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A systematic review of the state of knowledge on environment and the Belt and Road Initiative

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Abstract:

The Belt and Road Initiative (BRI) is a China-led global initiative that was officially launched in 2013. The wealth of research available on the BRI has been subject to few comprehensive reviews to date, reviews including both English and Chinese language research are even rarer still. In addition, many of the projects associated with the BRI involve infrastructure development, power generation and transmission system development leading to concern around environmental sustainability. As a result, China proposed the “Green BRI” concept in 2017 to improve the environmental credentials of the initiative and enhance sustainability, yet the assessment of how the BRI is tied to sustainability is still unsure.

In this study, we use the methodology of systematic review to address the following questions: 1) what the overall feature of BRI impact related research is; 2) how have the impacts of BRI been measured; 3) what gaps exist in terms of the scale of impact addressed by the literature; 4) how many studies map with environmental-focused SDGs; 5) what percentage of impact literature on the BRI is focused on environment or biodiversity; 6) is there a language bias between Chinese- and English-language literature. This review provides value as it examines PR and non-PR research to assess how observers in both English and Chinese are prioritizing and presenting the impacts of the BRI to improve understanding of the information available within different decision-making contexts.

This study shows that, to date though, there remains no agreed definition or set of matrices of what constitutes green development under the BRI, meaning specific guidance on what can be defined as green (type of project) and what measurement structure is required (including prior informed consent of communities, independent impact assessments, strategic assessments) is unavailable. The BRI research is not discussed along with SDGs or sustainability as we expect. There is scope and need to consider how the sustainability of the BRI can be evaluated so that improvement solutions can be developed for its accountability and sustainability.

To add, in both English- and Chinese-language publications, the non-peer-reviewed papers tend toward a more polarized interpretation of the likely impacts of BRI projects whilst peer-reviewed publications offered a more nuanced assessment. Papers in Chinese provide more qualitative discussions of the BRI whilst papers in English give more quantitative assessments. In both

43 languages, the discussion around BRI impacts is qualitative, suggesting a lack of data on which to
44 base quantitative research and develop clear and specific recommendations for action.

45 **Keywords:** The Belt and Road Initiative; BRI; Green BRI; SDGs; Language

46

47 **Introduction**

48 The Belt and Road Initiative (BRI) was proposed in 2013 by the Chinese President Xi Jinping (Xi, 2013)
49 and is potentially the largest and most ambitious infrastructure development and investment initiative
50 of the 21st century (Wang Y. , 2017).

51 The BRI involves both maritime infrastructure, building and enhancing port connectivity between BRI
52 countries in Europe, Africa, and other Asian nations as well as a terrestrial “belt” of roads, railways,
53 energy production and increased international connectivity at land borders from China to western
54 Europe. As of 2020, the BRI has already generated significant investment with a value of projects
55 estimated at \$3.67 trillion, and Memoranda of Understanding (MoU) signed with 138 countries in
56 Asia, Europe, Africa, Oceania, and South America (Ruta, 2019; Chance, 2017).

57 These infrastructure projects all have the potential to deliver significant economic benefits for
58 recipient nations, but they also have historically generated significant negative social and
59 environmental impacts through increased emissions, resource over-extraction, habitat loss and
60 pollution (Hughes, 2019; Lechner, 2019). While there is much publication about the BRI’s economic
61 and political influence, the impacts of the BRI on environment and biodiversity receive much less
62 attention (Ascensão, 2018)

63 The BRI countries (excluding China) account for 26% of global CO₂ emissions. This contribution is
64 expected to grow to 50% by 2050 in business-as-usual scenarios (Zhou, 2018; Pike, 2019). More
65 importantly, Yin’s (2019) study indicates that the BRI covers an area that has the world’s most
66 prominent ecological problems. Developing countries along the Belt and Road are facing serious
67 environmental security challenges, and their ability to handle these challenges is very weak. Some
68 countries along the BRI have a poor record of environmental governance, which means that projects
69 may be undertaken without pressure to comply with social and environmental standards (Yin, 2019).

70 In recent years, recognising the environmental impacts, the Ministry of Ecology and Environment
71 (MEE) of China published its Green Development Guidelines for Overseas Investment and Cooperation
72 in 2013 and the latest updated version in 2021 encouraged Chinese companies to follow international
73 green rules and standards if local standards were insufficient (BRIGC', 2021). The initial guideline was
74 updated with emphasis of a green BRI, ensuring “ecological civilization”, “green development
75 concepts”, “principles of resource efficiency and environmental friendliness” (MEE, 2019). The
76 guideline also touched on issues including climate, biodiversity, and pollution. However, as these
77 guidelines are not mandatory and rely on companies and investors to proactively take action, it is hard
78 to examine the effectiveness of their implementation in the absence of additional incentives or
79 constraints. There has been very limited research examining the state of research of green BRI.
80 Research and policies regarding this initiative can largely decide on if it can be used to promote green
81 and sustainable development, instead of the opposite, but before this, we need to have a great
82 understanding of state of current knowledge.

