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**ACCEPTED MANUSCRIPT**

Abstract

In this paper, a comparative review is provided of EIA systems in 65 countries participating in the Belt and Road Initiative (BRI). The review is carried out by means of a new integrated index (EIA Quality index – EQI), which is applied to EIA legislation of selected BRI countries. In developing the EQI, views and perceptions of experts were established, based on Multi-Criteria-Decision-Analysis (MCDA). Results of the comparative evaluation indicate that there is great disparity between EIA systems in the 65 countries. Countries with existing challenges, such as poverty, civil war and institutional instability tend to achieve lower EQI scores. Finally, we conducted a preliminary analysis to investigate the relationship between EIA quality and GDP per capita using Pearson Correlation. A positive (albeit weak) correlation is found between EQI scores and GDP per capita.

**Keywords:** BRI, Environmental Impact Assessment, Economic Development, Poverty, MCDA.

Introduction

The Belt and Road Initiative is an ambitious Chinese foreign policy that is likely to significantly influence the environment, not just in participating countries, but globally. Potentially including 70 countries and representing two-thirds of the global population, with a total value of over US$8 trillion by 2049, this initiative aims at unprecedented levels of infrastructure development, extending across borders of countries and being located within and between world regions (Hughes, 2019). Associated projects (e.g. roads, railway lines, pipelines and ports) are aimed at enhancing intercontinental trade, economic growth and energy security (Ascensão et al., 2018). However, development projects of the scale suggested here inevitably entail significant risks for the environment. Hughes (2019) categorized the potential environmental impacts of BRI into five categories:

* direct environmental resource destruction;
* raw material extraction;
* increased access to natural resources;
* habitat fragmentation; as well as
* increased wildlife trafficking.

BRI projects typically involve large-scale trans-boundary projects, are located in more than one country and are likely to cause significant socio-economic and environmental impacts, both positive and negative (Lechner et al., 2018), that go beyond local, regional and national borders (Tracy et al., 2017). Policymakers face considerable challenges when aiming at achieving resource-efficient, environmentally sustainable and economically viable Belt and Road investments (Wong & Jia, 2017). These challenges have led to calls for strengthening environmental legislation and associated policy instruments in countries participating in the BRI initiative (Ascensão et al., 2018). Environmental Impact Assessment (EIA) as well as Strategic Environmental Assessment (SEA) are potentially key tools for China and partner countries for integrating environmental information into decision-making (Aung et al., 2020). However, different countries and funding agencies involved in the BRI initiative have diverse environmental policies and EIA regulations, making the application of consistent EIA standards across BRI projects challenging. Also, in some countries, authorities might decide to relax EIA requirements in order to attract BRI related investment, and institutional, political and financial constraints may limit the effectiveness of EIA to address environmental impacts.

Despite growing concerns, to date understanding of how EIA systems in countries participating in the BRI initiative compare has remained poor (Aung et al., 2020). Research in evaluation of EIA legislations has historically relied on checklist based qualitative reviews, with a few notable exceptions (see e.g. Arts et al., 2012). There are currently no systematic data sets on EIA of all BRI countries, allowing for a comparative review of their EIA systems. However, having a good understanding of EIA systems is vital in order to (potentially at least) deliver good environmental – and social – outcomes, next to achieving economic development. This paper aims at addressing the existing knowledge gap by providing for a systematic review and comparative evaluation of EIA in 65 BRI countries.

In this context, the evaluation is conducted by applying an EIA quality index (EQI) to review EIA legislation of each country. The EQI is based on a range of important criteria, allowing for an appraisal of the quality of EIA systems. In developing the EQI, we used Multi-Criteria-Decision-Analysis (MCDA). The 65 countries were chosen, based on the availability and comprehensiveness of EIA information (further explained below).

