

1 Article

2 Synergies and trade-offs in the Sustainable 3 Development Goals – the implications of the 4 Icelandic tourism sector

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16 **Abstract:** The development of major economic sectors can provide the bedrock on which long-
17 lasting national economic prosperity is formed. Iceland's tourism sector is an example of a rapidly
18 expanded industry in recent years, to the extent that it has become the largest sectoral contributor
19 to the nation's economy. The growth of the sector has led to a number of sustainability impacts, thus
20 presenting opportunities and challenges in terms of meeting the seventeen Sustainable
21 Development Goals (SDGs) of the United Nations. Using the case study of Iceland, this paper aims
22 to advance conceptual understanding of the synergies and trade-offs between a nation's tourism
23 sector and performance across the 169 targets of the SDGs. Empirical results were derived from four
24 theme-based focus groups, comprised of expert participants, who were tasked with completing
25 scoresheets concerning their perception of the extent of synergies and trade-offs for each target. The
26 majority (126 in number) of the mean scoresheet outcomes for the SDG targets revealed neither
27 synergies nor trade-offs. However, 32 synergies and 11 trade-offs were identified. Many of the target
28 synergies related to new economic opportunities, such as jobs, employment and training for young
29 people. Target trade-offs tended to be environmental and social. In particular, concern was voiced
30 about the greenhouse gas emissions of the Icelandic tourism sector, which derives from
31 international aviation, cruise ships and rental car usage. The outcomes of this study are of particular
32 relevance to tourism companies, policy-makers and governance institutes, all of whom are
33 increasingly endeavouring to link their activities with the fulfilment of the SDGs, maximising
34 synergies, mitigating the extent of any potential trade-offs, and potentially transforming trade-offs
35 into synergies. Furthermore, the results are likely of interest to academics focused on researching
36 the broad sustainability impacts of economic sectors and their contribution to meeting the visionary
37 goals of the SDGs.

38

39 **Keywords:** decision-making; tourism; sustainable development goals; Iceland; synergies; trade-offs

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41

42 1. Introduction

43 Concerns about the sustainability of natural resources and a need for sustainable development
44 have been expressed and reiterated over the years in a series of global political gatherings: Our

45 Common Future in 1987, the Earth Summit of 1992, the World Summit on Social Development in
46 1995, the World Summit on Sustainable Development in 2002, and Rio + 20 in 2012 [1, 2]. The
47 seventeen United Nations' Sustainable Development Goals (SDGs)¹ have been widely acclaimed as
48 the culmination of this global dialogue, transitioning from the Millennium Development Goals to
49 provide a comprehensive global blueprint for a route to a more sustainable future and confronting
50 challenges linked to poverty, climate change, inequality, environmental degradation, and securing
51 peace, justice and prosperity [3].

52 The seventeen SDGs and their respective targets are interconnected, containing synergies but
53 also trade-offs which may be difficult to reconcile [4-7]. This is perhaps most clearly evidenced in
54 relation to Goal 8, 'Decent work and economic growth', which sets a target for all countries to sustain
55 per capita economic growth in accordance with national circumstances [3]. Many economists have
56 argued that maintaining stocks of natural resources should be allocated priority over the flows of
57 income and economic growth sourced from their depletion [8, 9]. Such 'strong sustainability'
58 arguments emphasize the limited substitutability of natural for produced forms of capital, and in so
59 doing shift the management objectives of an economy towards the pursuit of a sustainable yield of
60 renewable resources [10-13].

61 As Hall et al. (2015) articulate, pursuing economic growth entails trade-offs: *"Despite repeated*
62 *attempts to posit sustainable forms of development, including with respect to alternative and sustainable*
63 *tourism, the global ecological footprint of humanity continues to grow and run down the stock of the world's*
64 *natural capital. In other words, the achievement of sustainable development via economic growth strategies,*
65 *even if they constitute so-called green growth, appears extremely difficult if not impossible"* [14] (p. 28).
66 National compliance with the overarching growth objective, targets and indicators of goal 8 may lead
67 to trade-offs relating to goals such as numbers 11, 12, 13, 14, 15 and 16². Equally, synergies may exist
68 between goal 8 and other goals, such as 1, 2, 3, 4, 5 and 6. The extent and character of these trade-offs
69 and synergies are likely to vary given the context of the nation, whether it is a developed or
70 developing economy, and the extent to which a nation's economic expansion is delivered through
71 reliance on the growth of a single industrial or service-based sector. This is evident in the case of the
72 tourism sector, which is a major driver of economic growth in both developing and developed nations
73 [15, 16].

74 Although there has been general academic discussion concerning the potential impacts of
75 tourism activities on the SDGs [17, 18], so far no academic study has sought to evaluate the extent of
76 synergies and trade-offs between a national tourism sector and the goals of the seventeen SDGs. This
77 paper's aim is thus to evaluate the extent to which a national tourism sector stimulates synergies and
78 trade-offs linked to the pursuit of the SDGs, including their respective targets. The selected case study
79 for this task is Iceland, the nation with the fastest rate of economic growth in the OECD in recent
80 years, predominantly due to its burgeoning tourism sector [19]. In the period subsequent to the
81 banking collapse of 2008 – the largest in history relative to the size of its economy – spiraling
82 bankruptcies and unemployment threatened the sustainability and economic prosperity of the nation
83 [20]. The tourism sector has been the engine of Iceland's economic recovery, with the number of
84 tourists more than quadrupling between 2010 and 2017, from 488,600 to 2,224,603 [21]. For the first
85 time ever, tourism in Iceland in the period 2013-2017 was responsible for higher foreign exchange
86 earnings (42% in 2017) than exports of marine products (16% in 2017). Over the same time period the
87 number of people employed in the tourism sector has increased by 68% [21]. The total contribution
88 (direct and indirect) of the tourism sector to GDP amounted to 34.6% in 2017 and this is projected to
89 rise to 40.6% by 2028 [22].

90 This paper is structured as follows. Section 2 provides a brief literature review of existing
91 publications focused on interactions and trade-offs in the SDGs. Section 3 communicates the recent
92 importance of the tourism sector to the Icelandic economy in terms of growth and outlines a summary

¹ A schedule of all of the Sustainable Development Goals and their respective targets are provided in numeric order in Appendix A to this paper.

² See also Table 2 for details of the SDGs.

93 of the known economic, environmental and social consequences. Section 4 details the methodology
94 for this paper's evaluation, which is based on focus groups and the completion of evaluative
95 scoresheets. Section 5 provides a combined results and discussion. It summarizes the results from
96 the focus groups and provides a matrix of the extent to which the Icelandic tourism sector is
97 stimulating synergies and trade-offs across all of the targets of the SDGs. The discussion component
98 focuses on the main implications of the study and provides a broader reflection on the contribution
99 of Iceland's tourism sector towards the meeting of the SDGs. Section 6 details a brief conclusion and
100 summary of the paper's main implications for policy-makers.

101
102

103 2. Overview of existing SDG interactions and trade-off studies

104 Costanza et al. (2016) heralded the publication of the SDGs as "*a global consensus, years in the*
105 *making*" and "*an important step in the transition to a sustainable world*" [23] (p. 59). The authors also
106 recognized that the publication of the SDGs, however seminal, was only a starting point. They called
107 for future work analyzing how the goals and targets interconnect, especially their synergies and
108 trade-offs, voicing that this quest demands an interdisciplinary contribution from academics,
109 scientists and policymakers. Several authors have begun to embrace the challenge. In this brief
110 literature review, a summary details the current approaches to evaluating synergies and trade-offs in
111 the SDGs, together with reports which highlight the various institutional challenges relating to their
112 practical implementation.

113 Nilsson et al. (2016) detailed a conceptual framework, evaluating the extent to which interactions
114 occur between the seventeen SDGs, focusing predominantly on the issues of poverty, equality,
115 environmental conservation and climate change [4]. As an analytical support tool, the authors
116 outlined a seven-point scale of interactions between SDGs. These are rated from +3 (most positive) to
117 -3 (most negative), with four criteria considered in this evaluation (1) reversibility of the interaction;
118 (2) bidirectional attributes of the interaction; (3) extent of impact of the interaction; and (4) certainty
119 of the interaction. Examples cited of the most positive interactions are ending all forms of
120 discrimination against women, deemed by [4] to be indivisible from ensuring the full participation
121 of women and their equal opportunities for leadership. At the other end of the scale, a cited example
122 of the most negative interactions is the pursuit of the full protection of nature reserves, specifically
123 linked to Goals 14 and 15, which has a trade-off with ensuring public access for recreation. Through
124 their approach, [4] emphasised the importance of governance institutions undertaking mutually
125 reinforcing actions ('policy coherence') to minimise trade-offs [4].