83 Furthermore, Vice-President Han of the BRI framed that the BRI should be “green, low-carbon, circular
84 and sustainable” (Hou, 2018), and a “green BRI” is supposed to align with the UN’s Sustainable
85 Development Goals (SDGs) (MEE, 2019). Meanwhile, the original 64 BRI countries collectively account

86 for over 30% of global GDP, 62% of the global population, and 75% of known energy reserves (World
87 Bank, 2018b), and the SDGs can only be met if they are an integral part of the development paths of
88 countries under the BRI (BRIGC, 2020). Understanding how BRI's impact is examined in align with SDGs
89 implementation, is also crucial.

90 On the other hand, due to its geographical scope as well as massive nature of the investment, the
91 BRI has attracted a substantial amount of publications around the globe, according to our very initial
92 search of literature. Contrastingly, not many comprehensive reviews have been carried out, but only
93 very few reviews in the last three years (Teo HC, 2020; Andrei Panibratov, 2022; Thürer, 2019).
94 These reviews are rarely looking at environmental perspectives either.

95 Additionally, there has been a growing awareness of a need to explore the biases that may occur
96 when a subject is only studied or reviewed from the perspective of one language, which is possibly
97 leading to substantial biases, as some researchers have estimated that environmental research
98 published in non-English languages consist about 2/3 of the total amount (Amano T, 2016; Teo HC,
99 2020). Consequently, with respect to the BRI, there are only a small number of studies that have
100 attempted to analyse the language gaps between Chinese and international perceptions of the BRI
101 (Herrero and Xu 2019; Xiao et al. 2019; (Teo HC, 2020). Most of these rely on sentiment analysis with
102 only one based on a systematic review to evaluate patterns of green BRI research. However, this
103 study only focuses primarily on the publications specifically evaluating green aspects of the BRI (Teo
104 HC, 2020).

105 Based on above, we have identified a few questions that have not been sufficiently answered: 1) what
106 the overall feature of BRI impact related research is; 2) how have the impacts of BRI been measured;
107 3) what gaps exist in terms of the scale of impact addressed by the literature; 4) how many studies
108 map with environmental-focused SDGs; 5) what percentage of impact literature on the BRI is focused
109 on environment or biodiversity; 6) is there a language bias between Chinese- and English-language
110 literature.

111 A systematic review can combine a variety of information sources including documentation,
112 interviews, and artefacts, and perform large scale quantitative analysis using systems designed to
113 minimise bias (Scholz, 2011). We used this method to summarize the research on BRI impact at a
114 global scale between 2013 and 2021, and to answer the six questions raised above.

115

116 **Methodology**

117 **Systematic Review**

118 For this study, an a priori systematic review method (Scholz, 2011; Becker L, 2009) utilising human
119 reviewers and machine algorithms was used in order to identify and collate articles published relating
120 to the BRI from 2014 to May 2020.

121 To identify the research specifically examining the BRI impacts, we have used a framework of PESTE
122 (political, economic, social, technical and environmental) to scope the search (Aguilar, 1967;
123 Armstrong, 2006). Search strings were defined for English and Chinese language literature/web-search
124 databases including Google, Scopus, Proquest and CNKI. The identified results were screened using
125 Python, Rayyan and an active learning technique on ASReview Lab to exclude irrelevant and
126 repetitious articles with less manual input (ASReview, 2020; Settles, 2012; Harrison, 2020). 10 per cent
127 of these results were then screened by the author based on abstracts and keywords with narrative
128 inclusion criteria, and the algorithms were then used to automatically screen the remaining literature.

129 The original search was performed in June 2020. Notably, the algorithm of search engines can lead to
130 different search results based on the geographical location (Rovira, 2021), searched topic
131 (Mowshowitz, 2005), search language (Rovira, 2021; Vaughan, 2004), etc. Google scholar was
132 therefore not used in the original search due to the risk of bias emerging from the algorithms
133 contained within the search engine. Baidu or Baiduxueshu (百度学术) was not used for the same
134 reason.

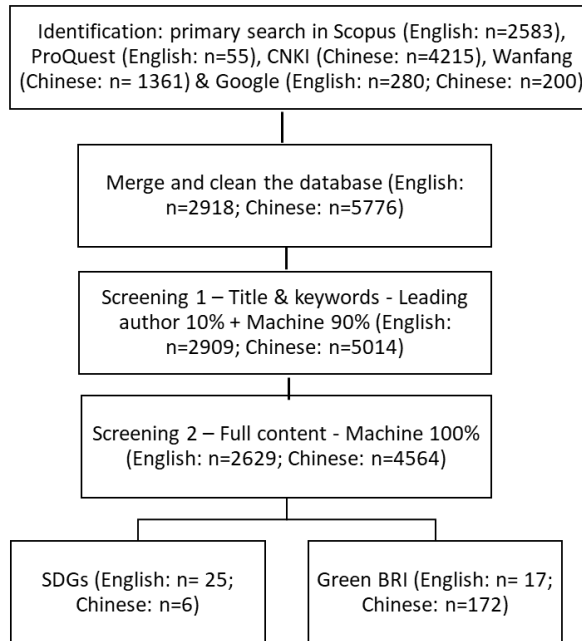
135 Due to the length of this study has taken, and the new publications have arisen since our initial search,
136 we acknowledge the need to do a follow-up search. In May 2021 this paper was updated with an
137 additional round of key word searches in Google, Google scholar, Baidu (百度) and Baiduxueshu (百
138 度学术) completed in order to update the literature referenced. This has resulted in the inclusion of
139 a number of more recent relevant studies, for consistency the search strings used during the update
140 were the same as during the original collation of reports. Whilst Baiduxueshu (百度学术) and Google
141 Scholar were not used initially to avoid implicit algorithm bias emerging it was used in the update for
142 the sake of finding the widest range of results. This returned a number of results from prior to May
143 2020 that had not been found in the original systematic review, this indicates that the academic
144 databases used have some limitations in terms of coverage.