The potential relationship between the EQI and GDP per capita is explored, using statistical analysis. Various authors have suggested that there is a positive relationship between the level of economic development and environmental performance of countries (Corrigan, 2014; Fakher & Abedi, 2017). However, there is no clear consensus about this relationship. In this context, reference has been made to air pollution reduction, formulation of environmental policy and indices such as the Environmental Performance Index and Environmental Sustainability Index (ESI) (Chowdhury & Islam, 2017; Cracolici et al., 2010; Dkhili, 2019; Fakher & Abedi, 2017; Fatma Tektüfekçi & Nilgün Kutay, 2016; Le et al., 2019). As indicated by the results of 2020 EPI, good environmental governance and policy can be associated with GDP per capita because economic prosperity allows countries to invest in systematic environmental regulation procedures that lead to better outcomes. On the other hand, the pursuit of higher GDP can result in more environmental problems, such as air and water pollution. It is also shown that good environmental governance can offset these negative impacts (Wendling et.al., 2020).

What we are looking for in this paper are indications for whether there is a correlation between EQI scores and GDP per capita. It is not our attention to provide for comprehensive analyses or models (e.g. Environmental Kuznets Curve (EKC) or Pollution Heaven Hypothesis (PHH)).

It is important that the BRI is still at the early stages of development, and it is not yet possible to directly measure environmental impacts of investments. However, exploring EIA requirements in countries can provide some important baseline information.

Review of EIA in BRI

There is a well-developed literature on the influence of EIA on decision-making processes of project development (see e.g. Loomis & Dziedzic, 2018; Arts et al, 2012). A widely used method in evaluating EIA is the comparative review of different legal systems and other features, including policy principles, implementation provisions and documentation processes (Bond, 2018; Fischer, 2015; Retief et al., 2016). EIA is known to promote sustainability and has been adopted in literally all countries worldwide, as shown in other environmental law processes, international law and as a requirements set by lending institutions (Morgan, 2012). Globalization has also led to EIA being recognized as a globally accepted norm (Yang, 2019). However, the quality of EIA systems differs substantially with regards to institutional and governance qualities (Abaza, H., Bisset, R., and Sadler, 2004; Arts et al., 2012).

There are some comparative studies evaluating EIA systems in BRI countries, however without referring to the initiative (many are pre-dating BRI). Currently, the only study on EIA systems across BRI countries is Aung et al. (2020)’s comparative review on the basis of China’s EIA system. Table 1 provides an overview of comparative studies covering BRI countries.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Region | Evaluation Criteria | Main findings | Method | Author |
| BRI countries  | Adapted from (Swangjang, 2018) | All countries have legal frameworks for EIA, but some criteria are more robust than others. China received the highest performance in Asia.  | Authors analyzed EIA legislation, and compared this with China.  | (Aung et al., 2020) |
| Southeast Asia | Ahmad and Wood (2002)’s framework  | Almost all countries have EIA processes. Some countries have SEA and transboundary EIA  | Evaluation of EIA legislation. | (Swangjang, 2018) |
| Visegrad countries  | Wood (2003)’s EIA review framework | Strong legal basis, advanced forecasting methods and sufficient instructions and guides | Survey based on criteria  | (Gałaś et al., 2015) |
| Lower Mekong Countries | Author’s own  | All countries have EIA process with similar procedures and decision-making.  | Reviewed laws, policies, regulations, and guidelines | (Frankel, 2015) |
| Egypt, Turkey and Tunisia | Wood (1995, 1999)’s EIA review framework.  | Identified similarities and differences in EIA. Egypt’s system is more advanced than Turkey and Tunisia’s EIA.  | Reviewed EIA guidelines and legislation.  | (Balsam Ahmad, 2002) |
| Developing countries  | Adapted from (Ahmad and Wood 2002) | Identified factors influencing EIA quality  | Literature review  | ( Kolhoff et al. 2009) |
| South Asia | Author’s own.  | EIA is project specific in all the countries.  | EIA law review | ( Lima et al.2015) |
| Georgia, Ghana and Yemen | Author’s own criteria. | The performance of EIA system is determined by the fit between context and capabilities in all the countries.  | Review of EIA Legislation and interviews.  | (Kolhoff et al., 2013) |
| Europe and Central Asia  | Author’s own  | Political and economic transition influenced regional variation in EIA.  | Review of EA legislations. | (Cherp, 2001b) |
| Central and Eastern Europe | Author’s own criteria similar to systemic measures.  | Inconsistencies and gaps in implementation in public participation in the screening and scoping procedures.  | Literature review | (Lotman et al., 2013) |
| MENA countries | Ahmad and Wood (2002) | Weak regulatory enforcement, Lack of legal requirements for report content, highly centralized, weak coordination.  | Review of EA legislations. | (El-Fadl & El-Fadel, 2004) |
| China and EU | Author’s own criteria. | Weaknesses in China’s EIA system are the application of new models for EIA legislation; the improvement of EIA guidance and education; and the enhancement of public participation in EIA process. | Review of EA legislations. | (Chen et al., 2007) |

Table 1: Literature on EIA reviews in countries involved in BRI. For more detail information about the literature, see (Aung et al., 2020).

