

Policy brief: Alternatives to in-person American Society of

Landscape Architects Conferences on Landscape Architecture

ABSTRACT Annual, in-person professional meetings at a centralized location yield several personal and organizational benefits. Yet, greenhouse gas emissions from conference organization, execution, and attendance contribute to the climate crisis. Within at least the last decade, the American Society of Landscape Architects (ASLA) has claimed to continually reduce the carbon footprint of the annual meeting and EXPO by performing a variety of actions. ASLA supports global and national greenhouse gas emissions reduction targets to limit global warming to 1.5°C and has committed to measuring, understanding, making public, and reducing the organization's emissions. To date, ASLA has not made such information public, if it exists. This study extends our previous work by estimating carbon dioxide emissions from 2018 and 2019 ASLA Annual Meeting and EXPO event venues, and 711 EXPO exhibitors' travel and attendees' hotel accommodations, using online carbon calculators, refereed literature, and building energy benchmarking data. Results indicated that meeting featured speakers and EXPO representatives originated from most of the same locations, thereby supporting potential future decentralized meetings. Additionally, conference attendees' and exhibitors' total estimated emissions equaled annual per capita emissions of an Ethiopian. Thereafter, we consider several alternative means of convening. Our estimations of various hybridized and virtual conference-related emissions indicate that hybridized meetings that require half of participants who originate

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from the most distant locations to attend virtually, and entirely virtual conferences, may meet

emissions reduction targets. We recommend immediately convening in hybridized meetings that

require no air travel until 2030, at the latest, and meeting virtually thereafter.

KEYWORDS climate change, equity, green meetings, sustainability, Paris Agreement

1

INTRODUCTION

2

3 This policy brief examines alternatives to in-person ASLA Conferences on Landscape
4 Architecture (formerly Annual Meetings and EXPOs) to significantly reduce conference-related
5 carbon dioxide emissions and ASLA’s contribution to the climate crisis. Since 1960, the ASLA
6 Annual Meeting and EXPO has taken place in Washington D.C., 25 U.S. cities, Hawaii, and
7 Ontario, Canada (Author, 2019), including nine of the ten most popular global conference
8 locations (Spinellis & Louridas, 2013). Thirty-one of 60 meetings and EXPOs took place in U.S.
9 coastal locations (Author, 2019). The 2021 ASLA Conference on Landscape Architecture took
10 place in person in Nashville. In-person conferences are planned for 2022, 2023, and 2024 in San
11 Francisco, Minneapolis, and Washington D.C., respectively.

12 Perceived benefits of ASLA Conferences on Landscape Architecture are numerous. Over
13 the last decade, ASLA Conferences on Landscape Architecture each included over 110 education
14 sessions on a wide variety of topics, two general sessions, 10 to 15 field sessions, about 5
15 workshops, and the EXPO, a trade show that is “consistently” rated the ““most valuable event’ at
16 the meeting each year” (ASLA, 2020). Organized social events at each conference include
17 receptions, benefits, dinners, happy hours, organized walks, business meetings, and ceremonies.
18 Moen (2014) found that all sixteen ASLA state chapter president respondents rated continuing
19 education credits and conferences, meetings, and symposia as most important to professional
20 learning and growth. Other questionnaire respondents indicated greater motivation to attend
21 annual meetings for inspiration and ideas, to stay current with professional trends, and network
22 than to earn continuing education credits (Moen, 2014). Annual meetings and EXPOs also
23 generate about one-third of ASLA’s annual revenue. Sixty-two percent of the \$4.22 million

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24 revenue (≈\$2.62 million) from “Meetings and Special Programs” reported in the 2017–2018
25 ASLA operating budget is derived from EXPO exhibit sales (ASLA Board of Trustees, 2016).
26 An early-bird registration fee of \$645 for members (ASLA, 2019a), if applied to 2,800 of the
27 5,700 attendees ASLA anticipates each year, yields \$1.806 million.

28 In what follows, we extend a previous study (Author, 2019) to estimate 2018 and 2019
29 meeting attendees’ and EXPO representatives’ carbon footprint from travel, hotel
30 accommodations, event venues, and event organization, use, and disassembly. Thereafter, we
31 examine various alternative models of convening and conclude with recommendations based
32 upon ASLA’s stated support of emissions reduction targets.

33

34 IN-PERSON MEETING-RELATED GREENHOUSE GAS EMISSIONS

35

36 Current Emissions-Reduction Actions

37 For at least the last decade, ASLA explicitly stated an intent to reduce the carbon footprint of the
38 annual meeting and EXPO (ASLA, 2011, p.36; 2017a, p. 11; 2019a, p. 41). ASLA employs a
39 general contractor that is a Platinum partner of the Green Meeting Industry Council, has
40 implemented a mobile conference application, uses agri-based inks on 100-percent recycled
41 paper, and electronically distributes conference session handouts (ASLA, 2021a). Moreover,
42 “convention centers, hotels, and event venues in the cities selected...must demonstrate progress
43 toward improving their operational efficiency and reducing their environmental impact” (ASLA,
44 2011, p.36; 2021a).

45 At least four study results suggest that ASLA’s efforts have little impact on reducing
46 conference-related emissions. Moreover, literature indicates that ASLA should focus on

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47 eliminating the need for conference attendees to travel by air, which is extraordinarily difficult to
48 decarbonize in comparison to modes of overland travel (Peeters, Higham, Kutzner, Cohen, &
49 Gössling, 2016), and accounts for more than the 2 to 3 percent of total global human-induced
50 carbon dioxide emissions due to fuel burn (Owen, Lee, & Lim, 2010) after including emissions
51 from aircraft manufacturing, upstream fuel consumption, ground support equipment, and routine
52 maintenance (Liu, Xu, Stockwell, Rodgers, & Guensler, 2016). First, Hischier and Hilty (2002)
53 found that production and dissemination of booklets, programs, bags, and conference
54 organization accounted for just under five percent of conference-related energy and emissions,
55 whereas travel accounted for over 96 percent. Second, Stohl (2008) found that air travel
56 accounted for 90 percent of personnel and scientists' business-travel-related emissions. Third,
57 Jäckle (2019) showed that eliminating a 215-page program for each of 1,600 attendees may
58 result in an overall emission reduction equal to less than the average attendee footprint at the
59 conference that had the lowest per capita emissions weight of six conferences investigated;
60 switching to vegetarian or vegan meals could result in a reduction of only 1 to 2 percent of total
61 travel-related emissions. Finally, the comprehensive life cycle assessment conducted by
62 Neugebauer, Bolz, Mankaa, and Traverso (2020) showed that conference travel had the highest
63 environmental impact in eight of 11 categories. Among travel modes, air travel accounted for 60
64 percent of the environmental impacts in ten of 11 categories, six of which exceeded 90 percent.
65 An analysis of three scenarios intended to reduce environmental impacts (i.e., reduction of
66 material inputs vs. omnivore to vegetarian menu vs. travel) showed that replacing air travel with
67 train travel would result in the greatest reduction potential in all 11 categories.