145 More details of the search strings, inclusive criteria in the screening and screening process can be
146 found in *Supplement Document I*.

147 **Key word search**

148 This review assessed the level of research that has been published to date examining the impacts of
149 the BRI. As discussed in the introduction, we are particularly interested in understanding the BRI
150 research related to SDGs and Green BRI, so we have used the key word searches in the database. The
151 relevant results were then returned under categories of interest including SDGs and green BRI. Each
152 search was performed independently from the other and completed in both Chinese and English.

153 Fig 1 is a simplified PRISMA flowchart of the methodology; full search strings and screening keywords
154 can be found in *Supplement Document I*.



155

156

Fig 1. Flow Diagram Outlining Search Steps and Screening Results

157

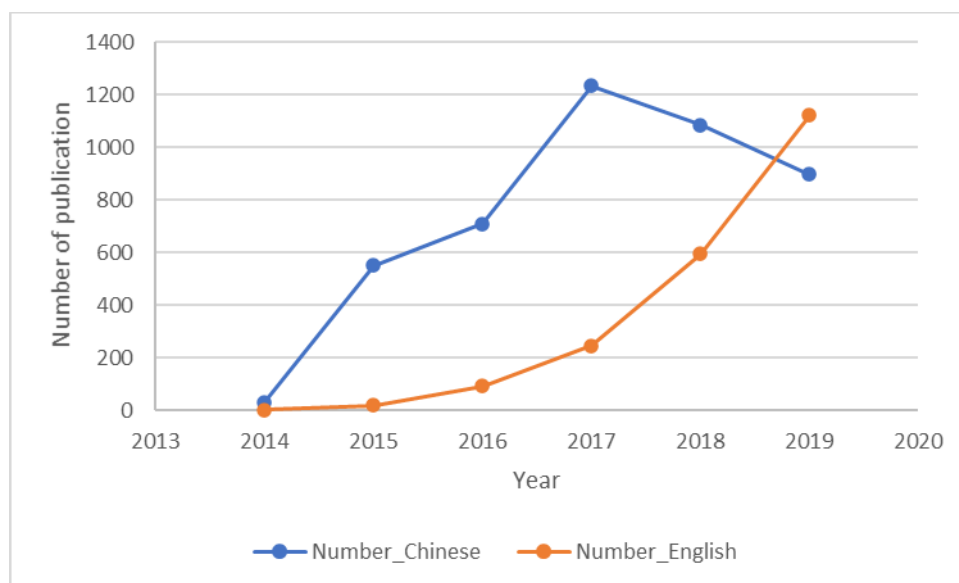
158 Results

159 Publication features

160 Number of publications

161 Through PRISMA flowchart, for BRI impact topic in various disciplines, we found 4564 publications in
 162 Chinese and 2629 in English between January 2014 and May 2020. While total number of Chinese is
 163 higher, English publication kept increasing and exceeded Chinese publication in 2019 (Fig. 2).

164 Publications in Chinese reached its peak in 2017 and have tapered off since then. We did not include
 165 number of publications in 2020 for the trend presence because our search covered the first half of
 166 2020 and could not present whole year status.



167

168 **Fig 2. Number of impact papers on the BRI recorded in both the English and Chinese databases**