*Consideration of EIA in Belt and Road Project Approval*

In 2016, China’s National Development and Reform Commission (NRDC) promulgated new measures to restrain undesirable investments (Sheng, 2018). Regulatory changes were made for outbound investments, including investments along the Belt and Road countries to obtain clearance from the NRDC. The key regulators involved in the process are the state-owned Assets Supervision and Administration Commission of the State Council (SASAC), acting as shareholder of Central Government state-owned Enterprises and the Ministry of Finance and Commerce (MOFCOM), the Ministry of Finance and Commerce (MOFCOM) and the State Administration of Foreign Exchange (SAFE). Fig 1 summarizes the approval process of Chinese outbound investment. Typical projects under the Belt and Road involve; 1. Strategic foresight, 2. Preliminary preparation, 3. Project bid, 4. Operation management and 5. Project completion and exit (PWCCN, 2015).

China developed environmental regulations for foreign outbound investments, such as guidelines for environmental preservation in foreign investment and enterprise, guidance on promoting a Green Belt and Road and the AIIB directive on environmental and social protection (AIIB, 2016). Likewise, project approval processes restrict investments that fail to meet basic environmental, energy efficiency and safety standards (Sheng, 2018). However, the guidelines do not specify how these measures will be evaluated and administered. The screening of sensitive or non-sensitive industries in current approval regulation is primarily based on political and security, but not environmental concerns. For instance, prohibited transactions include the export of core military technologies, gambling and sex industries, and media operations. It is here where the results of our research can help strengthening the environmental component in BRI investment.



Fig 1: BRI project approval process

Data and Methods

The research methodology consists of five main stages: collection of EIA documents, checklist development, weighting and normalization of selected criteria, comparative evaluation of EIA systems against selected criteria, aggregation of final scores and correlation analysis. At the first stage, in order to identify the strengths and weaknesses of EIA systems in 65 BRI countries, we gathered primary legal sources of EIA systems and consulted the existing literature. Baseline data and information were obtained in parts from the official database of the national Belt and Road Portal of China (<https://www.yidaiyilu.gov.cn>; <https://www.ydylcn.com>) where each BRI participating country is represented. Although not publicly available, the authors were provided access to the data required to conduct the evaluation. Overall, the database provides some comprehensive information on economic data, political context, as well as environmental and other policy related documents. The database currently covers 49 countries’ EIA systems from different geographic BRI regions. Information and data for the 16 countries not included in the Portal (and additional data for the 49 countries included) were collected from official sources, including government departments, NGOs, universities as well as books and journal articles. Supplementary Table 2 summarizes the materials used.

 A checklist based criteria tree was designed, based on the EIA comparative review criteria developed by Ahmad & Wood (2002), based on Wood (1995), Ortolano et al. (1987) and Leu et al. (1996; see Fig. 2). This is based on a hierarchical framework, grouping 23 attributes within five criteria. Criteria reflect different important aspects of EIA, including (a) legislation, (b) administrative arrangements, (c) procedure (d) decision-making, and (e) support provided to administrations. The framework was used to evaluate each Belt and Road participating country's EIA legal requirements. Each attribute is subdivided and expressed through a range of aspects (86 in total). These aspects were subdivided for analytical consistency and based on the checklist evaluation framework developed by USEPA (1998) and triangulated with principles of environmental impact assessment best practice developed by IAIA (Goldsmith et al., 1999).

 While a checklist-based evaluation system can be considered reliable and accomplishes intended purpose (Wathern, 2013), we acknowledged that subjectivity and inter-individual differences can influence reviewers’ judgements and can manifest divergence of the overall scores (Põder & Lukki, 2011). However, in most cases, the knowledge and experience of the authors can minimize these constraints (Morgan, 2017). We also cross-checked our findings with the wider professional literature.