126 The work of Singh et al. (2018) investigated co-benefits and trade-offs between the targets of
127 Goal 14, 'Life Below Water' and other SDG targets [7]. A framework was developed to consider three
128 hierarchical considerations (1) the compatibility of the relationship (is it a co-benefit, trade-off or
129 neutral); (2) the contribution of one SDG target for the fulfilment of another; and (3) whether the
130 compatibility of the relationship should be considered to be context dependent or not. The workshop
131 was split into sixteen sessions with contributing experts from the fields of marine science, economics,
132 ocean governance, and social anthropology. Participants were tasked with populating a matrix
133 representing the seven targets of SDG14 versus the targets of the sixteen other SDGs. It was found
134 that all of SDG14's targets are related to the other SDGs, with two out of seven targets being
135 particularly significant. These were the increase of economic benefits to Small Island Developing
136 States and least developed countries, the elimination of overfishing, and illegal and destructive
137 fishing practices. As well as highlighting the general contribution of marine environments to
138 sustainable development, the approach of [7] has potential transferability to work analyzing
139 synergies and/or trade-offs concerning other SDGs.

140 Nerini et al. (2018) conducted a study similar in general focus to Singh et al's (2018), however,
141 the spotlight of their attention was shone on Goal 7, 'Ensure access to affordable, reliable, sustainable
142 and modern energy for all' [6]. Synergies and trade-offs were characterised between the pursuit of
143 SDG7 and other SDGs. Using an approach of qualitative content analysis and expert consultation, the

144 authors uncovered 143 synergies and 65 trade-offs linked to 143 targets. In particular, the authors
145 specified three human capacity domains in relation to the synergies and trade-offs linked to SDG7.
146 These were (1) realizing aspirations of greater well-being; (2) building physical and social
147 infrastructures for sustainable development; and (3) achieving sustainable management of the
148 natural environment. The authors called for better organization and connectivity of the evidence,
149 enabling actors to work more effectively together to pursue sustainable development [6].

150 Bowen et al. (2017) considered some of the same governance challenges highlighted by [6] in
151 relation to the simultaneous delivery of multiple SDGs [5]. The authors also highlighted the example
152 of SDG7, and how compliance necessitates the contribution of various actors and agencies, each with
153 its respective stakeholder interests [5]. Furthermore, [6] reflected on how terminology can have
154 different meanings, with understandings of 'affordable' and 'reliable' varying relative to the national
155 context. Such complexities lead the authors to outline three major governance challenges that must
156 be addressed in order to ensure the successful implementation of the SDGs. These were as follows:
157 (1) ensuring collective action by creating inclusive decision spaces for stakeholder interaction; (2)
158 embracing inevitable trade-offs through a focus on the principles of equity, justice and fairness; and
159 (3) guaranteeing that mechanisms exist to hold societal actors to account regarding their decision-
160 making, policy actions, and outcomes [5].

161 Stafford-Smith et al. (2017) also addressed challenges in the implementation of the SDGs given
162 the inevitability of trade-offs [24]. As the authors noted in accordance with the observations of [23],
163 across the seventeen goals, forty-two targets address the means of implementation, whereas SDG17
164 is entirely focused on implementation, but there is no discussion concerning their various
165 interlinkages and interdependencies. As a consequence, the authors are calling for greater attention
166 to be given to interlinkages across three areas: economic sectors; societal actors; and between and
167 among low, medium and high income nations. Seven broad recommendations were delineated by
168 the authors to smooth interlinkages in implementation at a national and global level, covering the
169 issues of: (1) finance; (2) technology; (3) capacity building; (4) trade; (5) policy coherence; (6)
170 partnerships; and (7) data, monitoring and accountability [24].

171 Overall, there is a growing body of research that is seeking to better understand and quantify,
172 conceptually at least, the various interactions between the SDGs and their respective targets. The use
173 of scoresheets and evaluative matrices has been adopted as a straight-forward means of illustrating
174 the extent of synergies and trade-offs, and to act as a starting point in the process of considering how
175 governance institutions could potentially transform the latter into the former. However, such
176 approaches are yet to be adopted in connection with the impacts of important national economic
177 sectors, including tourism.
178

179 **3. Tourism and sustainability impacts in Iceland**

180 Iceland is a sparsely populated island in the North Atlantic Ocean with about 350,000
181 inhabitants. Around 62% of the population resides in the capital area of Reykjavík and Greater
182 Reykjavík, while the rest of the population live in the lowlands and around the coastline. About 80%
183 of the island is uninhabited, it is characterised by rugged, volcanic and mountainous areas with
184 several glaciers, one of them being the largest in Europe. In terms of tourist attractions, Iceland has
185 varied landscapes many of which are relatively short distances from one another and vast wilderness
186 areas, as well as a diverse array of nature-based activities such as horseback riding, river-rafting,
187 hiking, glacier walks and more [25]. Iceland's tourism is heavily dependent on its natural attractions
188 as most tourists visit the country to experience its nature [19, 21 and 26].

189 A recent book chapter by [27] and paper by [18] outlined the various economic, environmental
190 and social sustainability impacts of Iceland's expanded tourism sector. In this section, the aim is not
191 to repeat the level of detail contained in a very recent publication, but rather to provide a succinct
192 summary of the synergies and trade-offs described in its contents. Table 1 summarizes the economic,
193 environmental and social impacts of relevance to the sustainability of the Icelandic tourism sector.
194 Specific examples are added in the results section based on the observations reported in the focus

195 groups, along with empirical evidence from relevant reports and academic publications. Key
196 synergies and trade-offs reported by [27] relate to Iceland's macro-economy and environment.
197 Although tourism has contributed to employment and a growing share of Gross Domestic Product,
198 and now constitutes the largest economic sector in Iceland's economy, it has imposed upward
199 pressure on the Icelandic krona, ensuring it is expensive to live in and visit the nation [28]. Equally,
200 since much of Iceland's tourism is nature-based and the tourists are motivated by a desire to
201 experience the nation's unique landscape features and fragile wilderness areas [26], this creates
202 complexities for governance institutions [27]. There are challenges associated with infrastructure
203 development, maintaining carrying capacity and crowd management at popular tourist sites,
204 including the world-renowned locations on the Golden Circle route [27].
205

206 **Table 1.** Dimensions of tourism-related synergies and trade-offs in Iceland. (adapted from the
207 framework of [29] and informed by [27] and [18])

Type of impact	Synergies	Trade-offs
Economic dimension Economic environment	Increased expenditure Creation of employment Increase in labour supply Increased value of real estate Increase in standard of living Improved investment in infrastructure and services Increased free trade Increased foreign investment Diversification of economy	Localized inflation and national price increases Replacement of local with foreign labour Greater seasonal unemployment Real estate speculation Increased income gap between wealthy and poor Opportunity cost of investment in tourism means that other services and sectors do not get support Inadequate consideration of alternative investments Inadequate estimation of infrastructure costs of tourism development Increased free trade Loss of local ownership due to increased ownership by investment funds and foreign investors Overdependence on tourism for employment and economic development
Industry and firm	Increased destination awareness Increased investor knowledge concerning the potential for new competition for investment and commercial activity in the destination Development of new infrastructure and visitor facilities Increase in accessibility Improvements in destination image	Acquisition of a poor reputation as a result of inadequate facilities, improper practices or inflated prices Negative reactions from existing local enterprises due to the possibility of commercial competition Inappropriate destination images and brands
Environmental dimension	Changes in natural processes that enhance environmental values Maintenance of biodiversity Maintenance and regeneration of habitat and ecosystems	Changes in natural environmental processes due to air and water pollution, and waste issues Loss of biodiversity and invasive species Destruction of habitat and ecosystems Exceeding physical carrying capacity

Socio-cultural dimension	Strengthening of community values and traditions	Weakening or loss of community values and traditions
Community	Exposure to new ideas through globalization and transnationalism	Increase in criminal activity
	Creation of new community space	Loss of community space
	Greater security presence	Social dislocation
	Tourism as a general force for peace	Exceeding social carrying capacity
	Revival and upkeep of local traditions	Loss of authenticity
Psychological/Individual	Increased local pride and community spirit	Tendency towards defensive attitudes concerning host regions
	Greater cross-cultural understanding	High possibility of misunderstandings leading to host/visitor hostility
	Increased awareness of non-local values and perceptions	Increased alienation due to rapid changes to the local community