169 ***Geographical patterns of the publications***

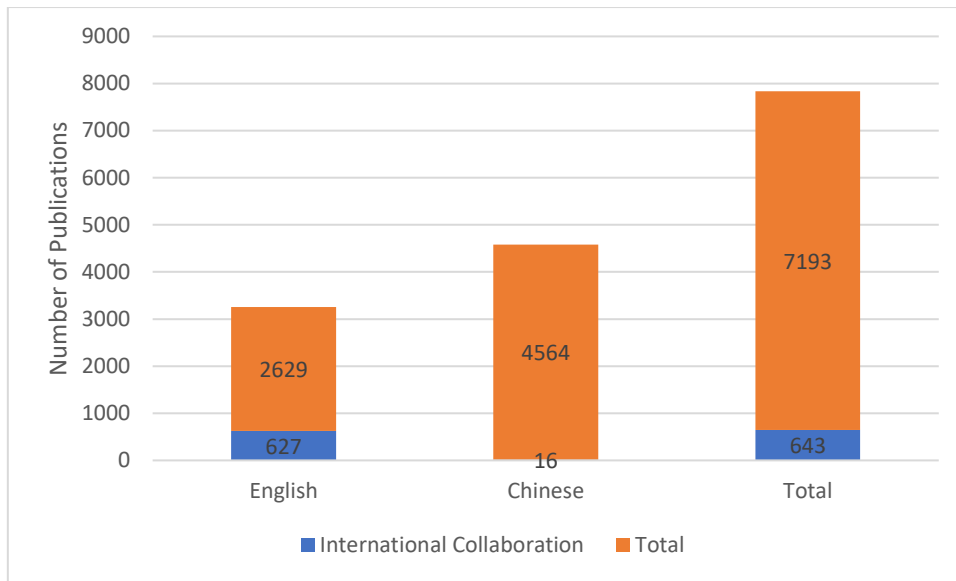
170 To explore the origin of BRI impact research, we extracted and mapped data of geographic location
171 for first author affiliation from 7,074 articles (Fig 3). Chinese authors was the dominant origin most
172 (82.06%), followed by authors from the United States (186, 2.6%), the United Kingdom (120, 1.7%),
173 Australia (118, 1.7%) and Russia (79, 1.1%). We then went through names of all these first authors in
174 English publications and found most authors' names follow Chinese name pattern, which indicates
175 they may be Chinese also. The global geographical patterns of the publications are mapped out in
176 *supplement document II*.

177 It is noted that this result can only present authors among Chinese or English publication and could
178 not present publication in other language. This is potentially a bias from our decision to compare
179 English and Chinese language publications. Although there are officially 64 original BRI countries¹,
180 only Russia (4th, 79), Singapore (5th, 69) and Malaysia (10th, 40) appear as the countries contributing
181 substantially to the literature on the BRI. Most BRI countries do not list English as their official
182 language, which may have caused that BRI countries are comparatively less engaged than many
183 English-speaking countries.

184 ***International collaborations patterns***

185 We identified international collaboration between authors from more than one country within a
186 single publication. English-language publications appear to show more activeness in international
187 collaboration (23.85%) than Chinese -language publications (< 1% involving international
188 collaboration). The total percentage of international collaboration across all publications is only
189 8.94%, which is disappointing considering the fact that the BRI is supposed to be a cross-border
190 initiative, and thus cooperation in publications could be expected. Fig 3 indicates number of
191 publications involving international collaboration.

¹ There are many different definitions of BRI countries. The scope of BRI countries has been expanding every year (BRIGC, 2020). In this paper, "BRI countries" refer to the very first 64 BRI countries (excluding China), according to *Industrial Cooperation between Countries along the Belt and Road* ("一带一路"沿线国家产业合作报告) by China International Trade Institute (2015). This list is commonly recognised and used in a great number of official reports or papers (eg. Fung Business Intelligence Centre, 2016; WB, 2018; OECD, 2018; Cao & Alon, 2020; etc.). The full list of these countries can be found in Annex III.



192

193

Fig 3. Number of publications for international collaboration of English, Chinese and total

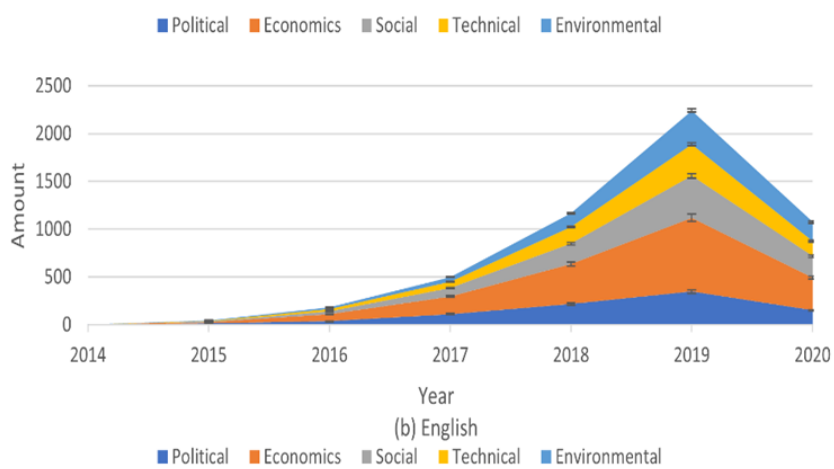
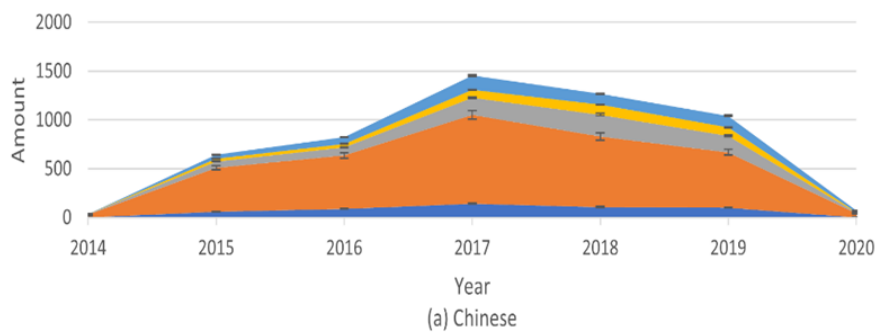
194

195 ***How does BRI impact be researched?***

196 Detailed topics of each article can be found in *Supplement Document III*. The topic distribution in Fig

197 4 is mapped over the sample period until mid-May 2020.