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69 **Estimating In-Person Conference- and EXPO-Related Emissions**

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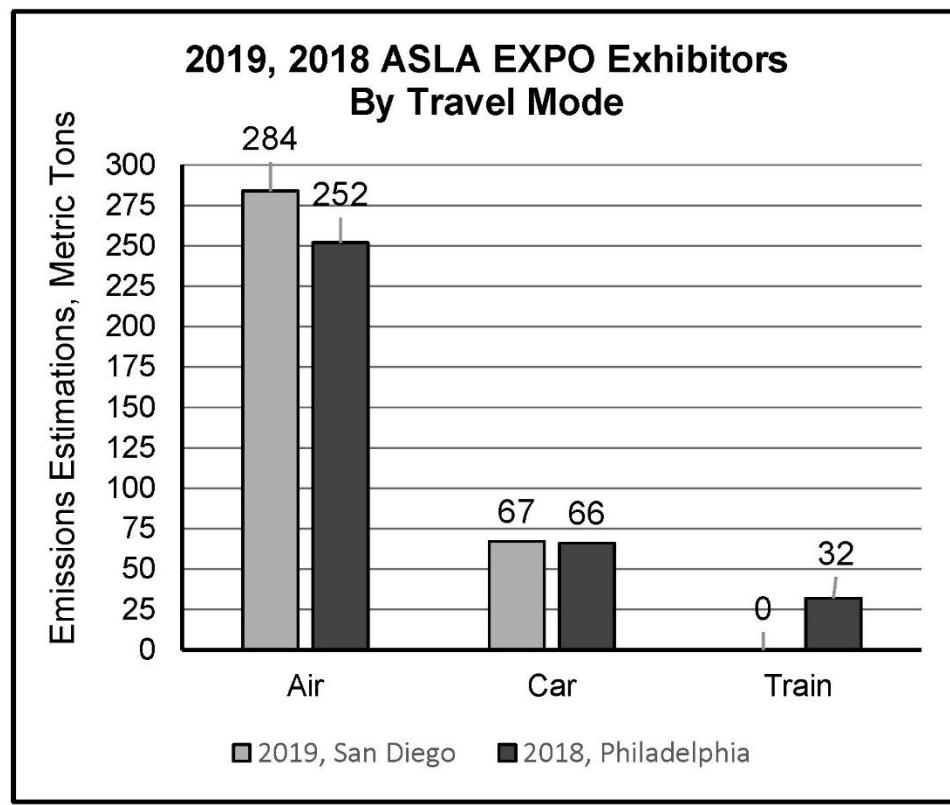
70 After publishing a study (Author, 2019) of travel-related emissions from ASLA meeting
71 education session featured speakers and attendees, we sought to gain a broader understanding of
72 ASLA conference-related emissions. The bulk of work began by utilizing EXPO floor plans and
73 exhibitor lists for the 2018 and 2019 ASLA Annual Meetings (ASLA, 2018; 2019b) to estimate
74 the travel-related emissions of one exhibitor for each of 358 exhibits in the 2018 ASLA EXPO
75 and 353 exhibits in 2019, which is comparable to the mean number of education session featured
76 speakers that we estimated earlier (Author, 2019). In addition to using the web-based Carbon
77 Footprint Calculator to estimate travel-related emissions, like before (Author, 2019), we
78 computed estimations using two other sources. To estimate emissions that account for the
79 increased global warming potential of aircraft emissions in the upper atmosphere, which is
80 generally between 2 and 5 times greater than ground-based emissions (IPCC, 1999; Owen et al.,
81 2010), we referred to Jungbluth and Meili (2019), who reviewed five major approaches for
82 applying a radiative forcing index (RFI) factor that were available and in practice in the last
83 seven years (Table 1). We also used the web-based International Civil Aviation Organization
84 (ICAO) Carbon Emissions Calculator, which Baumeister (2017) states has been adopted by other
85 emissions calculators, is the most widely recognized in the aviation industry, and often cited in
86 many studies.

87 **Table 1. Methodological Assumptions and Specifications for Estimating Travel-Related Carbon Dioxide Emissions of 2018 and**
 88 **2019 ASLA EXPO Representatives.**

Primary Travel Mode	Travel Duration from Workplace Origin	Primary CO ₂ Estimation Source	Primary CO ₂ Source Specifications	Secondary CO ₂ Estimation Source	Secondary CO ₂ Source Specifications	Tertiary CO ₂ Source	Tertiary CO ₂ Source Specifications
Local	Same as EXPO	None	t CO ₂ = 0	None	t CO ₂ = 0	None	t CO ₂ = 0
Car	Not Phila. or San Diego, but \leq 3h	Kalmus (2017, p.162)	2019 XSE, 3.5 L, 6 cyl. Automatic Toyota Camry; 26 mi/gal.; 11.3 kg CO ₂ /gal. gas	None	Mean of primary & tertiary source values	Carbon Footprint Calculator	2019 XLE/XSE SemiAuto-8 2WD Toyota Camry; 162.378 g CO ₂ /km
Train	3h 1min–6h, if available	Kalmus (2017, p.162)	0.16 kg CO ₂ /mi	None	Mean of primary & tertiary source values	Carbon Footprint Calculator	Long distance
Airplane	> 6h	Life Cycle Assessment (LCA) by Jungbluth & Meili (2019)	Short-haul flight = 340 g CO ₂ -eq /km; Medium-haul = 285 g CO ₂ -eq /km; Long-haul = 230 g CO ₂ -eq /km	International Civil Aviation Organization (ICAO) Carbon Emissions Calculator	One passenger, return trip, economy class	Carbon Footprint Calculator	one passenger, return trip, economy class, no radiative forcing index factor included