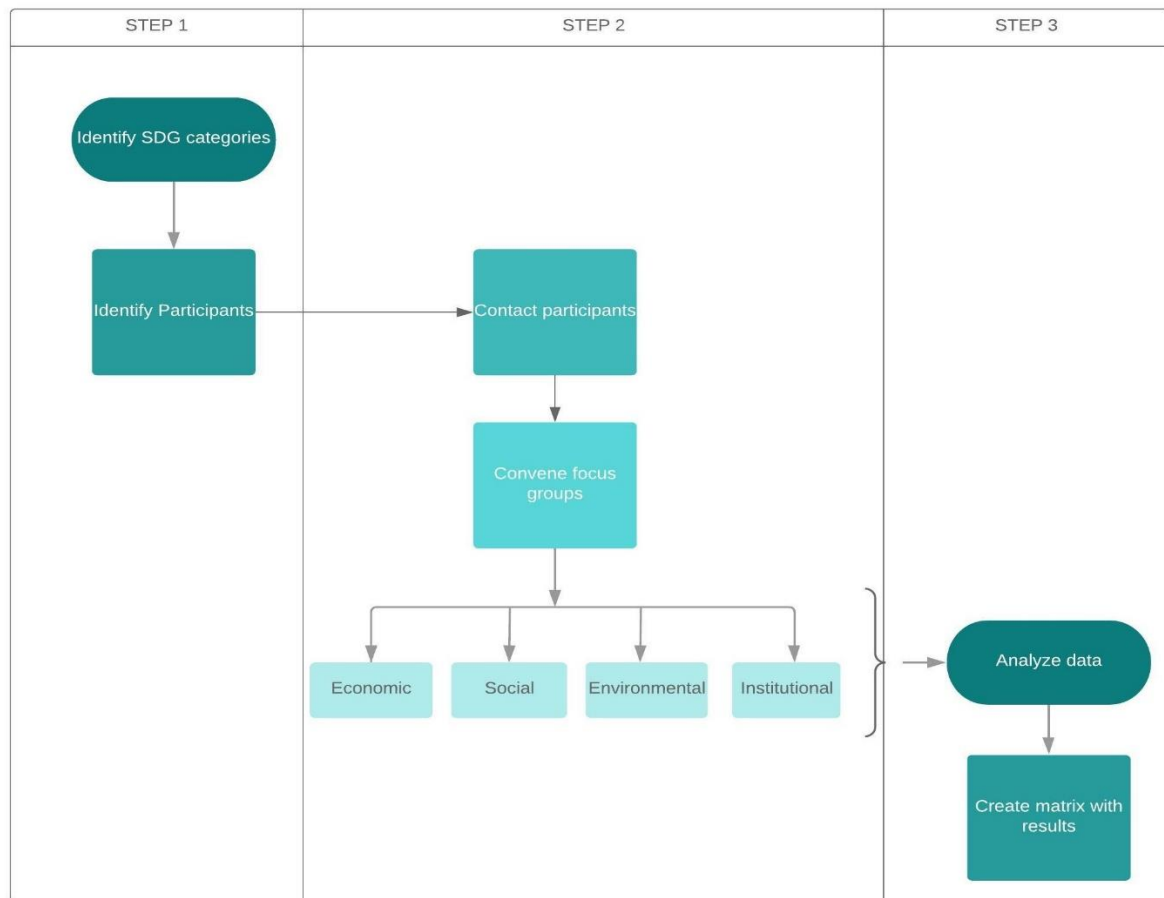
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209 4. Research methods

210 4.1. Focus groups

211 This study was based on a series of four focus group interviews with experts, during which
 212 participants completed evaluative scoresheets on the extent to which the Icelandic tourism sector is
 213 contributing to synergies or trade-offs in meeting the targets of the seventeen SDGs. Focus groups
 214 were selected as the research methodology for this study due to their capacity to integrate the
 215 expertise of relevant experts and use deliberation to stimulate an informed debate [30]. The
 216 interactive nature of the debate presented advantages over interviews with individuals, enabling
 217 participants to share views, hear the views of others, and perhaps refine opinions in the light of what
 218 they have heard [31]. An overview of the method is provided in Figure 1.

219



220

221 **Figure 1.** Flowchart of the research procedure in this study.

222

223 In the first step, the SDGs were categorized into four different thematic categories adapted from
 224 the Stockholm Resilience Institute [32]. The Stockholm Resilience Centre has grouped the SDGs into
 225 three thematic categories: Biosphere (Goals: 6, 13, 14 and 15), Society (Goals: 1, 2, 3, 4, 5, 6, 7, 11 and
 226 16) and Economy (Goals: 8, 9, 10 and 12), with SDG17 as a crosscutting goal [32]. In this study, the
 227 SDGs were grouped according to four categories: Environmental; Economic; Social; and Institutional.
 228 Table 2 sets out this study's categorization.

229

230 **Table 2.** Categorization of SDGs

231

SDG number	Short title
Social	
1	No poverty
2	Zero hunger
3	Good health and well-being
4	Quality education
5	Gender equality
11	Sustainable cities and communities
Environmental	
6	Clean water and sanitation

13	Climate action
14	Life below water
15	Life on land
Economic	
7	Affordable and clean energy
8	Decent work and economic growth
9	Industrial innovation and infrastructure
10	Reduced inequalities
12	Responsible consumption and production
Institutional	
16	Peace, justice and strong institutions
17	Partnerships for the goals

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The categorization thus diverged from the Stockholm Resilience Centre in the following ways:

- SDG7 on affordable and clean energy was grouped within the economic rather than the social theme because of its emphasis on the affordability of energy.
- SDG16 and SDG17 were placed in the institutional theme in order to facilitate discussion on the crosscutting issues of institutional capacity and coordination, data collection and implementation in the context of tourism and the SDGs.

241 4.2. Participants

242 Once the categories were formed, an initial pool of experts was identified by the researchers
243 through stakeholder analysis. Close attention was paid to the stakeholder map recently produced in
244 the 'Nordic Tourism Policy Analysis' report [33], which highlighted all major tourism sector
245 stakeholders in Iceland. Expert opinion then guided the researchers towards approaching the most
246 suitable participants for the theme-based focus groups. The specific participant selection criteria
247 adhered to the approach advocated by [31] and were as follows:

- 248 a) Purposive sampling: Participants was chosen based on their expected knowledge in
249 terms of the content of each SDG goal, their related targets and the tourism sector.
250 Participants were contacted by email and informed about the study and its aims. They
251 were also asked to propose an expert to take their place if they were unable or unwilling
252 to participate in the focus groups. This was done to ensure that participants were key
253 informants in their respective fields and to utilize the snowball method.
- 254 b) Representative sampling: each focus group had to include participants from various
255 stakeholder groups: business, academia, NGOs, tourism organizations and
256 governmental institutions.
- 257 c) Composition: equal numbers of male and female participants were included in the initial
258 pool of participants to ensure an equitable gender balance.

259
260 There were 20 participants in total. Of these, there were 8 males (40%) and 12 females (60%). The
261 number of attendees in each thematic focus group were as follows: environmental (6), economic (4),
262 social (5) and institutional (5). Pilot sessions took place between April 3-24, 2019 to test the materials
263 and procedures. The four focus group meetings took place from April 10 – May 8, 2019 and each
264 lasted approximately 90 minutes.

265
266

267 4.3. Procedures

268 Each focus group discussion was moderated by two members of the research team. The
269 moderators' role was to act as observers and facilitators in the discussion and to ensure that all
270 perspectives were heard and discussed. Materials were distributed in each group with the relevant
271 SDGs and associated targets. Participants were invited to consider and discuss each SDG in their
272 respective thematic group. Each group discussed the extent to which they considered synergies and
273 trade-offs to exist between the Icelandic tourism sector and the targets specific to the SDGs in their
274 respective thematic category. They were also asked to consider how to ameliorate trade-offs through
275 policy-making or other measures. After the focus group participants had deliberated on each SDG
276 target they were asked to score the extent of the trade-off/synergy with the Icelandic tourism sector,
277 with each SDG target evaluated using a seven-point scale. This was the same approach as the one
278 adopted by [4]. The scale was as follows: (-3) strong trade-off; (-2) moderate trade-off; (-1) slight trade-
279 off; (0) neither a trade-off nor a synergy; (+1) slight synergy; (+2) moderate synergy; and (+3) strong
280 synergy³.

281

282 4.4. Analysis

283 The thematic focus group sessions were recorded although participant anonymity was
284 guaranteed. The transcribed data from the discussions was used to enrich the numerical evaluation
285 so as to include lines of reasoning in the final assessment. Each researcher listened to the recordings
286 and summarised them. These summaries were then compared to ensure content validity. Finally, all
287 recorded data was deleted upon completion of the research project. Results from the scoresheets were
288 averaged and reported to two decimal places for each of the SDGs targets. A straight-forward traffic
289 lights system was then applied, akin to the indicator evaluation approach of [34], which fed into an
290 evaluative matrix for all of the 169 targets. A red traffic light equated to a trade-off and was linked to
291 a mean score of between -1.00 and -3.00. A yellow traffic was associated with a mean score of between
292 -1.00 and +1.00, meaning that there was neither a synergy nor a trade-off. A green traffic light equated
293 to a synergy and was linked to a mean score of between +1.00 and +3.00.