198



199

200

Fig 4. PESTE focus of literature within the database

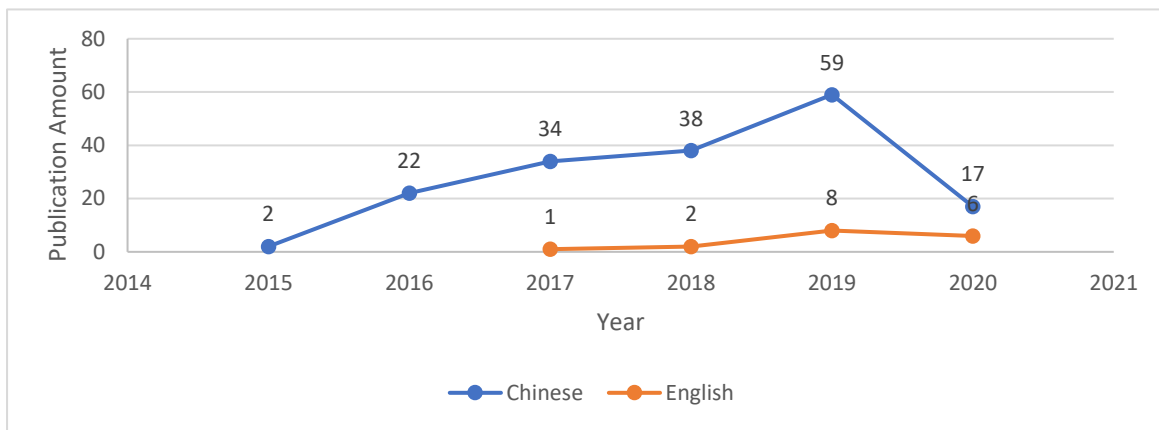
201 Fig 4. illustrates that economics appears to be the most dominant topic in both Chinese (71.4%) and
202 English-language (68.7%) publications about the BRI. However, Fig 5. (b), we can see that although
203 economics is still the most published topic in English-language journals, the distribution of each topic
204 is more diverse than in Chinese-language publications. Environmental issues arise more often in
205 English (29.1%) publication, than in Chinese-language outputs (11.1%).

206 Green BRI

207 We identified 189 hits (17 in English, 172 in Chinese) discussing green BRI. This concept receives
208 much more attention in Chinese. Fig 5 appears to illustrate an increasing trend with respect to
209 publications mentioning “green BRI” within Chinese-language publications.

