all show double-digit numbers of international links (ranging from 11 to 40), whereas countries ranked 11–20 show mostly single-digit link counts (ranging from 2 to 9), with New Zealand as a notable exception (19). The matrix therefore highlights both the most frequent bilateral collaborations (e.g., UK-Brazil with 45 joint papers, USA-Finland with 31, and USA-Brazil with 30) and the absence of co-authorship ties between many other country pairs. Overall, Figure 4 suggests that collaboration among the main contributing countries clusters around a limited set of recurring ties, while many country pairs have not yet co-authored at IGLC.

Building on the collaboration matrix, Figure 5 complements this country-pair perspective with an overall time-series view by distinguishing between nationally and internationally co-authored papers per year. Overall, the analysis shows that national papers dominate across the full timeline (79%; 1,902 papers), although the relative balance changes noticeably over time. In the early conference years, the publication record is almost entirely national. From the late 1990s onward, international papers appear more regularly, typically accounting for 10–20% in many years. A first sustained period with higher shares becomes visible around 2010, when the share of international papers exceeds 20%. Since 2015, the international share has remained at or above 20%, reaching a peak of 37% in 2021. The OLS trend lines further indicate a gradual relative decline in national papers and a corresponding increase in international papers, which account for 21% (511 papers) across the full period.

⁷ For many countries, the sum of off-diagonal cells is higher than the country's total paper output. This occurs because some papers have co-authors from more than two different countries. Such multi-country papers contribute to multiple country-pair cells and are therefore counted more than once across the off-diagonal entries.

Overall, the figure suggests that international co-authorship has become more common in recent years, while national papers continue to make up the majority of annual output.

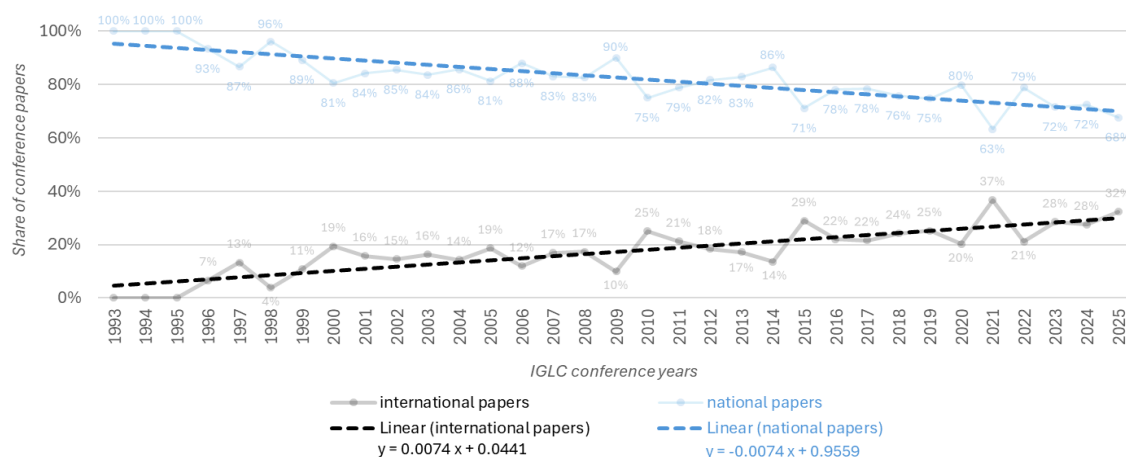


Figure 5: Share of national vs. international conference papers per conference year

These findings indicate that the IGLC community has become more internationally connected over time. At the same time, this collaboration is concentrated around a limited set of recurring ties among more established countries. From a community perspective, stronger cross-country collaboration involving less represented countries may help widen access to the IGLC community, diversify the contexts from which LC knowledge is generated, and support the broader diffusion of Lean Construction research across national settings.

CONCLUSION

This study provides a quantitative overview of academia-industry participation, institutional involvement, and geographical collaboration patterns in the IGLC conference over 33 years (1993–2025). Based on the full publication record of 2,413 papers, it shows that LC research at IGLC remains concentrated in a relatively small set of organisations and countries, despite broader participation over time and the continued entry of additional countries into the conference community. Most countries still contribute primarily through nationally authored papers, although the share of internationally co-authored contributions has gradually increased. Where international collaboration occurs, it is often concentrated in a limited set of recurring country ties, while many country pairs have not yet collaborated at IGLC. Industry involvement is more often visible through joint publications with academia than through industry-only contributions. Standalone industry papers were comparatively more prominent in early years.

Overall, these findings help to make visible the institutional and national contexts from which the IGLC body of knowledge primarily originates. While publication volume is not in itself evidence of influence, it can be understood as an indicator of visibility, continuity of participation, and structural concentration within the conference context. From a community perspective, these insights may inform discussion on how broader participation, stronger academia-industry exchange, and more international collaboration can be supported in order to further enrich LC knowledge production at IGLC. In this sense, the present study provides a descriptive baseline for future bibliometric and network-based analyses that can examine citation patterns, collaboration structures, and sources of influence in LC research in greater depth. Together, this line of work may help support a more systematic understanding of how LC knowledge develops within the IGLC community and how its long-term reach and practical relevance can be strengthened across a broader set of construction contexts.

However, this analysis is subject to limitations. It is restricted to the IGLC proceedings and therefore does not represent the full global landscape of LC research beyond the conference.

Moreover, the country-based analyses rely on affiliation data and a full-count approach, which makes participation and collaboration patterns visible but does not allow conclusions about the relative substantive involvement of individual countries in internationally co-authored papers.

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