294

295 5. Results and discussion

296 Authors should discuss the results and how they can be interpreted in perspective of previous
297 studies and of the working hypotheses. The findings and their implications should be discussed in
298 the broadest context possible. Future research directions may also be highlighted.

299

300 5.1 Summary of main outcomes

301 Table 3 (Appendix B) sets out an overall matrix of scoresheet outcomes from the four focus
302 groups. Mean scores (to 2 decimal places) from participants are provided with respect to each SDG
303 target. Colors for each entry relate to the traffic-lights system of evaluation outlined in section 4.4 of
304 this paper. Gray space reflects cases where a particular target does not exist in relation to a specific
305 SDG. Across the SDGs' 169 targets, there were 32 synergies (18.9%) and 11 trade-offs (6.5%) identified,
306 whilst all other targets were classed in the neither nor category.

307 Across 6 of the 17 SDGs (35.3%), zero synergies were identified. Exactly one-quarter of the 32
308 target synergies related to SDG8 (decent work and economic growth). Other goals with 3 or more
309 synergies were SDG4 (inclusive and equitable education), SDG9 (industrial innovation and
310 infrastructure), SDG11 (sustainable cities and communities), SDG12 (sustainable consumption and

³ Appendix A to this paper includes all of the evaluative scoresheets used in the four focus groups. For ease of reference, these are arranged in numeric order of the SDGs rather than being grouped according to their thematic categories.

311 production) and SDG17 (partnerships for the goals). Out of the 32 target synergies, 5 had mean
312 outcomes of more than 2.00, equating to moderate to strong synergies. These belonged to SDGs 8 (2
313 targets), 9, 11, 12 and 17. The highest mean outcome across all targets was 2.50, identified in
314 connection with SDG8, Target 6 on youth employment.

315 Trade-offs were identified within 7 of the 17 goals (41.2%). However, only SDGs 7 (affordable
316 and clean energy), 14 (life below water) and 15 (life on land) had more than 1 trade-off, and no SDG
317 had more than the 3 linked to SDG14. For three of the SDGs with trade-offs – 14, 15 and 16 (peace,
318 justice and strong institutions) – there were no counterbalancing synergies. Out of the 11 trade-offs,
319 3 had mean target outcomes of less than -2.00, equating to moderate to strong trade-offs. These were
320 linked to SDGs 5 (gender equality), 14 and 15. The lowest mean outcome and thus the largest trade-
321 offs across all targets was -2.40, associated with SDG5, Target 2 (violence against women and human
322 trafficking).

323

324 5.2 Synergies

325

326 5.2.1 Economic

327 The focus group participants communicated the contribution that Iceland's tourism sector has
328 made to economic growth and job creation, reflected in the fact that SDG8 had the most target
329 synergies. Two of the targets linked to SDG8 had mean outcomes of more than 2.00, target 3 relating
330 to entrepreneurship, development and job creation, and target 6 addressing youth employment. Since
331 the collapse of Iceland's banking sector in 2008 [20], tourism in Iceland has been a major driver of
332 economic growth and an aid to economic stability, contributing (both directly and indirectly) about
333 40-50% of the economic growth in Iceland after 2011 [35]. In 2017, tourism outpaced other sectors in
334 Iceland with 42% in foreign exchange earnings [21], making a direct contribution to GDP of 8.6% [36].

335 During the period 2008-2018, the number of people employed in the tourism sector and related
336 activities grew by 98.5% [37]. Since 2015, there has also been a 40% increase in the number of firms in
337 the Icelandic tourism industry [38]. The contribution of tourism to job creation and economic growth
338 in Iceland appeared to be an underlying factor in the synergies found in relation to targets 1, 3 5, 6
339 and 9 of SDG8, with target 9 directly focused on the topic of sustainable tourism and job creation.
340 Although much of the job creation in Iceland's tourism sector has related to traditional service-sector
341 roles, the construction sector has also expanded to try to keep pace with the increased supply of
342 visitors, particularly through the building of hotels and visitor infrastructure [38].

343 Focus group attendees commented on the contribution that the Startup Tourism initiative has
344 made in stimulating innovation and entrepreneurship across the sector in Iceland, as well as leading
345 to job creation among young persons and economic growth. These were discussed as being central
346 to synergies in SDG8 but also SDG9, which focuses more directly on the subject. The strongest
347 synergy (mean of 2.00) was found in relation to Target 1 of SDG9, addressing the creation of resilient
348 and sustainable infrastructure. Targets 3 (access to credit for developing infrastructure) and 4
349 (upgrading of infrastructure using clean technologies) of SDG9 were also found to be synergistic.
350 Focus group participants commented on the recent advancements in infrastructure development
351 linked to Iceland's tourism industry, observing the expansion at Keflavík International Airport and
352 the provision of facilities at the most frequented visitor sites, including the Golden Circle. The airport
353 has expanded in size considerably since 2012 to accommodate increasing numbers of tourists and
354 through-traffic, as it also serves as a hub between Europe and the Americas [35]. There was
355 recognition amongst the participants that the growth of the tourism sector had quelled arguments in
356 Iceland in favour of the expansion of heavy-industries, such as aluminium production, which,
357 although fueled by renewable energy, is carbon intensive.

358 A total of 3 synergies linked to SDG12 were reported based on the scoresheet responses of the
359 focus group participants. The strongest of these were associated with Targets 2 (sustainable
360 management of natural resources) and 8 (information and awareness about sustainable
361 development). Focus group participants reported that the expanded tourism industry had led to both
362 the need for greater management planning and policy interventions concerning the sustainability of

363 Iceland's natural assets, and in turn had increased awareness of such issues amongst the population.
364 These opinions are reflected to some extent in current government policy, which advocates the
365 adoption of financial incentive instruments in the form of a tourism tax from 2020 onwards [39]. In
366 addition, the government's financial plan for the period 2016-2023 earmarked 2.8 billion ISK to
367 tourism-specific development in protected areas and popular destinations throughout the country
368 [39].

369 370 5.2.2 Environmental

371 A total of 3 synergies were identified by focus group participants in connection with the
372 environmental goals. No synergies were identified with respect to SDGs 14 and 15. One of the target
373 synergies related to the cross-cutting objectives of SDG6, focused on supporting and strengthening
374 the participation of local communities in improving water and sanitation management. Focus group
375 participants opined that local communities around Iceland, whose livelihoods greatly depend on
376 tourism, might envisage more sustainable management of water resources and sanitation as being
377 economically advantageous. As far as the authors are aware, there is no documented evidence
378 showing these effects, particularly in relation to sanitation and water treatment issues. On the
379 contrary, there is anecdotal evidence that some areas have reached capacity limits and may soon need
380 to be upgraded in line with increased use [40]. This is also important in terms of reducing ecological
381 impacts to sensitive areas, for example, in Lake Mývatn, where inadequate sewage treatment by
382 hotels in the area has threatened the ecosystem [41]. Another report, commissioned by the Tourism
383 Task Force, assessed access to toilets around the country in 2016. The report found that toilet
384 availability in popular destinations and on the Ring Road which surrounds the island was far from
385 satisfactory and often non-existent [42].

386 The other two synergies linked to SDG13 (climate action) involved numbers 2 and 3.
387 Respectively, these targets address the integration of climate change measures into national
388 policymaking, and education concerning climate change mitigation and adaptation. With regards to
389 both targets, focus group participants suggested that the Icelandic tourism sector can increase
390 pressure on national and local governments to reduce impacts on the climate, in part due to the
391 importance and image of the sector. The increased adoption of certification schemes for quality and
392 environmental management in Icelandic tourism, such as Vakinn, was cited as an example of the
393 tourism industry leading by example and placing indirect pressure on the national government to
394 enact policies which reduce the impacts of the sector.

395 396 5.2.3 Social

397 Across the six SDGs with a social focus, a total of eight synergies were identified, and half of
398 these linked to SDG4. synergies were found linked to SDGs 1 and 3.