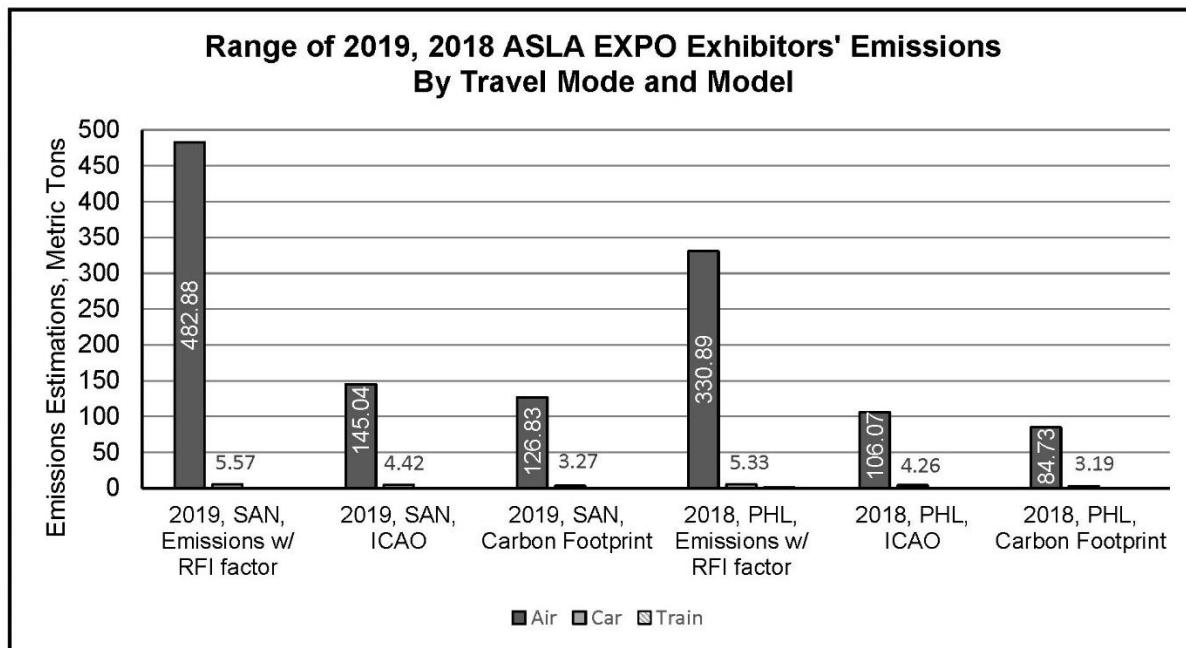
89 Notes. 1. Like Klöwer (2019), we classified short-haul flights as \leq 1,500 km; EuroControl (2021) classifies medium-haul flights as
 90 between 1,501 km and 4,099 km; long-haul flights are \geq 4,100 km. 2. We used a travel agency and metasearch engine website
 91 (kayak.com) to determine the most common routes from points of origin to the EXPO location, and a mapping website (gmap.com)
 92 to determine the great circle distances (GCD) between airports. If multiple aircraft routes between an origin and EXPO location were
 93 available, we selected the direct route, which inherently decreased the emissions rate in our calculations.

94 **EXPO Travel-related emissions.** We identified 205 ($\approx 57\%$) exhibitors that participated
95 in both EXPOS. Over 70 percent of product representatives likely traveled by air to the 2018
96 EXPO in Philadelphia, accounted for over 96 percent of exhibitors' travel-related carbon
97 emissions, overall, and may have been responsible for a mean emission and global warming
98 potential (GWP) value per exhibitor of 0.33 t CO₂ and 0.96 t CO₂ (Figures 1 and 2). Almost four
99 times as many product representatives flew than traveled by car, but the GWP of air travelers'
100 emissions equaled about 62 times that of car travelers'. If we include train travelers, about two-
101 and-a-half times the number of product representatives traveled by air than land, but the GWP of
102 air travelers' emissions still equaled over 46 times that of overland travelers.



103

104 **Figure 1.** 2019 and 2018 ASLA EXPO exhibitors' likely mode of travel. Excluded from the
105 graph are two 2019 exhibitors who were likely local, two 2018 exhibitors who were likely local,
106 and six 2018 exhibitors for which we could not identify an origin.



107
108 **Figure 2.** Emission estimations by travel mode, 2018 and 2019 ASLA EXPO exhibitors. The 32
109 exhibitors who likely traveled by train in 2018 may have emitted 1.80, 0.98, or 0.16 t CO₂,
110 depending on the primary, secondary, or tertiary emissions estimation methods, respectively, we
111 employed. Two 2019 and two 2018 exhibitors who were likely local and six 2018 exhibitors for
112 which we could not identify an origin are excluded from the estimations presented in the graph.

113 Over 80 percent of exhibitors likely traveled by air to the San Diego ASLA EXPO in
114 2019 and may have emitted, on average, 0.37 t CO₂ or 1.38 t CO₂, after including the RFI factor,
115 which accounted for over 97 percent of travel-related carbon emissions (Figures 1 and 2). Again,
116 over four times as many product representatives may have traveled by air than by land. However,

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117 after accounting for the RFI factor, air travelers' emissions may have a GWP over 86 times that
118 of overland travelers.

119 In both EXPOs, the greatest number of exhibitors by region appears to have fluctuated to
120 coincide with EXPO locations. In 2018, most exhibitors originated from the Northeastern U.S. (n
121 = 110, 30.73%), near the Philadelphia EXPO; in 2019, most exhibitors originated from the U.S.
122 West Coast ($n = 107$, 30.31%) near the San Diego EXPO. After aggregating exhibitors by the
123 nearest airport, we further investigated airports that served four or more exhibitors. Seventeen of
124 21 locations from which education session featured speakers originated most frequently in our
125 previous study (Author, 2019) are represented in the 29 top locations from which 2018 and 2019
126 EXPO exhibitors originated (Appendix 1). Thus, utilizing future regional hub conference
127 locations that we proposed before (Author, 2019) could maximize education session featured
128 speakers' *and* exhibitors' participation each year and reduce conference-related carbon dioxide
129 emissions by eliminating air travel.

130 **Event venues.** The venues within which the 2018 and 2019 ASLA EXPOs took place
131 advertise green methods but building energy benchmarking data indicate that these result in
132 small, positive environmental impacts. The San Diego Convention Center (SDCC) is a LEED-
133 certified building that contains LED and CFL technology, energy-efficient dishwashers and
134 boilers; water-efficient toilets, kitchen facilities, and irrigation, and drought-tolerant plants;
135 recycles 100% of cardboard; composts inedible food; donates edible food; and diverts waste
136 from landfills (visitsandiego.com/sustainability-community). However, an ENERGY STAR
137 score of 50 denotes that the SDCC is not a top performing building (i.e., > 75) and does not
138 qualify for ENERGY STAR certification (Table 2). The Pennsylvania Convention Center (PCC)
139 (2018), also a LEED-certified event venue, reported composting; recycling oil, metal, fluorescent

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140 bulbs, pallets, single-stream and show materials; employing a certified green cleaning service;
141 and installing water-efficient fixtures. Additionally, PCC reported burning over 74,000
142 dekatherms (74,000 million BTUs) of natural gas, consuming over 34,000 CCF (>25 million
143 gallons) of water, and over 24 million kWh of electricity in 2018. Host organizations like ASLA
144 only utilize venues for a few calendar days, thereby making individual organizations responsible
145 for a small percentage of costs and benefits. Accordingly, four calendar days (i.e., two operating
146 EXPO days, one setup and one removal day) of emissions and energy use at the PCC for the
147 2018 ASLA EXPO (Table 2) results in emissions that are about equal to the travel-related
148 emissions of 2018 EXPO representatives that we estimated using the Carbon Footprint
149 Calculator (Figure 2), without radiative forcing.