210

211

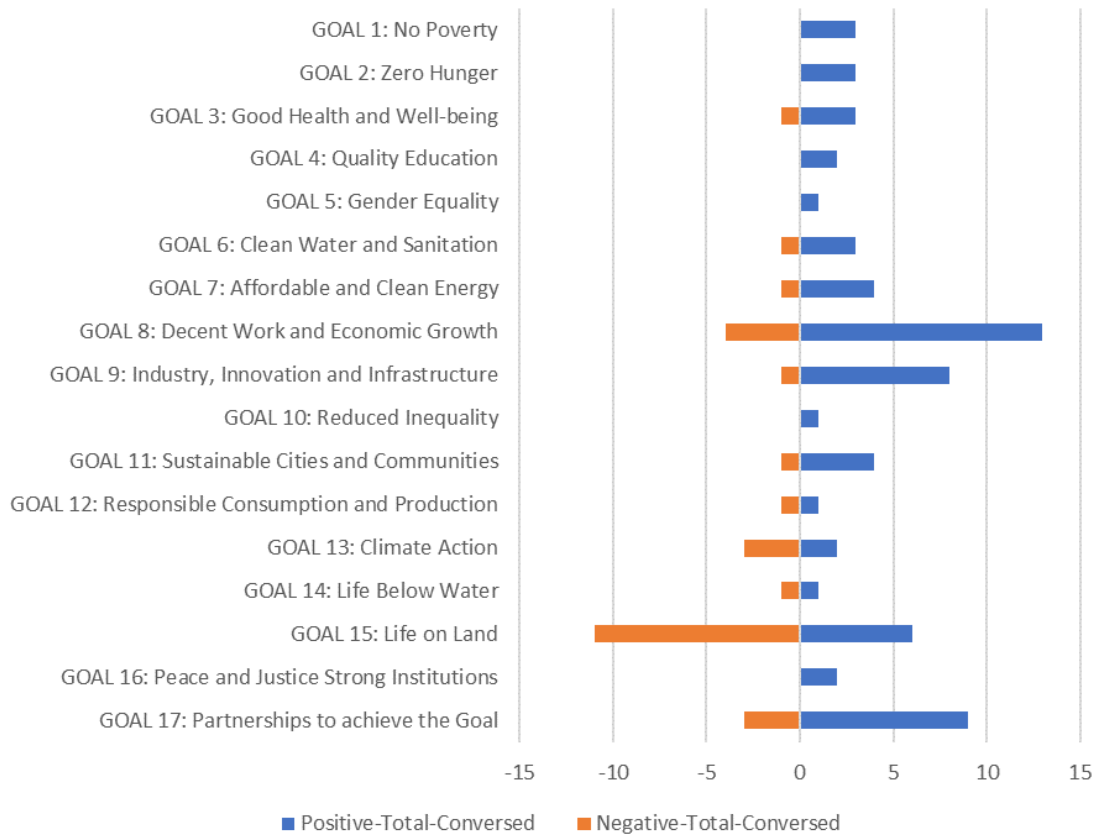


212 **Fig 5. Yearly number of publications involving “green BRI”.**

213 SDGs and the BRI

214 In regard of the potential relationship between the BRI and the SDGs mentioned in the introduction,
215 31 records were returned in the key word search (see *Supplement Document IV*).

216 This systematic review identified only 31 papers specifically discussing links and impacts between the
217 SDGs and BRI. To visualize the results, the author went through each paper and identified the
218 evaluation statements of BRI’s impacts. Negative impacts are displayed with “-1” for each incidence
219 and vice versa for positive impacts. For those papers with no clear evaluation or for both opportunities
220 and risks both “-1” and “+1” were assigned. Fig 6 displays the result of this analysis for all 17 SDGs.



221
222 **Fig 6. Links between the SDGs and BRI**

223 **Discussion**

224 Our initial explorations of literature revealed a very large number of potentially relevant publications
 225 in Chinese and English, presenting both an opportunity and a challenge. Consequently, a strength of
 226 this review methodology is that we were able to combine a very large variety of information sources,
 227 providing a basis for a comprehensive synthesis (Scholz, 2011). Furthermore, the challenge was to deal
 228 with the sheer magnitude of this literature. To overcome this hurdle, we introduced a machine
 229 learning technique into the process, to substantially increase the efficiency of identifying relevant
 230 literature amongst the large datasets in order to analyse different perspectives of the BRI.

231 **Green BRI and challenges for measuring BRI related environmental impacts**

232 BRI projects also do not occur in isolation but in the context of ongoing environmental degradation,
 233 climate change, wider national economic development programs and other BRI-funded projects at
 234 multi-national scales (Ng, 2020).

235 Guo *et al* (2019) developed an Environmental Sustainability Potential Index (BRI-ESP Index) to assess
 236 BRI countries' potential to support environmentally sustainable projects vis-a-vis their performance
 237 on climate and energy (Guo, 2019). Han *et al* (2020) used an eco-safety evaluation index system based
 238 on economics, nature, and society (EES) factors (Han, 2020). Both were providing a national-level
 239 overview highlighting higher and lower-risk countries in terms of environmental sustainability and the
 240 BRI. Ng *et al*. (2020) presented a spatial analysis to map habitat and biodiversity impacts of BRI projects
 241 in Southeast Asia. Such an approach is useful in identifying areas of most concern. The research
 242 provided directions that could subsequently be investigated in more detail.

243 Despite the high-impact nature of the projects, little PR research has been published examining the
244 potential social and environmental impacts of the BRI at different scales (local, national, regional,
245 global). Instead, research and discussion to date on the impacts of the BRI has focused on the
246 economic return of projects and the political and economic impacts of international development
247 financing from Chinese funding bodies. Of the 7,193 publications reviewed by this research less than
248 30 per cent of English and less than 12 per cent of Chinese publications discussed or studied the
249 potential or actual impacts of projects on the environment and/or biodiversity. An even smaller
250 proportion of papers, one per cent, specifically examined the impacts of projects through the lens of
251 the Sustainable Development Goals (SDGs). Instead, an overwhelming proportion (71 per cent of
252 Chinese and 68 per cent of English) of publications focused on the economic impacts of the BRI.

253 The assessment above establishes that economics is the primary focus of BRI impact research, with
254 much less research focusing on environment. Although there appears to be a significant number of
255 publications on “green BRI”, we failed to find a widely recognized, clear definition of “green BRI,”
256 making discussion and synthesis difficult. The official definition involving ecological civilization and
257 green development concepts is rather vague. We also failed to find official indicators to evaluate
258 green BRI.

259 The Belt and Road Initiative International Green Development Coalition (BRIGC) Database was
260 established after the second Belt and Road Forum in April 2019 (BRIGC, 2022). Its goal to promote
261 and implement the “green BRI.” The BRI Environmental Big Data Platform was established to record
262 datasets including BRI countries' environmental regulation, threatened species, environmental
263 performance indices (EPI), vegetation cover, climate and carbon emission data (The Ministry of
264 Ecology and Environment, 2022). However, the database is incomplete and most variables only have
265 very recent datasets.

266 Projects falling under the BRI umbrella include energy generation (both fossil and renewable), heavy
267 industry, linear transport networks, digital infrastructure, and cross-border trade infrastructure. This
268 long-term infrastructure will lock-in transport, economic development and energy pathways for
269 decades to come (Hughes, 2019). Therefore, an additional consideration to note regarding the
270 existence of relevant research is whether the work has been considered through a BRI lens or
271 whether the focus is on the sector where the activity is taking place.