399 In association with SDG4, synergies were found in relation to Targets 3, 4 and 7. In the case of
400 Target 3, focus group participants expressed an opinion that the Icelandic tourism industry has
401 developed courses and training for people working in the sector. Participants also contended that the
402 Icelandic tourism sector is making a strong, albeit slightly indirect, contribution to education for
403 sustainable development (Target 7) because the national discourse has been focused on these issues.
404 Although this discourse has not been centered specifically on the term "sustainability", there has
405 always been a lot of discussion about environmental issues such as soil erosion of footpaths and
406 walkways. In addition, focus group participants discussed the role of tourism in Iceland as a
407 promoter of peace via the many cultural exchanges that happen when people travel to the nation and
408 return to their homeland with a new perspective.

409 In relation to the synergy reported for Target 4, focus group participants acknowledged many
410 examples of entrepreneurship in tourism even in the remotest areas of Iceland, which have led to the
411 creation of jobs for Icelanders and necessitated imported labour. In recent years, Icelandic culture has
412 been broadened through increased immigration, as workers have moved to the country in search of
413 employment within the tourism sector. A recent report on tourism and the labour market in the
414 capital area found that about half of the jobs in the tourism sector have been filled by immigrant

415 workers [43]. Foreign immigration to Iceland has increased by 79% since 2011 [44], with the tourism
416 and construction sectors absorbing most of these workers [28, 45]. Many of these workers live and
417 work in new hotels and guesthouses located a considerable distance from the capital city of Reykjavik
418 [43].

419 Other synergies across the socially themed SDGs were Target 3 of SDG2, Target 5 of SDG5, and
420 Targets A and B of SDG11. With regards to Target 3 of SDG2, multiple focus group participants had
421 voiced the viewpoint that remote rural areas in Iceland appeared to be benefiting from tourism, with
422 local agricultural activities and family farms brought to life again through the emergence of
423 diversified income opportunities. The synergy in Target 5 of SDG5 reflected the observation that
424 women have become more prominent in senior positions across the Icelandic workforce, and, specific
425 to Icelandic tourism, female CEOs are in charge of some of the leading companies, including Elding,
426 Icelandair Hotels and the Radisson hotel chain. The synergy identified in relation to Target A of
427 SDG11 appeared to reflect recognition that the expanded Icelandic tourism sector has stimulated the
428 interest of policymakers concerning how to support the growth of cities and towns around Iceland,
429 and how to ensure a more balanced distribution of visitors across the country. Target B of SDG12 was
430 assessed to be synergistic given that the increased number of people present in Iceland has
431 necessitated greater planning by the relevant authorities on disaster management. This is particularly
432 due to possible evacuations caused by volcanic eruptions or glacial outburst floods, either of which
433 might imperil the ring road around Iceland.

434

435 5.2.4 Institutional

436 Four synergies were identified across the two institutionally themed SDGs, all of which related
437 to SDG17. These targets were numbers 1, 14, 16 and 17. With regards to Target 1, focus group
438 participants asserted that the lack of earlier regulation of accommodation platforms, such as Airbnb,
439 has since prompted the tax authorities to clamp down on potential tax evasion practices, albeit they
440 recognized that the practice has not been ameliorated completely.

441 The strongest target synergy concerned number 14, which had a mean score of 2.00. There was
442 recognition among the focus group participants that the Icelandic tourism sector was playing a strong
443 role in ensuring policy coherence for sustainable development. Comments were made about how the
444 Ministry of Tourism, Industry and Innovation had, in 2015, formed a Tourism Task Force which was
445 required to develop a five-year plan for the sustainable development of the industry. The culmination
446 of this work is currently occurring at the same time as a general national debate about how best to
447 preserve Icelandic nature and develop the tourism industry [27].

448 Synergies linked to Targets 16 and 17 related to partnership building among institutions. Focus
449 group participants communicated that tourism to Iceland was emissions intensive due to the
450 remoteness of the island and need for most visitors to fly in and out. The Icelandic tourism sector was
451 deemed to be indirectly highlighting the need for international solutions to the problem of
452 greenhouse gas emissions from the aviation sector. In addition, it was stated that the Icelandic and
453 New Zealand governments were cooperating to find common policy solutions to the sustainability
454 challenge of nature-based tourism on a national scale. Domestically, with respect to Target 17,
455 participants acknowledged that municipalities have responsibility for the development and
456 maintenance of Icelandic tourist sites, but receive little or no financial benefit from the tourist flows.
457 Therefore, public-private partnerships have been increasingly adopted to ensure that the supply of
458 infrastructure meets demand.

459

460 5.3 Trade-offs

461

462 5.3.1 Economic

463 Trade-offs were identified in only one of the five SDGs with an economic theme. These were
464 targets 1 and 2 of SDG7. In relation to Target 1 on access to affordable, reliable and modern energy
465 services, focus group participants voiced concerns that access to energy may come at a cost to tourism
466 due to negative effects on the landscape and natural wilderness. The discussion included a debate

467 about competition between Iceland's energy and tourism sectors regarding the value of nature, with
468 the energy sector potentially demanding access to resources which the tourism sector deems
469 sufficiently valuable that development of energy infrastructure should not be allowed.

470 Although the main focus of the focus group debate was on the advantages of energy provision
471 versus the preservation of natural resources for the benefit of tourists, the participants tapped into a
472 wider debate in Iceland about the relative merits of infrastructure provision and what should be
473 prioritized. The pace of tourism growth has outstripped institutional and governmental capacity to
474 respond in a timely fashion and so various public services and built infrastructure have been put
475 under strain due to the increased numbers of tourists [45]. The airport has expanded in size
476 considerably since 2012 to accommodate increasing numbers of tourists and through-traffic, as it also
477 serves as a hub between Europe and the Americas. Effects of the airport expansion and associated
478 increase in tourist numbers on other infrastructure and services have largely been overlooked [35]. A
479 recent OECD report on Icelandic tourism argued that "major infrastructure decisions...need to be
480 based on sound and wide-ranging analysis", taking into account not only economic effects but also
481 social and environmental impacts [28] (p. 34). In part, this gap between policy and infrastructure
482 needs reflects the initial rationale in the policy sphere during the first few years after the economic
483 recession, wherein the tourism industry was conceptualized as one of the production industries in
484 Iceland's economy. As Jóhannesson and Huijbens (2013) put it, "the mentality in regard to tourism
485 development by the central authorities has to a large extent been similar to the production industries
486 where more fish mean more money and larger aluminium smelters mean greater profits" [46] (p.
487 143).

488 The trade-off identified in relation to number 2 of SDG7 was in relation to the share of renewable
489 energy in Iceland. Although Iceland is world-leading in this regard, the focus groups nevertheless
490 recognized the negative contribution of the expanded rental car market, given its reliance on fossil
491 fuel combustion. Iceland's transportation system is predominantly based on the private car in terms
492 of the most frequent travel mode within the country. As a result, tourism relies heavily on rental cars
493 which have increased rapidly in the last few years from around 5,000 rental cars in 2006 to 21,000 in
494 2016 [47], almost 10% of the car fleet in Iceland is now comprised of rental cars [48]. Apart from the
495 pressures on infrastructure, the increase in cars can lead to more traffic congestion and air pollution
496 [49], and greenhouse gas emissions [50], especially in the capital region. The transportation sector has
497 already been singled out as a major target area for improvement to increase the sustainability of
498 tourism in Iceland [28], it is also one of the nation's main policy avenues for climate action [51]. This
499 is equally the case with transportation to and from Iceland, which is mostly by air, but there is also a
500 growing volume of cruise ship traffic in the summer months [27].

501 502 5.3.2 Environmental

503 Almost half of all the trade-offs across the SDGs were associated with environmentally themed
504 goals. Three trade-offs were determined in connection with SDG14, two in SDG15 and one in SDG6.
505 Zero trade-offs were identified by the focus group participants in SDG13.

506 The three trade-offs associated with SDG14 were numbers 1, 2 and 3. All of the concerns voiced
507 by the focus group participants related to the greenhouse gas emissions of the tourism industry in
508 Iceland. In Iceland, greenhouse gas emissions from tourism have been attributed mostly to the
509 transportation sector, with aviation estimated to account for 50-82% of all tourism emissions
510 depending on the distance of flights [52]. According to the international bunker fuel data held in
511 relation flights to and from Iceland, Iceland's emissions from aviation have more than doubled in the
512 period 2000 to 2016 (the last submission year) [50].

513 In relation to targets 1 and 2 of SDG14, concerns were also raised about the impacts of cruise
514 ships, with trade-offs discussed concerning their use of heavy fuel oil. Cruise ship tourism has also
515 become a potentially significant source of pollution in the last few years. Cruise ships are associated
516 with a number of negative environmental effects including air pollution, polluting discharges such
517 as sewage, bilge oil and chemicals and greenhouse gas emissions [53]. These impacts have yet to be
518 quantified in Iceland although cruise ship passengers have increased from about 28,000 in 2001 to

519 about 145,000 in 2018 [54], an approximate increase of 420%. In relation to target 3 of SDG14, the
520 group opined that the greatest threat to ocean ecosystems is acidification and that this is directly
521 related to the amount of greenhouse gases released. Thus, if tourism in Iceland increases, it will
522 adversely impact the ocean ecosystem, even if indirectly.