Fig 2: EIA Index Criteria Tree

At the third stage, we used Multi-Criteria-Decision-Analysis (MCDA) to weigh and normalize selected criteria and to construct an EIA quality index (EQI). MCDA allows to construct indices, based on the quantitative assessment of different variables and component metrics (Brombal et al. 2017). MCDA is considered an appropriate and adequate approach for dealing with multidimensional concepts such as operationalization of sustainability policies (Munda, 2005). It also allows to incorporate perceptions of experts by attributing weights and indicators. The specific approach used in the analysis underlying this paper is a Multi-Attribute-Value-Theory (MAVT) approach. The advantages of MAVT include a capability to support the structuring of problems, applying different criteria and attributes and to use both, qualitative and quantitative approaches (Brombal et al. 2017). Parameters pertinent to each attribute were normalized by converting them into weights on a scale of 0 to 1 (0.00, 0.10, 0.33, 0.66, 1.00). For three attributes, L6. D1 and D2, only 2 to 3 aspects were used. This doid not affect evaluation results, though, as the highest score is still 1.00 and the lowest is 0.00.

Normalization is based on weighting of criteria. Weights were allocated by a panel of four EIA experts who participated in the 3rd Digital Belt and Road Conference held in Tengchong, China on 5-7 December 2018. Although the number of experts is small, they were closely involved with the formulation of environmental framework for BRI. Table 1 summarizes affiliation and expertise of the panel experts. During the meeting, which was moderated by the first author, experts discussed and allocated importance scores, using a five-point scale, ranging from "1 (not important)" to "5 (extremely important)". In case of disagreement among panel members, diverging opinions were discussed with the aim of creating consensus on an importance score. Importance scores were then converted into weights using the equation below:

 $W\_{X\_{i}}=\frac{<S\_{X\_{i}}>}{\sum\_{i}^{}<S\_{X\_{i}}>}$ (1)

Where: $<S\_{X\_{i}}>$ is the important scores.

|  |  |  |
| --- | --- | --- |
| No | Affiliation | Expertise |
| 1 | University  | Environmental law; BRI; EIA consultancy |
| 2 | Ministry  | Environmental Science; BRI; EIA technical review |
| 3 | United Nations  | Environmental law; BRI |
| 4 | Environmental NGO | Environmental Law; BRI; Chinese EIA regulations  |

Table 1: Experts background information

|  |  |  |  |
| --- | --- | --- | --- |
| **Criterion** | **Attribute** | **Aspects**  | **Weight**  |
| **EIA Legislation** | The system is based on clear legal provisions (L1) Formal provision for SEA. (L2)EIA system is linked with other environmental laws and regulations. (L3)EIA public participation (PP). (L4)Legal specification for timeframe. (L5)Transboundary EIA (L6) | The enactment of mandatory EIA law and regulation in national legal provisions and the existence of direct responsible agencies. The enactment of mandatory EIA law and regulation in national legal provisions. The enactment of EIA law and regulation in national legal provisions, but not mandatory. There is no enactment of a mandatory EIA laws and regulation in national legal provisions. SEA is a formal provision; there are SEA procedures/guidelines and public involvement is required. SEA is a formal provision, there are SEA procedures/guidelines.SEA is a formal provision.There is no SEA formal provision. The system is linked with ≥ 4 related lawsThe system is linked with ≥ 2 related lawsThe system is linked with ≥ 1 related lawThe system is not linked with any related laws.Public participation is mandatory; procedures, measures and technical guidelines existed; requirement to incorporate PP results in the EIA report. Public participation is mandatory; procedures, measures and technical guidelines exist.Public participation is mandatory.Public participation is not mandatory.The existence of legal specification for time limits for submission, approval and appeal. The existence of legal specification for time limits for approval and submission.The existence of legal specification for time limits for submission.No legal specification for time limits. Legal specification of transboundary impact assessment for large-scale projects exists. Legal specification of transboundary impact assessment for large-scale projects does not exist.  | 1.000.660.330.001.000.660.330.001.000.660.330.001.000.660.330.001.000.660.330.001.000.00 |
| **EIA Administration** | Detailed EIA guidelines. (A1)Availability of EIA reports. (A2)EIA review body. (A3)Specified the sectoral authorities’ responsibilities in the EIA process. (A4) | EIA guidelines include technical guidance for types of development, EIA procedures, public involvement, preparation, review, appeal, monitoring and SEA guidelines.EIA guidelines include technical guidance for types of development and EIA procedures. EIA guidelines include basic EIA procedures. There are no specific EIA guidelines. All the EIA reports are archived and made publicly available. All the EIA reports are archived but only some are made publicly available.Some of the EIA reports are archived and made publicly available.There are no publicly available EIA reports. EIA review bodies independence from project proponents exists. EIA review authorities from government department association to project.There are no EIA review authorities.Specify core agencies, local planning authorities and various regional agencies.Specify core agencies and local planning authorities.Specify core agencies.There is no specification of the responsibilities of authorities.  | 1.000.660.330.001.000.660.330.001.000.660.331.000.660.330.00 |