272 **SDGs-related BRI impact literature**

273 Fig 4 and fig 6 both represent where the focus of research has been to date. The result indicates that
274 existing publications mostly perceive BRI projects as offering economic, infrastructure development
275 and partnership benefits. Impacts on Goal 15 “life on land” are perceived to be mostly negative. There
276 is also concern about the impacts of the BRI on Goal 8, decent work, indicating benefits may be
277 uneven.

278 Climate change received little attention despite 75 per cent of BRI-funded new generation capacity
279 power projects from 2013 to 2020 from fossil fuels, and 14 per cent of new generation capacity went
280 to hydroelectricity, locking in these production systems and associated emissions for decades Tao et
281 al. (2020). Peng et al. (2017) further calculated that the BRI was involved with over 37 per cent of
282 planned, under construction and operational coal power plants globally (Peng, 2017). The long-term
283 impacts of climate change are projected to fall most heavily on the poorest people in the world, as
284 such the impacts of the BRI on a number of SDGs should be evaluated in light of BRI’s potential impacts
285 on carbon emissions.

286 As stated in the introduction, excluding China, the BRI countries account for 26 per cent of global
287 CO₂ emissions, and their contribution is expected to grow to 50 per cent by 2050 in business-as-

288 usual scenarios (Zhou, 2018; Pike, 2019). Although there is no evidence to indicate the emission is
289 due to BRI investment/projects in BRI countries, it indicates the BRI needs to be ambitious in pushing
290 for innovation across the initiative, developing new low carbon pathways to transition to
291 sustainability.

292 There are signs of change as the recent (January 2021) Green BRI report on BRI investment indicated
293 that renewable (wind, solar, hydropower) energy investments increased to 57 per cent of overseas
294 energy investments. The Chinese Ministry of Ecology and Environment created the BRI International
295 Green Development Coalition with external international partners in 2019 to promote consensus on
296 how to support the green development of the BRI and deliver on the Paris goals and some SDGs
297 (BRIGC, 2020). However, as the BRIGC partners do not seem to include the main financiers of BRI
298 projects or the ministries most involved in planning, such as the Natural Resources Development
299 Council, this leads to questions of relevance and influence. In December 2020, the BRIGC published
300 the “Green Development Guidance for BRI Projects, Baseline Study Report” providing an overview of
301 international best practice on international investments and a series of recommendations for the BRI
302 (BRIGC., 2020).

303 However, many of these recommendations have been taken up into the new voluntary guidelines
304 issued in 2021, any tangible impact on investments remains to be seen (Wang & Tang, 2021).
305 Meanwhile, coal and oil remain at 40 per cent of investments and hydro power is not necessarily
306 environmentally or socially positive indicating room for further greater number of articles (Wang &
307 Tang, 2021).

308 **Measuring language-induced literature difference**

309 Of the papers and reports considering the BRI identified by this review, the majority are Chinese
310 language, with fewer research reports published in English. As decision makers for the BRI are
311 predominantly Chinese nationals there is a chance that a natural bias toward using Chinese language
312 research exists to support policy making. Therefore, the nature and coverage of research on the BRI
313 available in Chinese is important, particularly with regard to environmental sustainability as many
314 partner BRI countries have historically low levels of environmental governance structures in place.

315 In both English- and Chinese-languages, the non-PR papers tend toward a more polarized
316 interpretation of the likely impacts of BRI projects whilst PR publications offered a more nuanced
317 assessment. Chinese language PR papers provide more qualitative discussions of the feasibility and
318 risks of the BRI whilst English language PR papers give more quantitative assessments. However, much
319 of the discussion around impacts of the BRI is fairly qualitative, suggesting a lack of data on which to
320 base quantitative research and develop clear and specific recommendations for action. Joint research
321 publications conducted by China and BRI nations were not found by this review, although there is a
322 chance this research exists in languages other than English or Chinese.

323 More interestingly, while studying the feature of BRI investment, we identified three official BRI
324 websites² based in China, none of which have made most data publicly accessible. The Chinese
325 Government has published a basic trade database³ of all BRI countries but with very limited and
326 vague information about BRI investment.

² 中国一带一路网: <https://www.yidaiyilu.gov.cn/>; 一带一路网: <http://www.zgydyl.org/>; 中国网
“一带一路”网: <http://ydyl.china.com.cn/>;

³ 一带一路大数据 (基础数据) : <https://www.yidaiyilu.gov.cn/jcsjpc.htm>

327 On the contrary, the American Enterprise Institute (AEI) has generated the China Global Investment
328 Tracker (CGIT) database, to track China’s global investment since 2005, particularly focusing on BRI
329 investment. This is the only comprehensive public data set covering China’s global investment and
330 construction, used by many leading research institutions and private enterprises including the
331 African Development Bank⁴, Center for Strategic, International Studies⁵, and Bloomberg⁶. The CGIT
332 underpins almost all analyses of the distribution of the BRI investment at global, regional and
333 national levels. Notably, the AEI is a public policy think tank sponsored by the US, so the datasets are
334 plausibly limited due to accessibility of BRI investment data.