523 A trade-off was also identified in relation to Target 3 of SDG6. The focus group participants were
524 concerned about the impacts of the Icelandic tourism sector on water quality, particular in small,
525 remote communities. The example of Lake Mývatn was mentioned. Increases in tourism have placed
526 upwards pressure on current facilities creating the need for upgrades, and focus group participants
527 opined that many very small municipalities are struggling to secure sufficient funds for these.

528 The trade-off in Target 2 of SDG15 related to concerns about afforestation practices in Iceland.
529 Whether the issues raised related to tourism is debatable. Participants observed that the trees planted
530 in Iceland are often not native species. The go-to plants for afforestation are often coniferous rather
531 than birch due to their rapid growth. However, when planted in the wrong sites they can reduce
532 biodiversity and could thus be deemed to be unsustainable.

533 The joint-largest trade off (mean of -2.40) among the environmental goals related to Target 8 of
534 SDG15. This was connected to the potential for tourists to introduce invasive species to Iceland. Focus
535 group participants discussed the potential for freshwater ecosystems to be impacted by alien species
536 through tourism activities, for instance via fishing equipment or wellington boots. Participants also
537 reflected further on the issue of ballast water and cruise ships According to the group, it makes
538 economic sense for cruise ships to unload ballast water at the ports, since doing this when passengers
539 disembark saves time.

540 541 5.3.3 Social

542 Two trade-offs were identified in relation to the socially themed goals. These were Target 2 of
543 SDG5 and Target 1 of SDG11. No trade-offs were found in connection with SDGs1, 2, 3 and 4.

544 Target 2 of SDG5 concerned the elimination of all forms of violence against women in the public
545 and private sphere, including human trafficking and sexual exploitation. It was felt that this situation
546 was worsening in Iceland due to the tourism sector. As far as the authors are aware, there are no
547 academic studies that corroborate the opinions of the focus group, although there have been
548 anecdotal reports in the English-language media [55], a critical US government report on the extent
549 of human trafficking [56], and a recent domestic study by the Icelandic Travel Industry Association
550 on wage exploitation and financial fraud [57].

551 Target 1 of SDG11 concerns access to safe and affordable housing. Focus group participants
552 raised the issue of immigrant workers in the tourism industry being forced to live in unsuitable
553 accommodation, such as converted garages or industrial buildings. There was also discussion
554 concerning the affordability of housing in Iceland due to a supply shortage spawned by the hosting
555 of tourists within the Airbnb market. Although Airbnb has helped to meet the demand for tourist
556 accommodation, it has also led to fewer available apartments for local residents and increased prices
557 in the housing and rental markets. The Central Bank of Iceland estimates that the number of
558 apartments which were mainly used for short-term lodging through Airbnb were about half to more
559 than two thirds of new apartments in 2016 [58]. In total it has been estimated that 15% of the total rise
560 in real house prices in the period 2014-2016 can be attributed to the growth of Airbnb apartments in
561 that period [58]. Housing has therefore become less affordable for young people and low-income
562 households [28]. Immigrants in Iceland are particularly vulnerable to increases in prices in the rental
563 market [59], whilst at the same time as it is more difficult for them to secure rental accommodation
564 [60]. The number of apartments used only for short-term renting did not increase in 2018 and,
565 although there is still a housing shortage it is estimated that the supply of housing, especially
566 affordable dwellings, will gradually rise to match demand over the next few years [38].

567 568 569 570 5.3.4 Institutional

571 A single trade-off was identified, belonging to Target 5 of SDG16. Focus group participants
572 expressed the view that tourism was probably having a countering effect on reducing bribery in all
573 its forms in Iceland. This opinion appeared to be formed from anecdotal evidence about the practices
574 of some tourism companies in Iceland. Examples were cited of hotels selling bottled water to tourists
575 and some restaurants having a tip jar, even though the service charge is included in their menu prices.
576 Equally, the discussion concerning corruption proceeded to focus on issues of rights and power – for
577 example, the individuals and companies who win contracts to provide tourism services, build certain
578 infrastructure, obtain loans, and how these people are connected. Others in the group contended that
579 fixing these issues was not really within the remit of tourism, and these issues were really societal
580 and political challenges for Iceland to address.

581

582 *5.4 Implications of results*

583 This paper set out to evaluate the impacts of Icelandic tourism on performance across all of the
584 SDGs and their respective targets, with the aim of determining whether the sector stimulates
585 synergies and/or trade-offs. The majority of the mean outcomes with respect to the SDG targets
586 showed neither synergies nor trade-offs. Overall, this study suggests that the Icelandic tourism sector
587 makes a largely positive contribution towards the meeting of multiple objectives across the SDGs,
588 with evidence of almost three times more synergies than trade-offs. However, several trade-offs
589 pertain to environmental goals and their incidence and degree should not be understated based on
590 the outcomes from this study.

591 The significance of Iceland's tourism sector to the national economy was reflected in synergistic
592 effects with SDG8. This was the only SDG to have an overall synergy with the Icelandic tourism
593 sector. This outcome should be of interest to tourism companies in Iceland, employees in the sector,
594 politicians and agencies seeking to maximise the economic benefits of tourism across the nation, such
595 as the Iceland Tourism Cluster. There is increasing interest around the world in matching company
596 and business sector objectives with the SDGs and their respective targets, and thus one of the main
597 practical advantages of this work is that it identifies, at least specific to Iceland, the links between
598 corporate activities and SDG targets. New entrepreneurial activities linked to tourism in Iceland,
599 aided and abetted by innovative initiatives such as the Iceland Tourism Cluster and Startup Tourism,
600 directly contribute to job creation and synergies with at least five targets in SDG8, especially number
601 9 on sustainable tourism and job creation.

602 Businesses specializing in infrastructure works may also wish to take note of the results.
603 Synergies in the environmental sector were identified, including a need for communities around
604 Iceland to have sufficient infrastructure to cope with the influx of tourists. In many cases, built
605 infrastructure has been put under strain in recent years due to the large increase in users over a short
606 time period and many roads and various facilities, especially in the countryside, are not up to par
607 [40]. The physical condition of the roads is important for tourism in terms of safety and access to
608 certain areas and can also be an important factor influencing the distribution of visitors around the
609 island. Improved road conditions might reduce the number of incidents that the police and
610 emergency services have to deal with. A prominent example of infrastructural improvement that is
611 important for tourist safety is the changing of single to double-lane bridges, especially on the most
612 frequently used Ring Road around Iceland [40]. The lag in infrastructure development to
613 accommodate the increased numbers of users is partly due to private and public sector oversight as
614 the soaring popularity of Iceland as a tourist destination was relatively unanticipated. In some cases,
615 the lack in appropriate infrastructure is related to the lack of tourism revenues for those
616 municipalities that are responsible for development in their regions [28]. The Federation of Icelandic
617 Industries published a report in 2017 on the state and future outlook of built infrastructure in Iceland.
618 The report assessed the current condition of infrastructure and estimated the associated maintenance
619 costs for the coming decade. The assessment found that the road transport system, sewer and
620 drainage systems, and the other airports and landing areas, received the lowest marks and are in
621 need of maintenance and upgrades in the coming decade [40].

622 Politicians, relevant ministries (for example, the Ministry of Environment and Natural
623 Resources, and Ministry of Tourism, Industry and Innovation) and agencies working to increase
624 Iceland's share of renewable energy and reduce greenhouse gas emissions may wish to take note of
625 environmental trade-offs linked to the fossil fuel consumption of tourists, especially via cruise ships,
626 international aviation and rental car usage. Cruise ship tourism has also become a potentially
627 significant source of pollution in the last few years. Cruise ships are associated with a number of
628 negative environmental effects including air pollution, polluting discharges such as sewage, bilge oil
629 and chemicals and greenhouse gas emissions [53]. These impacts have yet to be quantified in Iceland
630 although cruise ship passengers have increased from about 28,000 in 2001 to about 145,000 in 2018
631 [54], an approximate increase of 420%. The hiring of rental cars has increased considerably in the last
632 few years from around 5,000 rental cars in 2006 to 21,000 in 2016 [47], and they now form almost 10%
633 of the car fleet in Iceland [48]. Apart from the pressures on infrastructure, the increase in cars can lead
634 to more traffic congestion and air pollution [49], and greenhouse gas emissions [50], especially in the
635 busy capital region. The transportation sector has already been singled out as a major target area for
636 improvement in regard to increasing the sustainability of tourism in Iceland [28], as well as being one
637 of the nation's main policy avenues for climate action set out in Iceland's Climate Action Plan for
638 2018-2030 [51].