150 **Table 2. Building Benchmark Data, Pennsylvania and San Diego Convention Centers**

	PA Convention Center, Annex, Philadelphia ^a	PA Convention Center, Exhibit Hall & Train Shed, Philadelphia ^a	4 days, PA Conv. Ctr. Exhibit Hall, 2018 ASLA EXPO	SD Convention Center, San Diego ^c	4 Days, SD Convention Center, 2019 ASLA EXPO
Electricity Use, kWh	2,347,061.27	15,565,827.84	170,584.41	17,695,130.40	193,919.24
Natural Gas Use, BTUs	13,742,244,000	51,168,058,000	560,745,841.10	25,053,865,272.76	274,562,907.10
Site Energy Use Intensity (EUI), kBtu/ft ²	40	90	NA	48.4	NA
Source EUI, kBtu/ft ²	NA	NA	NA	110.8	NA
Total Greenhouse Gas Emissions t CO ₂ e	3,008	7,542	82.65 ^b	5,583.60	61.19
Water use, gallons	11,853,000	17,742,000	194,432.88	NA	NA

151 ^aValues from The City of Philadelphia, Office of Sustainability, Building Benchmarking Index (2020) 2018 calendar year.

152 ^bEducation sessions and other activities related to the 2018 ASLA Conference occurred within the PA Convention Center Annex. We
153 cannot estimate what percentage of the annex area ASLA used. Therefore, we cannot estimate the percentage of annex emissions for
154 which ASLA may be responsible. Thus, our event-venue-related emissions from the 2018 ASLA Conference are likely low.

155 ^cValues from The City of San Diego, Department of Sustainability, reported 2019 data.

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157 **EXPO organization, assembly, use, and disassembly.** We could not estimate emissions
158 post hoc related to the organization and execution of the 2018 and 2019 EXPOs. However, a life
159 cycle assessment showed that a 3-day exposition of 120 exhibits across 11,600 m² resulted in
160 emissions of between 73 and 75 t CO₂e (Toniolo, Mazzi, Fedele, Aguiari, & Scipioni, 2017).
161 After removing emissions from venue heating and lighting, emissions from event carpeting, tape,
162 display panels, forklifts, cleaning and machine sweepers during organization, assembly, use, and
163 dismantling equaled between 35.9 to 37.3 t CO₂e. For comparison, the 2018 EXPO included 352
164 exhibits across 6,819 m² (excluding aisles) and the 2019 EXPO included 353 booths across 6,633
165 m². Thus, a rough approximation based upon area alone may yield another 21.22 t CO₂ emitted
166 during the organization and execution of each ASLA EXPO.

167 **Hotel accommodations.** Many ASLA Conference attendees and EXPO representatives
168 needed nightly accommodations, which created carbon dioxide emissions. We located and
169 multiplied mean emissions values of carbon dioxide equivalence per occupied room for
170 Philadelphia and San Diego in the 2020 Cornell Hotel Sustainability Benchmarking (CHSB)
171 index tool spreadsheet (Ricaurte & Jagarajan, 2020) by the number of meeting attendees and
172 EXPO representatives, and the number of nights of accommodation likely reserved. For
173 comparison, Stohl (2008) and Neugebauer et al. (2020) reported that hotel accommodations
174 accounted for 5 and 8.62 percent of emissions estimations, which is close to our estimations for
175 the 2019 meeting and EXPO, but lower than emissions from accommodations in 2018.

176 **Summation of emissions and comparative impacts.** Table 3 summarizes estimations of
177 carbon dioxide emissions from the 2018 and 2019 ASLA Meetings and EXPOs. For airborne
178 meeting attendees and EXPO representatives in 2018 and 2019, the range of emission weight
179 mean sums estimated from travel, event venue, hotel accommodations, and EXPO organization,

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180 use, and disassembly may be about equal to the 2018 per capita annual emissions of a resident in
181 Ethiopia (0.44 t CO₂) or Gambia (0.48 t CO₂), without radiative forcing, or over three Ethiopians
182 or Gambians with radiative forcing (Climate Watch, n.d.). In contrast, overland travelers could
183 have emitted about as much as a resident of Bhutan (0.09 t CO_{2e}) or Niger (0.16 t CO₂) in 2018.
184 For an ASLA airborne meeting attendee or exhibitor, 0.46 t CO₂ is between 4.26 and 9.38
185 percent of an annual U.S. per capita emission weight in 2030 that is associated with a global
186 emissions cap of 30 (i.e., 10.8 t CO₂ per person), 25, or 20 Gt CO₂ (4.9 t CO₂) (Chakravarty et al.,
187 2009). However, after factoring in radiative forcing index factors, 1.72 t CO₂ is between 15.93
188 and 35.10 percent of an annual per capita emission cap.

189 Overall, the four-day 2019 ASLA Conference in San Diego may have yielded about
190 2,925 to 10,216 t CO₂, which is equal to the per capita emissions of 6,648 to 23,219 Ethiopians,
191 or between 201 and 703 Americans ($M = 14.54$ t CO₂ as per Climate Watch, n.d.). Convening for
192 four days in 2018 resulted in between about 1,845 to 5,667 t CO₂, which is equal to the per capita
193 emissions of 4,194 to 12,881 Ethiopians or 127 to 390 Americans.

194

Table 3. Summary of Emissions Estimation Means, in t CO₂, for 2018 and 2019 ASLA Annual Meeting and EXPO.

2019, San Diego										
Emissions Source	Meeting Attendees	Per Attendee, Exhibitor	Attendee Carbon Fund w/ RFI Factor	Attendee Carbon Fund	Attendee Carbon Footprint w/ RFI Factor		EXPO Rep, LCA (includes RFI)	EXPO Rep, ICAO	EXPO Rep, Carbon Footprint	
					Attendee	Carbon Footprint				
Air Travel	5,826 ^a		1.62000	0.60000	0.81313	0.43000	284	1.70000	0.51070	0.44660
Car Travel	522 ^b			0.06000		0.06000	67	0.08300	0.06650	0.05000
Event Venue	6,500 ^c	0.00903 ^d					353			
Hotel Accommodations	6,348 ^e	0.00876 ^f					329 ^g			
EXPO Org., Use, Disassembly	6,500 ^d	0.00310 ^h					353			
Means	By Air		1.64089	0.62089	0.83402	0.45089		1.72089	0.53159	0.46749
	By Car			0.08089		0.08089		0.10389	0.08739	0.07089
2018, Philadelphia										
Air Travel	3,061 ^a		1.53900	0.57000	0.75640	0.40000	252	1.31000	0.40000	0.34000
Car Travel	235 ^b			0.06300		0.06300	66	0.08200	0.06600	0.05000
Train Travel	2,150 ⁱ			0.05000		0.01000	32	0.06000	0.03100	0.01000
Event Venue	6,200 ^a	0.0126 ^d					358			
Hotel Accommodations	5,446 ^e	0.0227 ^f					319 ^g			
EXPO Org., Use, Disassembly	6,200 ^a	0.0032 ^h					358			
Means	By Air		1.57755	0.60855	0.79495	0.43855		1.34854	0.43854	0.37854

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By Car	0.10155	0.10155	0.12054	0.10454	0.08854
By Train	0.08855	0.04855	0.09854	0.06954	0.04854

196 ^a Values from Table 5 in Author (2019).