|  |  |  |  |
| --- | --- | --- | --- |
| **EIA Procedure** | Screening (I1)Scoping or terms of reference (ToR) (I2)Environmental Management Plan (EMP) (I3)Qualification of EIA consultant. (I4)EIS content and submission (I5)Public Participation (I6)EIA follow-up process (I7)Compliance monitoring/auditing (I8) | Proposal is subject to initial determination of acceptability, based on defined environmental thresholds, and if likely to be acceptable, the type of detailed review required; If the project is considered acceptable and needs detailed review, the proponent is informed about the concerns of government and stakeholders. Proposal is subject to initial determination of acceptability, based on defined environmental thresholds, and if likely to be acceptable, the type of detailed review required. Proposal is subject to initial determination of acceptability. There is no initial screening in EIA procedures. Scoping is formally developed in terms of reference (ToR). Covers (1) project justification, (2) potential impacts and planned mitigation (3) cumulative impact (4) alternatives to the project and plan, (5) likelihood of project success.Scoping is formally developed in terms of reference (ToR). Covers (1) project justification, (2) potential impacts and planned mitigation. Scoping is formally developed in terms of reference (ToR).There is no formal scoping procedure or ToR.EMP focuses on mitigation measures and includes technical details, financial allocations, and time schedules.EMP focuses on mitigation measures and includes technical details.EMP existed but there is no technical details.EIA system does not require EMP.Legal requirement stating the consultant to be accredited to prepare EIA documents, and require formal registration of the consultants.Legal requirement stating the consultant to be accredited to prepare EIA documents.There is no specification of the qualification requirement of EIA consultant.Requirements formally specified; include project description and its alternatives, baseline environment description, positive and negative environmental impacts prediction, cumulative impact assessment, the evaluation of impact significance and mitigation measures and non-technical summary. Requirements formally specified; include project description and its alternatives, baseline environment description, positive and negative environmental impacts prediction, cumulative impact assessment, the evaluation of impact significance and mitigation measures.Requirements formally specified but not in detail.There are no formally specified requirements. Public Participation is required to start during the initial stage of EIA; public involvement in EIA review and decision-making process. Public Participation starts during late stage of EIA; public involvement in EIA review and decision-making. There is no public involvement in EIA review and decision-making process. No Public Participation requirement. Follow-up is done by the competent authority; involves project-proponents and affected community. Follow-up is done by the competent authority and involves project-proponents. Follow-up is done by the competent authority. There is no formal follow-up process. Compliance monitoring programs for EIA is in place; carried out by the environmental authorities; public access to the results of the monitoring. Compliance monitoring programs for EIA is in place; carried out by the environmental authoritiesCompliance monitoring programs for EIA is in place.There are no EIA formal compliance monitoring programs.  | 1.000.660.330.001.000.660.330.001.000.660.330.001.000.660.331.000.660.330.001.000.660.330.001.000.660.330.001.000.660.330.00 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Decision making** | Incorporation of EIA in decision-making. (D1)Transparency of EIA decision-making. (D2) | Mandatory requirements for the EIA report to be included in decision making. EIA is considered but not regulatory requirement.EIA is not considered in decision-making. Regulatory requirements for explanation and disclosure of the decision; includes an explanation of how the EIA report is included in the decision. Regulatory requirements for explanation and disclosure of the decision.There are no regulatory requirements for explanation and disclosure of the decision.  | 1.000.660.001.000.660.00 |
| **Administrative support** | Adequate resources provided for EIA (S1)Training and capacity building. (S3)Across-government coordination and support. (S4) | There are adequate financial, human, technical and time resources to implement EIA; existing staff have the appropriate expertise to execute the EIA system; well-qualified, private local consulting firms existed. There are adequate financial, human, technical and time resources to implement EIA; existing staff have the appropriate expertise to execute the EIA system. There are adequate financial, human, technical and time resources to implement EIA.There is a lack of financial, human, technical and time resources to implement EIA.Provide regular EIA training courses; training courses are formally organized by the environmental authorities. Provide regular EIA training courses. EIA training courses organized but not regular.EIA training courses have never been organized. Formal mechanisms established for integration mechanisms for EIA implementation; integration of interagency, local authorities and the core/regional environmental agencies exist. Formal mechanisms established for integration/co-ordination mechanisms for EIA implementation; integration of interagency and local authorities exist. Formal mechanisms established for integration/co-ordination mechanisms for EIA implementation exist.There are no formal mechanisms established for integration/co-ordination mechanism.  | 1.000.660.330.001.000.660.330.001.000.660.330.00 |