639 Concern was also voiced during the focus groups and reflected in the quantitative outcomes that
640 some migrant workers in the Icelandic tourism industry were exploited and abused during their time
641 working in Iceland. These concerns also been voiced in the English-language media in Iceland [61,
642 62]. This should be of concern to various institutions in Iceland, including the Red Cross,
643 municipalities, the police (especially in relation to stories of human trafficking) and the Ministry of
644 Welfare.

645 Outcomes from this study should be of interest to a very broad array of domestic stakeholders,
646 including individuals training to work in the Icelandic tourism sector, service providers, and
647 policymakers who are tasked with maximising the benefits of synergies and either minimizing the
648 extent of trade-offs, or finding ways of intervening to transform these into synergies. They should
649 also be relevant to academics specializing in tourism studies, as well as those from other disciplines
650 seeking straight-forward and practical methodologies that can be deployed to evaluate the
651 contribution of economic sectors to performance across all SDGs.

652

653 *5.5 Contribution of Iceland's tourism sector to meeting the SDGs*

654 It was made clear to focus group participants that they were asked to assess the contribution of
655 tourism to meeting or not meeting the SDGs and their respective targets. They were specifically
656 requested not to evaluate whether a particular SDG or target was being met. However, it is important
657 to consider the outcomes from this study in the light of Iceland's current performance across the
658 SDGs.

659 A recent evaluation by the OECD reviewed SDG performance for all member states. In the case
660 of Iceland, it was found that the nation had already achieved 17 of the targets based on the data
661 available for 111 of the 169 targets [63]. The nation was compliant in areas relating to adult
662 information and communication skills, air quality and the share of renewable energy. Even though
663 Iceland was compliant, outcomes from this study therefore suggest that the tourism industry presents
664 one of the few drawbacks linked to even better performance for air quality and the share of renewable
665 energy in Iceland. This is reflected in the fact that a transition to electric car usage is one of the main
666 policy ambitions of Iceland's Climate Action Plan for 2018-2030 [51]. Equally, objectives 12, 13 and 14
667 of Iceland's Climate Action Plan recognize the environmental impacts of cruise ships and shipping,
668 seeking to increase clean energy use for ferries, increasing the share of renewable energy utilised by
669 ships, and advancing electrical infrastructure in harbors, respectively [51].

670 The OECD assessment also observed several challenges for Iceland in meeting the SDGs, with
671 the nation considered to be very far away from meeting 5% of the targets [63]. These include targets
672 relating to energy intensity and hazardous waste. The outcomes from this study suggest that the

673 Icelandic tourism industry is unlikely to make either a positive or negative contribution to meeting
674 the targets related to energy intensity or hazardous waste.

675 Iceland was assessed as being furthest away from meeting the SDGs on energy, sustainable
676 production and biodiversity (SDGs 7, 12 and 15, respectively) [63]. There are parallels with the results
677 of the focus groups from this study. Their assessment revealed two trade-offs linked to SDG7 and
678 two trade-offs for SDG15. Trade-offs linked to SDG7 concerned potential conflicts between increased
679 renewable energy generation and the need to preserve nature for the benefit of tourists. This
680 argument is part of an ongoing debate in Iceland about whether to establish a national park in the
681 central highlands of Iceland, which would preserve the landscapes for Icelanders and tourists [64].
682 Although forest-based tourism is very limited in Iceland, focus group participants also recognized
683 the tendency to plant non-native tree species as part of Iceland's programme of afforestation, a
684 strategy mainly aimed at sequestering greenhouse gas emissions in pursuit of Iceland's climate
685 change objectives. This approach was deemed to be contrary to the biodiversity objectives of SDG15.

686

687 *5.6 Broader applicability of methods to other contexts*

688 The methodological approach adopted in this paper has relevance and applicability to other
689 studies seeking to acquire a conceptual understanding of the links between a specific sector of an
690 economy and its contribution to SDG outcomes. The study outcomes may also be of particular interest
691 to other nations who rely heavily on nature-based tourism, such as New Zealand, Australia and Costa
692 Rica. Equally, the outcomes pertaining to developing nations with significant tourism sectors may be
693 very different. Nature-based tourism has long been advanced as a means of generating economic
694 growth, particularly in least economically developed African states [65]. If a similar study to this one
695 were to be adopted in a developing nation, the results might be quite different. This study found no
696 synergies or trade-offs relating to 126 of the 169 targets (74.6%) across the seventeen SDGs. Very often
697 this was because of the manner in which the targets were worded, which rendered objectives specific
698 to developing nations or small island states. Due to the lack of flexibility to encompass separate
699 objectives for developed nations, such as Iceland, many of the targets were deemed by the focus
700 group participants to be irrelevant, especially in the social and institutional sessions. Many more of
701 these targets would very likely be relevant and synergistic with tourism and the sector's contribution
702 to wealth creation in developing nations, for instance those relating to poverty eradication, access to
703 basic services, and ensuring the full and active participation of women in employment.

704

705 *5.7 Scope of coverage of the SDGs in relation to the sustainability impacts of Icelandic tourism*

706 The aim of this paper was not to provide a comprehensive evaluation of the sustainability
707 impacts of tourism in Iceland, but rather to uncover links between impacts and the SDGs. A number
708 of sustainability impacts reported in the studies of [18] and [27] were not discussed in the focus
709 groups, or were perhaps not deemed to be connectable to the SDGs and their respective targets. These
710 included impacts that could be considered to be synergies and trade-offs, which, for completeness,
711 are discussed in more detail here. It should be remembered that the aim of the SDGs is not to capture
712 every component of sustainability specific to a nation or an economic sector. Given that the SDGs are
713 not comprehensive but rather represent a means to fulfilling a global vision, nations must also
714 identify the issues and targets that are most relevant.

715

716 *5.7.1 Economic impacts*

717 Icelandic tourism has had a positive effect on state revenues due to increased VAT on typical
718 tourist products. In 2016 the share of turnover from travel agencies and tour operators accounted for
719 one-quarter of total taxable turnover. The share of turnover from hotels and other tourist
720 accommodation, as well as passenger land transport has also increased [28]. On the other hand, for
721 most of the past decade the Icelandic currency has been appreciating in value due to increased
722 inflows of foreign currency, and this can be associated with negative effects. As the tourism sector
723 has grown and the krona appreciated, price inflation (especially related to the costs of housing, its
724 limited supply and population growth) and upward pressure has been placed on wages. In this light,

725 some tourist firms have been outsourcing part of their operations to reduce wage-related costs (e.g.
726 “WOW Air becomes”, 2016; “Icelandic tour operator”, 2018) and there has been some consolidation
727 of tourism firms [66].

728 Aside from the effects at the level of industry/firms and the economy, currency fluctuations have
729 also had an impact on the cost of living and discretionary spending of the Icelandic population [67].
730 The effects of inflation in particular on local prices and loans can be particularly burdensome for low
731 income households. The effects of tourism on the housing market has been a topic of considerable
732 debate in the last few years. With increased tourist numbers came increased demand for short-term
733 accommodation, especially in the capital area. Housing has, thus, become less affordable for young
734 people and low-income households [28]. Immigrants in Iceland are particularly vulnerable to
735 increases in prices in the rental market [59], and at the same time as it is more difficult for them to
736 secure rental accommodation [60].

737

738 *5.7.2 Environmental impacts*

739 Impacts on the environment have been recognized as a major challenge for the Icelandic tourism
740 sector [68, 69]. Although policy documents at both the governmental and industry level have
741 emphasised nature as a major resource for tourism, policy implementation, funds and institutional
742 coordination to address the issues have been lacking [28, 70 and 71]. Underlying the issue of policy
743 implementation is a dearth of data regarding the environmental impacts from tourism [72]. The
744 collection of integral economic data for the tourism sector in Iceland has outpaced the collection of
745 environmental data [28]. Effort is now under way to develop sustainability indicators for the sector
746 [49] and for Iceland’s protected areas in order to improve data collection, monitoring and
747 management [71].