197 ^b Derived from percentage of educational session featured speakers who traveled by car in Author (2019).

198 ^c Total projected attendees in SAN2019 Conference on Landscape Architecture Program, p.41.

199 ^d Derived by dividing estimated emissions from four days of use at San Diego or Pennsylvania Convention Center (61.19 or 82.65 t
200 CO₂, Table 2) by the sum of attendees and EXPO exhibitors. Source: The City of San Diego, Department of Sustainability, reported
201 2019 data; The City of Philadelphia, Office of Sustainability, Building Benchmarking Index (2020) 2018 calendar year.

202 ^e Sum of air and car travelers in 2019, or air, car, and train travelers in 2018.

203 ^f 2018 calendar year benchmark data from the Hotel Carbon Measurement Initiative (HCMI). Values based upon the mean hotel
204 carbon footprint per occupied room, in kg CO_{2-e}, for Philadelphia (22.71 kg) and San Diego (8.67 kg), each as an "urban location," and
205 presented in the 2020 Cornell Hotel Sustainability Benchmarking Study tool.

206 ^g We assumed that exhibitors who traveled a distance greater than 90 mi would reserve hotel accommodations. Additionally, we
207 assumed three nights of hotel stays, which would total 166.83 and 8.65 t CO₂ for 2019 attendees and EXPO exhibitors, respectively,
208 and 371.04 and 21.72 t CO₂ for 2018 attendees and EXPO exhibitors.

209 ^h Value based upon area of 2018 and 2019 ASLA EXPO exhibit spaces, excluding aisles, in comparison to the results of a life cycle
210 assessment performed by Toniolo et al. (2017). We divided our estimation, 21.22 t CO₂, by the sum of attendees and EXPO exhibitors
211 for each conference.

212 ⁱ Derived from percentage of educational session featured speakers who traveled by train in Author (2019).

ALTERNATIVE MODELS OF CONVENING

Emissions reductions target. In the first Nationally Determined Contribution (USA

216 NDC, 2016) to the Paris Agreement, the U.S. intended to “achieve an economy-wide target” of
217 emissions reductions equal to 28 percent relative to 2005 by 2025. As a signatory of the We Are
218 Still In declaration (WWF-Climate Nexus-Ceres, 2017), ASLA committed to the goals outlined
219 in the Paris Agreement, including meeting- and event-related emissions reductions, developing a
220 plan and timeframe for becoming climate neutral, reducing travel-related greenhouse gas
221 emissions, and completing a greenhouse gas inventory. ASLA’s policy recommendations for the
222 Biden-Harris Administration (ASLA, 2021b) include rejoining the Paris Climate Agreement and
223 implementing a plan to reduce greenhouse gas emissions to levels recommended in IPCC (2018)
224 which, depending on the model pathway that projects global warming equal to or slightly above
225 1.5° C, is between 41 and 58 percent by 2030, relative to 2010 levels, and 91 and 95 percent by
226 2050 (IPCC, 2018, p. 16). After rejoining the Paris Agreement (USA NDC, 2021), the United
227 States’ NDC committed to reducing economy-wide emissions 50 to 52 percent relative to 2005
228 levels by 2030. US emissions peaked in 2005 then began falling (Hausfather, 2017). In contrast,
229 ASLA conference attendance and emissions have gradually grown (Author, 2019). Thus, the
230 following synopsis of costs and benefits related to alternative models of in-person annual
231 conferences is based upon emissions reductions ASLA publicly advocated.

232 **Biennial meetings.** Meeting every other year in-person, with or without a virtual meeting
233 between in-person meetings, would basically halve conference-related emissions (Bousema et
234 al., 2020; Klöwer, Hopkins, Allen, & Higham, 2019; Ponette-González & Byrnes, 2011) while
235 retaining the benefits of in-person meetings on a less frequent schedule. Biennial meetings may

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236 also decrease conference-related revenue by half without alterations to registration, sponsorships,
237 and monetized conference experiences. However, meeting less frequently in person may increase
238 the value of conference content and experiences by allowing more time for substantive
239 innovation and collaboration between conferences. Accordingly, conference attendance may
240 increase in comparison to current, typical conferences, and with it travel-related emissions.

241 **Geographically centralized conferences.** Convening in a centralized location, rather
242 than in a city on a U.S. coastline, would reduce air-travel-related emissions (Klöwer, Hopkins,
243 Allen, & Higham, 2019; Ponette-González & Byrnes, 2011; Stroud & Feeley, 2015) by as much
244 as 4 to 44 percent in comparison to baseline estimations (Jäckle, 2019). In this scenario,
245 international attendees, who account for between 8 to 16 percent of attendees but between 12 and
246 56 percent of travel-related emissions (Author, 2019; Ponette-González & Byrnes, 2011) would
247 only participate virtually, if at all (Author, 2019; Jäckle, 2019). Besides, the results of one study
248 show that intra-national interactions, rather than international, are 2 to 2.5 times more likely at
249 “international” conferences, despite the origins of registrants (Derudder & Liu, 2016). Presenting
250 and exhibiting at a meeting in a major U.S. city, the authors suggest, implies approval, status,
251 and prestige.

252 Convening in a centralized location would afford almost all the benefits of typical in-
253 person conferences but may require additional technical support and organization to include
254 potential international speakers, product representatives, and attendees. Carbon dioxide
255 emissions estimations for the 2014 and 2015 ASLA Annual Meetings in Denver and Chicago
256 (Author, 2019) suggest that geographically centralized conferences may still result in travel-
257 related emissions of between 1,172 and 1,832 t CO₂ without radiative forcing and between 2,216
258 and 4,945 t CO₂ with radiative forcing, which would result in an emissions reduction of between

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259 2 and 21 percent, below US and global targets for 2025 and 2030. Additionally, emissions from
260 the operation of the event venue, organization, use, and disassembly of the conference, and hotel
261 accommodations would still occur, as would waste and water use.

262 **Alternating between centralized and decentralized in-person meetings.** Ponette-
263 González and Byrnes (2011) estimated that emissions reductions from domestic air travel
264 equaled between 18 and 59 percent if meetings alternated between multiple regional sites and a
265 single national site, and even greater reductions could occur (i.e., between 49 and 74 percent) if
266 international travel is eliminated. However, these estimations are dependent on the location of
267 the event and proximity to potential attendees. Alternating between regional and national sites
268 may require additional infrastructure and planning and decrease revenue overall without
269 reimagining the monetization of decentralized, regional conference registration and experiences.