335 **Limitations**

336 The lack of a definition for what constitutes a BRI project, the absence of an official database providing
337 information on where projects are located, how and who finances them and the regulations under
338 which they are operating are all issues that hinder accurate and meaningful research.

339 English and Chinese publications were selected for review due to the role of China in the BRI and the
340 dominance of the English language. However, the countries considered in this review have five
341 different official languages, none of which are English or Chinese. Studies published in languages other
342 than English represent a substantial amount of scientific knowledge available globally, potentially
343 constituting more than one third of scientific evidence but are often overlooked.

344 The countries selected for more in-depth research are not the biggest recipients of BRI investment
345 and there is very little research with a specific BRI-lens available. However, there are papers, articles,
346 and discussions that centre on bilateral relations and investments looking through a sector lens
347 without reference to the BRI. The framing of the systematic review to search for BRI related papers
348 was needed to narrow the field and deliver a manageable number of results, however it necessarily
349 excluded relevant research and news regarding national and project-based project impacts.

350 At present the available literature examining impacts on biodiversity of projects identified as BRI-
351 related is extremely limited. Additionally, there are very few field studies providing a context or
352 baseline against which to measure environmental and biodiversity changes from BRI projects meaning
353 assessing impact is difficult.

354

355 **Conclusion and Future Research**

356 The huge scale of the BRI offers enormous potential to establish a new and more efficient and
357 sustainable pathway for human development and infrastructure. However, to do this there must be
358 political will underpinned by robust research and evidence.

359 **To increase research to track and quantify the impacts of BRI and develop sector-specific 360 evaluation & monitoring methodologies and mechanisms**

361 At a global level, attention has focused mostly on the political and economic impacts of the BRI in
362 different contexts and scales. In recent years however, there has been increasing attention given to
363 the environmental and social implications of the large-scale infrastructure projects falling within the
364 BRI. In recent years, more research and discussion pay attention to green BRI and its potential linkage

⁴ <https://aih.opendataforafrica.org/wgmwpzc/china-s-global-investment-tracker>

⁵ <https://chinapower.csis.org/all-topics/?lang=zh-hans>

⁶ <https://www.bloomberg.com/news/articles/2020-06-18/global-appetite-for-chinese-assets-resilient-despite-virus>

365 to SDGs. Asia, and particularly Southeast Asia has received a greater deal of attention from academic
366 and media observers than other regions, likely as a result of the higher levels of investment.

367 Further research, with a focus on spatial planning, scenario-modeling for various options, cost-benefit
368 analysis for each scenario, and decision option, with strong case studies at national or regional levels,
369 can help decision-makers with quantified information and lessons about the tradeoff of various
370 decision consequences.

371 **To accelerate Data and knowledge sharing**

372 Research on the implications of the BRI is undermined by low levels of transparency and a lack of
373 agreement regarding the definition of a BRI project. The multitude of Chinese government actors
374 involved from a regulatory perspective leads to a confusion in policy making and unclear lines of
375 responsibility. A publicly accessible official information disclosure system/platform is in need.

376 As the BRI is an international program, it is suggested that project information and the development
377 of the aforementioned database need to be developed and promoted jointly by China and countries
378 with BRI MoUs together. This would also support greater collaborative research and knowledge
379 sharing between host countries, all of which would support the improved partnerships and
380 governance goals of the BRI and SDGs.

381 A clear and unified voice from civil society providing robust evidence, concrete policy
382 recommendations, and a number of evaluated pathways and options for the future direction of the
383 BRI is necessary to help steer the behemoth to a sustainable future. This is predicated on increased
384 transparency for all aspects of BRI projects including locations, funders, implementers, stakeholder
385 engagement and strategic positioning within the larger initiative. Currently transparency initiatives
386 are not being spearheaded by China, this has led to a situation where the BRI is increasingly viewed with
387 suspicion and mistrust, causing project delays and cancellations.

388 **To enhance the impact of NGOs and academics**

389 The findings of this systematic review indicate that there remains a lack of knowledge, research and
390 research collaboration on the cumulative impacts of BRI projects, particularly in terms of impacts on
391 biodiversity, habitats, and ecosystem services at different scales.

392 To enhance the impact of NGOs and academics it is recommended that a consistent effort is made to
393 share information across groups, work toward a common understanding of goals and objectives on
394 how best to engage with the BRI actors at different levels, and coordinate on what the objective
395 outcomes should be. This may increase the willingness of governments to engage with NGOs and
396 academics and therefore increase the effectiveness of the research provided. Creating a clearinghouse
397 or platform for NGOs and academics to collaborate, identify research gaps, and strategize on
398 engagement with BRI decision-makers would enable research to be undertaken more strategically,
399 maximizing scarce resources. This would also provide a focus for BRI decision-makers seeking
400 information meaning that the research could have a greater impact on policy.

401 As such the greatest single endeavor that would facilitate the transition of the BRI to a path of
402 sustainability is a commitment to greater transparency by the Chinese government and the
403 collaborative development of a definition for BRI projects. Based on this foundation, research and
404 policy making can be enhanced and the BRI can proceed more strategically and effectively.

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