748 The majority of studies that have been carried out in Iceland regarding impacts from tourism
749 have been based on the principles of carrying capacity i.e. the level of use an area can accommodate
750 [73]. Of the numerous carrying capacity studies that have been carried out since 1999, in Iceland only
751 six have looked at environmental impacts [74]. Studies have estimated the possible impact upon
752 and/or extent of recreational trampling and the erosion of trails and tracks in popular destinations
753 and national parks in the country [72, 75 and 76]. Iceland’s vegetation is very sensitive and even low
754 levels of degradation of vegetation and soil around popular hiking trails can have serious
755 consequences for the underlying soil resource. When the underlying soil resource is left exposed to
756 wind and water it often leads to further degradation. For the same reason, off-road driving in Iceland
757 can be especially damaging as it degrades the landscape and leads to further soil erosion [77].
758 Although off-road driving is illegal in Iceland, with large fines levelled against offenders,
759 enforcement depends on monitoring which is often lacking [68].

760 The Environment Agency of Iceland also releases annual reports on the state of protected areas
761 in Iceland, a red list detailing areas under threat is issued every two years. In its most recent report,
762 the increased number of visitors is listed as a threat factor in relation to nearly all of the red-listed
763 sites [78]. Reducing the high seasonality of tourism did not have the anticipated positive effect on
764 protected areas, as popular (and often protected) sites have less time to recover between periods of
765 visitation, in part because the growth in the number of tourists exceeded expectations [78].

766 Tourism can also impact on biodiversity through, for example, behavioral disruption via wildlife
767 watching tours or the introduction of invasive species. Studies have found, for example, that whale-
768 watching may affect the feeding behaviour of minke whales in Iceland [79], and seals were also found
769 to show signs of distress under certain conditions during seal-watching [80]. Tourists can also
770 inadvertently carry with them invasive pathogens, plants and animals. One study found that seeds
771 or other plant propagules of non-native species have spread between geothermal areas in southern
772 Iceland via the hiking shoes of visitors [81]. Tourism can, however, also be a positive force in some
773 cases by supporting the protection of ecosystems from other potentially more disruptive forms of
774 development or activity e.g. energy production [82] or whaling [83].

775

776

777 5.7.3 Social impacts

778 The tourism industry in Iceland has had a number of social effects in terms of employment,
779 wages, population effects, infrastructure and services. Although tourism has played a major role in
780 reducing unemployment in Iceland it is also important to examine the structure of employment in
781 terms of the types of jobs created and wages. Although tourism can create a lot of skilled positions it
782 can also create a lot of low-skilled and low-paying jobs [28]. In addition, as was touched on in the
783 socially themed focus group, it is important to consider the working conditions and labour rights of
784 people employed directly by the tourism sector, and also those employed indirectly such as in the
785 construction industry.

786 A recent report on tourism and the labour market in the capital area found that about half of the
787 jobs in the tourism sector have been filled by immigrant workers [43]. Indeed, foreign immigration
788 to Iceland has increased by 79% since 2011 [44], with the tourism and construction sectors absorbing
789 most of these workers [28, 48]. Iceland has dealt with large influxes in immigration before during
790 economic booms, however, there has been some debate concerning the emigration of Icelandic
791 citizens which has increased again since the last major emigration event following the banking
792 collapse of 2008 [84, 85]. In its report on the labour market, the Icelandic Confederation of Labour
793 (ICL), an umbrella organization of 48 worker unions, expressed concerns that the recent economic
794 boom is not providing enough jobs for highly educated people, leading to a potential “brain drain”
795 from Iceland [85]. The increase in the number of foreign workers in Iceland has also led to concerns
796 about the labour rights of foreign workers, especially in relation to internships and “room and board”
797 employment contracts instead of paid wages [57, 86]. The possibility that the number of unregistered
798 workers may be growing has also been a cause for concern in recent years [28, 57].

799 The recent increase in tourism has created pressure on public services such as, health, policing,
800 and search and rescue operations. These areas have all had to accommodate larger numbers than
801 they have in the recent past. Iceland’s health sector provided health care services to 14,500 tourists in
802 2016, which amounts to a 146% increase since 2009 [87]. For tourists that visit from the European
803 Union (EU) those services are covered by the European insurance system whereas tourists from
804 outside of the EU are covered by other insurance schemes [87]. Reimbursement for services has been
805 partial as it has been difficult in some cases to track down patients once they have left the country
806 [28].

807 Iceland’s harsh environment combined with inexperienced visitors has often led to tourists
808 getting lost or into accidents and as a result the police and search and rescue services have had to
809 deal with more incidents. Police resources may be especially strained in the south-west of Iceland
810 where there was an increase of 800,000 tourists in the period 2007-2015, but the number of police
811 officers per inhabitant in the region has remained unchanged over this period [49]. The search and
812 rescue teams (which are largely dependent on volunteers) experienced a large increase in the number
813 of operations between the years 2012-2014. They responded to this increase by investing in more
814 preventative measures and increasing safety information dispersal to tourists. The number of
815 reported incidents decreased somewhat after 2015 and was at its lowest in 2017, a trend which the
816 Icelandic Association for Search and Rescue (ICE-SAR) attributed to better weather conditions and
817 their increased information and prevention activities [88]. A contingency plan was also made by the
818 Icelandic Tourist Board and the State Police for the first time in 2018 to guide coordinated responses
819 to serious events in order to ensure tourists’ safety [89].

820 5.8 Methodological limitations

822 Insights gleaned from focus groups rely heavily on the availability and willingness of experts to
823 contribute to the panels. Although the researchers made an exhaustive effort to identify and source
824 experts that were best suited to contribute to the deliberations, a small number were unavailable –
825 for example, a representative from the police for the institutionally themed session – and some
826 cancelled their participation on the day. This may have had an impact on the results in ways which
827 are difficult to quantify. Equally, the irrelevance of many of the SDG targets to a developed nation

828 such as Iceland, or a persistent failure to identify links between the Icelandic tourism sector and the
829 SDG targets, may have led to some experts becoming frustrated with the evaluative process.

830 The scoresheet system was a useful means of establishing the conceptual links between the
831 Icelandic tourism sector and the SDGs, but the extent of the identified synergies and trade-offs should
832 be considered with some degree of caution. Furthermore, the arbitrary decision on the part of the
833 researchers to classify all mean target outcomes in the range of -1 to +1 as neither synergies nor trade-
834 offs, may mean that some minor synergies and trade-offs were overlooked. This study does not
835 provide a substitute for quantitative evaluations of impacts, but, especially in the case of trade-offs,
836 rather implies areas needing further evaluation, monitoring and consideration by the Icelandic
837 Tourism Task Force, which is focused closely on the local sustainability impacts of Icelandic tourism.
838 Additionally, the extent of trade-offs and synergies identified in this study may in part be reflective
839 of emotional responses to the issues involved, for instance, the extent of social impacts relating to
840 human trafficking. That is not to say that this impact is minor in actuality, but rather that its extent
841 needs further evaluation.

842
843

844 6. Conclusion

845 The complex interactions between the SDGs and their respective targets have demanded further
846 analysis of the links between key economic sectors and performance outcomes across all of the SDGs
847 169 targets. This study used four theme-based focus groups and evaluative scoresheets to determine
848 the synergies and trade-offs pertaining to Iceland's tourism sector, which has almost singlehandedly
849 been responsible for transforming the nation's economy following its financial crisis of 2008. Based
850 on the results, it was determined that there were a total of 32 synergies and 11 trade-offs across the
851 SDGs 169 targets. Key areas for Icelandic policymakers to focus on in the next few years include
852 reducing greenhouse gas emissions associated with the transportation of tourists to and within
853 Iceland, particularly via aviation, cruise ships and rental cars. Equally, attention needs to be paid to
854 the pressing demands on local infrastructure stimulated by the influx of tourists to Iceland,
855 particularly the nation's road network and sewage systems. Maximising synergies across the SDGs
856 economic dimensions will require the retention of a considerable volume of tourists to Iceland, many
857 multiples greater than the scale of the national population. Mitigating trade-offs will necessitate
858 policy interventions by various governance institutes and investment decisions to minimise the
859 negative environmental impacts of Icelandic tourism and ensure critical infrastructure is sufficient in
860 scale and standard.

861 This study stimulates several ideas for further research. In particular, greater consideration
862 needs to be given to the particular policy initiatives that could be applied to minimise the extent of
863 trade-offs and opportunities to transform these into synergies. Additionally, the contribution of local
864 Icelandic communities, which are heavily dependent on tourism, needs to be considered in more
865 detail linked to Iceland's SDG performance. The methodology adopted in this paper could also be
866 applied to other key sectors of the Icelandic economy, such as fisheries, to gain a broader portrayal
867 of the relationship between economic sectors and SDG performance. All of these research lines are
868 equally relevant to other nation-states.

869

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879 publish the results.

880 **Appendix A**

881 Evaluative scoresheets, including all SDGs and respective targets

882

883 **Appendix B**

884 **Table 3.** Evaluative matrix of synergies and trade-offs between Icelandic tourism and SDG
885 targets

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887

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