270 In this scenario, emissions reductions related to event venue operations, and event organization,
271 setup, use, and disassembly, and hotel accommodations may occur but are difficult to estimate.

272 **Hybridized meetings.** Annual hybridized meetings entail traveling overland only to
273 convene regionally in person while using teleconferencing software to view presentations and
274 engage attendees in other regional “hubs” virtually. Hybridized meetings would eliminate air-
275 travel-related carbon emissions, but still rely upon fossil-fueled event venues that are smaller but
276 more numerous (e.g., hotel conference rooms, university auditoriums), possibly fewer hotel
277 accommodations, and ground-based transport (i.e., buses, trains, and cars) that contribute to
278 climate change. Yet, hybridized annual meetings could temper economic losses in cities that
279 typically welcome large business sector events, or increase economic activity in more cities that
280 serve as hubs. Exhibitors, researchers, and practitioners could still meet; attendees may still
281 inspect actual products and observe trials. Products on display in regional meetings may be

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282 localized and better suit attendees' interests and professional needs, particularly when measures

283 to adapt to regional effects of the climate crisis become more common and necessary.

284 Additionally, conference attendance, diversity, and exposure to content may increase; access to

285 information may extend beyond an in-person, regional event, and product representatives may

286 see up to a 70-percent return on investment in the EXPO, as one precedent reported (Pearlman &

287 Gates, 2010).

288 Coroama, Hilty, and Birtel (2012) documented a two-site international conference (Japan

289 and Switzerland) that described techniques ASLA could utilize. Speakers pointed to podium

290 monitors during presentations, which allowed the remote audience to see and understand

291 presenters' gestures. Organizers projected video of the remote audience on a screen positioned

292 perpendicular to the presenter to make visible remote audience reactions. Camerapersons

293 captured dynamic views of the audience and magnified views of those posing questions.

294 Organizers also provided a teleconferencing station for small, impromptu, and informal group

295 meetings over coffee, and another in a quiet area for more formal meetings. Majorities of

296 attendee questionnaire respondents were very or fairly well satisfied with the interactive Q & A

297 sessions, sensing the presence of the remote audiences, spontaneous and formal cross-site

298 meetings. Respondents' opinions regarding conference social interaction and networking rated

299 positive yet lower than quality of content, cost and time efficiency of participation,

300 environmental impact, and experience of different cultures. Analysis of conference attendees'

301 probable travel behaviors had the conference been entirely in-person in one location or another

302 indicated that the two-site conference attracted more attendees and reduced travel-related

303 emissions by 1.5 to 3.5 times per capita and between 37 and 50 percent overall (Coroama et al.,

304 2012), which is slightly lower than the 58-percent reduction estimated by Bousema et al. (2020).

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305 Two other study results are relevant. Orsi (2012) found that air-travel-related emissions
306 from an in-person conference would have decreased by about one-third had attendees instead
307 traveled to the nearest organization chapter city. Emissions dropped another 12 percent with a
308 two-venue conference, and 35 percent with a three-venue conference. Additionally, Jäckle
309 (2021) found that conference-related emissions would decrease between 51 to 55 percent if
310 participants from the most distant origins attended online; reductions of up to 79 percent resulted
311 if the other 90 percent of participants traveled overland between 5 and 20 hours. If the half of
312 participants who originate from locations closest to the conference attended in person while all
313 others attended virtually, emissions would drop 95 to 98 percent.

314 At least three organizations have begun utilizing a hybridized conference model that
315 ASLA may follow. In addition to in-person presentations for the 2022 annual conference, the
316 Council of Educators in Landscape Architects (CELA, n.d.) is providing a limited number of
317 virtual oral, panel, or film presentations. The 2021 annual fall meeting of the American
318 Geophysical Union (AGU, n.d.), which has had over 22,000 registrants since 2017, is providing
319 in-person, hybridized, and online-only oral, poster, and (e)lightning presentations, as well as in-
320 person exhibit spaces and virtual exhibition packages. Finally, in 2021 the American Association
321 of Geographers (AAG, n.d.), which has a five-year mean attendance of about 8,400 attendees,
322 has collaborated with another annual conference and six regional AAG divisions for in-person
323 and virtual presentations. In 2022, the AAG will convene in a centralized location while
324 providing in-person, hybridized, and virtual presentations and attendance. All 2022 AAG
325 exhibitors will receive a virtual exhibit space at no cost. Registration rates for virtual attendees
326 and presenters at the 2021 AGU and 2022 AAG meetings are lower than rates for in-person

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327 attendees and presenters, whereas rates for the 2022 CELA meeting are the same regardless of
328 attendance option.

329 **Virtual meetings.** The evident costs of convening future ASLA Conferences on
330 Landscape Architecture virtually include the removal of an opportunity to visit, engage in active
331 leisure, and independently explore and relax in the event destination, which was a primary
332 motivation of Americans' conference attendance in one study (Tretyakevich & Maggi, 2012).
333 Attendees may view specifications, photographs, and videos of EXPO products, rather than the
334 actual objects. Comparatively, registration and exhibitor fees, and perhaps sponsorships, may
335 yield less revenue in comparison to business-as-usual conferences. Consequently, different, or
336 new means of monetizing conference experiences, other ASLA products (e.g., magazine
337 production and advertising) and events, and or annual membership fee structures would be
338 needed, along with a critical review of annual expenditures and operations. Additionally,
339 eliminating future in-person events would decrease the economic benefits that event venues and
340 host cities receive, including revenue from hoteling, feeding, and entertaining event visitors.

341 Oester, Cigliano, Hind-Ozan, and Parsons (2017) identify several possible technical
342 limitations of virtual conferences including restrictions on the number of attendees; an inability
343 to ensure attendance; potential attendees' limited access to electricity, computers, and or
344 bandwidth, particularly in developing countries; and the possible exclusion of interactive
345 workshops. In contrast, at least four studies show that virtual conferences attract more attendees,
346 some of whom are outside of the organizing professional association, must care for others, or
347 have budget constraints (Bousema et al., 2020; Klöwer et al., 2019; Pandian, 2018; Raby &
348 Madden, 2021a). Klöwer et al. (2019) noted that attendance at the virtual European Geosciences
349 Union conference increased from 16,000 to 26,000 (62 percent), between 2.5 and 4 times the

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350 current annual attendance of ASLA conferences. Moreover, Raby and Madden (2021a)
351 recognize that online conferences allow attendees flexibility with time on the day of the
352 conference, require less planning for travel (i.e., air and car) and hotel accommodations, and
353 physical exertion from traveling. Increased attendance may require additional marketing but
354 decrease the overall revenue gap between in-person and virtual conference registration fees.
355 Requiring that attendees complete quizzes for continuing education units, as was done during
356 ASLA's 2020 reVISION, would ensure attendance. Uploading recordings, digital posters and
357 text-based discussions should prevent concentrated demand (i.e., "bottlenecks") for streaming
358 content while offering high- and low-bandwidth connections could expand access to audiences
359 that may have service restrictions (Klöwer et al., 2019). Lortie (2020) suggests that Zoom,
360 Twitch, or any streaming platform that allows sharing data or screens would allow for the
361 conduct of virtual workshops on all the topics that Oester et al. (2017) list (i.e., statistics,
362 mapping, remote sensing, and modeling).

363 Performing professional development online instead of in-person may yield the same or
364 slightly better effect on learning, but acceptable modes of delivering continuing education at the
365 state level may need to change. Following a meta-analysis and review of 15 independent data
366 sources, Gegenfurtner and Ebner (2019) found that webinars are "trivially more effective in
367 promoting student achievement than other learning environments," (p. 16) including face-to-face
368 instruction. Moreover, longer webinars resulted in greater knowledge and skills when comparing
369 pre- and posttest scores. Non-significant differences between learners in higher education and
370 professional training, between knowledge tests and performance ratings, and across multiple
371 separate or single combined webinar events indicate that future continuing education may take
372 place predominately and effectively online, though some webinar platforms may be more

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373 effective than others. In the Commonwealth of Pennsylvania, at least, the Covid-19 health
374 emergency prompted the creation of a waiver to permit 100 percent, rather than half, of the
375 required 24 continuing education clock hours for the 2019-2021 biennium to be completed
376 online (Pennsylvania Department of State, 2021). With support from ASLA, state boards of
377 landscape architects may need to revise codes accordingly to address the climate emergency and
378 permit the completion of a greater percentage of continuing education online.

379 The greatest cost of virtual conferences to attendees may be related to networking, which
380 is difficult to perform remotely (Raby & Madden, 2021a, 2021b). Oester et al. (2017) reported
381 that 89 percent of conference attendees established new professional contacts in their area of
382 interest; between 50 and 70 percent of respondents gained exposure to new techniques, skills,
383 and novel ideas; and convening in person “led to new initiatives, publications, and enhanced
384 multidisciplinary learning” (p. 2). However, several study results present a mixed view of
385 networking. van Riper, van Riper, Kyle, and Lee (2013) found that the formation of social
386 networks through new and existing relationships and “within and outside areas of expertise”
387 resulted in strong, positive associations with respondents’ ratings of conference satisfaction, but
388 may not “build a sense of community” in respondents’ area of expertise. Forret and Dougherty
389 (2004) found that increasing internal workplace visibility significantly related to the number of
390 respondents’ promotions, total compensation, and perceived career success; socializing (i.e.,
391 attending social functions, playing golf, tennis, etc. with co-workers or clients) and maintaining
392 external contacts were not significantly related. Participation in professional activities, such as
393 speaking engagements and conference attendance, significantly related to total compensation
394 only. Wolff and Moser (2009) found that building, maintaining, and using external and internal
395 contacts over three years collectively had a significant effect on concurrent salary. Maintaining

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396 internal contacts at one's employer had a significant positive effect on salary growth and
397 concurrent career satisfaction but did not significantly contribute to growth in career satisfaction.
398 Again, using external contacts had the weakest effect on measures of career success. Finally,
399 Wynes, Donner, Tannason, and Nabors (2019) showed that emissions from traveling by air,
400 primarily to conferences, did not significantly relate to an index measure of researchers'
401 productivity, total or normalized citations, or the average number of authors per paper (i.e., a
402 measure of collaboration that may stem from networking at conferences). Furthermore, Wynes et
403 al. (2019) suggested that increased air travel may not relate to professional success as measured
404 by salary.

405 Time zone differences among attendees, presenters, and exhibitors may result in
406 scheduled discussion and interaction periods outside of regular business hours, which may limit
407 or exclude participants, especially potential international attendees. A direct equivalent of
408 spontaneous meetings in hallways, bars, or restaurants may not exist for virtual conferences.
409 However, Lortie (2020) suggests that Google Hangouts, Microsoft Teams, Qigochat, Slido, and
410 uMeeting are tools that may afford impromptu meetings. Klöwer et al. (2019) recommends
411 Discord and Slack. Raby and Madden (2021a) found some support among virtual conference
412 attendees for peer-to-peer meetings, mentoring, pub quizzes, debates, and special interest group
413 meetings using Zoom meeting and breakout rooms, but overall dissatisfaction with the lack of
414 social interaction. Oester et al. (2017) questioned whether virtual meetings can offer genuine,
415 memorable, and authentic impressions. Indeed, slight delays between actions of virtual attendees
416 cause our brains to work harder toward synchronicity (Wiederhold, 2020). We cannot see and
417 interpret body language, may be distracted by "chat" content, find other attendees' faces too
418 large and threatening or too small and distant (Wiederhold, 2020).

419 Our personal, individual desire for three to four days of social interaction outside of
420 education sessions and the EXPO each year is countered by the centuries-long collective good
421 ASLA members would be doing by almost eliminating conference-related carbon dioxide
422 emissions, in addition to water and land use demand (Gössling & Peeters, 2015) and waste. Two
423 studies indicate that a virtual meeting may result in about 1 t CO₂, which is between less than
424 one percent and six percent of emissions from an in-person meeting (Pandian, 2018; Raby &
425 Madden, 2021a). Jäckle (2021) estimates that a virtual conference may result in between 0.06 to
426 and 12.95 t CO₂, or as much as 10 percent of an in-person conference. Thus, ASLA members
427 would meet US and global emissions reduction targets well before 2050 and immediately stop
428 contributing to Arctic sea-ice loss (Stroeve & Notz, 2018), labor productivity loss in developing,
429 equatorial regions (Chavaillaz et al., 2019); and near-term heat-related (Vicedo-Cabrera et al.,
430 2021) and future human deaths (Nolt, 2011; 2013; 2015; Parncutt, 2019) that are associated with
431 greenhouse gas emissions and climate change. In addition to the potential for increased
432 attendance, virtual conferences afford a greater number of potential contacts one could make in
433 comparison to an in-person conference (Raby & Madden, 2021a); require less time and money
434 for travel, hotel accommodations, food and drinks; and more flexibility in accessing content and
435 participating. One study suggests that developing a virtual conference platform may demand an
436 initial expense equal to 30 percent of the cost of organizing and executing an in-person meeting
437 (Raby & Madden, 2021a), but subsequent future use of the platform could equal about 8 percent.
438 Finally, the dissonance between ASLA's professed values and actions (i.e., on climate change
439 and equity) would diminish, the potential for *ad hominim* attacks would decrease, and the
440 credibility of the Society and public policy support for which ASLA advocates could increase
441 (Attari, Krantz, & Weber, 2016; 2019).

442

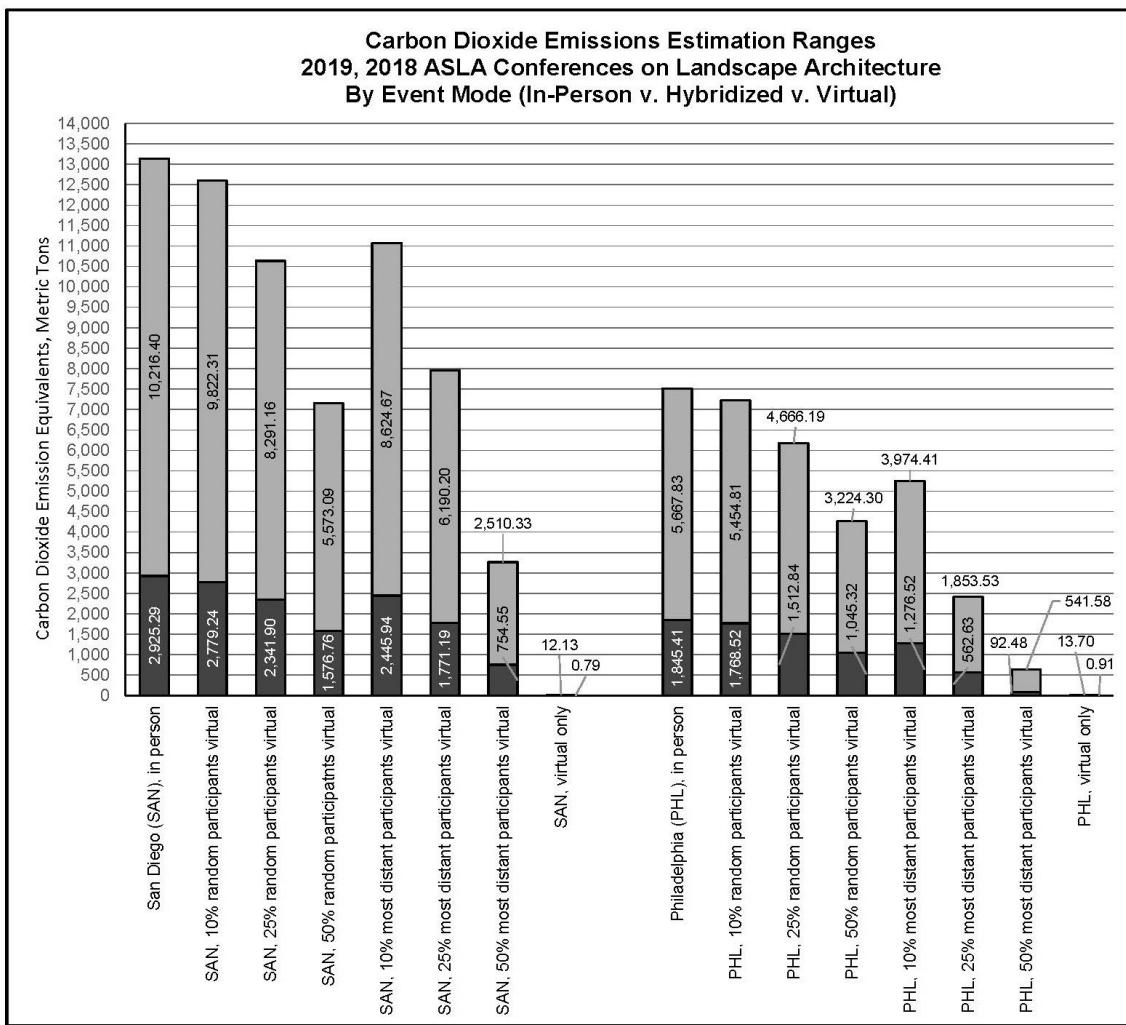
443

RECOMMENDATIONS

444 Based upon our analysis of alternative modes of convening annually within the context of
445 emissions reductions ASLA supports, hybridized and virtual meetings should result in the
446 greatest potential emissions reductions. To assess this hypothesis, we estimated and compared
447 emissions ranges for virtual and various hybrid meeting models using methods from Jäckle
448 (2021). For one hybrid model, we commanded software (XLSTAT in Excel) to compute the
449 mean sums of 2,000 random selections without replacement for 90, 75, and 50 percent of EXPO
450 representatives' and education session featured speakers' emissions weights. For the other, we
451 calculated the sum emission weight ranges after removing 10, 25, and 50 percent of the highest
452 emitting, most distant EXPO representatives and education session speakers from our datasets.
453 To calculate the ranges of emissions for virtual meetings, we inserted into formulae Jäckle
454 (2021) presented an electricity generation rate of 85 lbs. per kWh (EIA, 2020), the number of
455 total participants from Author (2019) (Table 3) for each meeting, and the number of conference
456 hours (25.5 for 2019; 28 for 2018), which excludes galas, dinners, and meetings and includes
457 discrete hours without overlap devoted to general and education sessions, workshops, and the
458 EXPO.

459 Our estimations indicate that virtual ASLA meetings and the hybridized conference
460 model that requires 50 percent of the most distant participants to attend virtually only may meet
461 the 50 percent emissions reduction target, relative to 2005 or 2010, by 2030 recommended by the
462 IPCC (2018) and the USA NDC (2021) and supported by ASLA (2021b) (Figure 3). Relative to
463 our 2019 San Diego in-person emissions estimations, a hybridized conference model that
464 requires 50 percent of the most distant participants to attend virtually only may approach a 50

465 percent emissions reduction target. Relative to 2018 Philadelphia in-person emissions
466 estimations, hybridized conference models that require virtual attendance by 25 and 50 percent
467 of the most distant participants may approach 50 and 90 percent reduction targets, respectively.
468 Note that our 2018 estimations classified 50 percent of education session speakers and about 28
469 percent of EXPO representatives as local or overland travelers even prior to requiring additional
470 virtual participation. Thus, centralized conference locations that have limited access to overland
471 travel modes, particularly train travel, will require greater virtual participation to meet emissions
472 reduction targets.



473

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474 **Figure 3.** Carbon Dioxide Emission Estimation Ranges for 2019 and 2018 ASLA Conferences

475 on Landscape Architecture by Event Mode. Dark gray columns represent minimum estimates;

476 light gray columns represent maxima. Participants include conference attendees' and EXPO

477 representatives' emissions.

478

479 Thus, we recommend immediately transitioning to hybridized annual meetings that
480 require no air travel until 2030, at the latest. Thereafter, we recommend virtual annual meetings
481 only. However, if or when hybridized meetings occur, emissions estimations should be
482 performed and compared to those from business-as-usual conferences to determine whether the
483 transition to virtual conferences should happen sooner. Carbon offsets are not valid alternatives
484 to behavioral changes that result in actual emissions reductions and should not be purchased in
485 lieu of our recommendations (Anderson, 2012; Hagmann, Ho, & Loewenstein, 2019; Werfel,
486 2017; Wilde, 2020). Until such time that ASLA convenes virtually, annual ASLA Conferences
487 on Landscape Architecture will contribute to the climate crisis. ASLA must wholly avoid claims
488 of being green and sustainable.

489

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