Table 2: Criteria, attributes and normalized measurements.

At the fourth stage a comparative review of EIA requirements based on EQIs was conducted. Based on the EIA materials collected, authors assigned a score of each attribute of the EQI. At this stage scores were then aggregated using following equation:

$S\_{PPI}=\left[W\_{L}\left(\sum\_{i=1}^{3}L\_{i}W\_{L\_{i}}\right)+W\_{A}\left(\sum\_{i=1}^{4}A\_{i}W\_{A\_{i}}\right)+W\_{P}\left(\sum\_{i=1}^{3}P\_{i}W\_{P\_{i}}\right)+W\_{D}\left(\sum\_{i=1}^{3}D\_{i}W\_{D\_{i}}\right)+W\_{S}\left(\sum\_{i=1}^{2}S\_{i}W\_{S\_{i}}\right)\right] $(2)

Where: $X\_{i}$ refers to the score of each attribute; $W\_{x }$ refers to the weight of each criterion; $W\_{X\_{i}}$ refers to the weights of each attribute.

Whilst comparative evaluation is the primary goal of analysis, the authors also explored any association between the quality of EIA systems and the country’s GDP. For this purpose, the correlation between a country’s GDP per capita and ensuing EQI scores was determined, using Pearson Correlation. For simple correlation purposes, this technique measures the strength and direction of the linear relationship between two quantitative, continuous variables. Pearson correlation is appropriate to use when the two variables of interest are scored, using interval measures (Schober & Schwarte, 2018). Our variables meet these criteria and the method therefore serves our purpose. However, caution must be taken in interpreting results, as our approach is fairly simplistic. Despite its widespread application, it is also important to interpret Pearson correlation with caution due to some limitations, for instance, *r* tests only thelinear relationship between the variables(Armstrong, 2019).

Results and Discussion

EIA systems of the 65 BRI countries are ranked, based on the ensuing EQI scores. Fig. 2 shows final scores. Fig. 3 shows rankings for each of the five EIA criteria. There is a considerable degree of diversity within countries with regards to aspects, attributes and criteria. The EIA system of Lithuania obtains the highest overall score of 0.87, followed by the systems from Moldova (0.85), Hungary (0.85) and Latvia (0.80).

Lithuania's high EQI scores reflect strong performance across most of the criteria, apart from integration of EIA into decision making and associated transparency. High scores are obtained with regards to legislative requirements (following the European EIA Directive), EIA process and administrative support for EIA. The country has robust EIA and SEA as well as – being a signatory to the 1991 Espoo Convention on EIA in a transboundary context – transboundary EIA legal provisions and guidelines on public participation. Moldova’s high overall score can be attributed to the country’s recent development of the national EIA system which is in line with both, the EU EIA and SEA Directives as well as the UNECE Protocols on EIA and SEA in a transboundary context (Laevskaya, 2013). Since 2005, the EU-Moldova Action Plan has led to the development of Moldova’s legislative framework for EIA (Ivanov, 2009). Hungary and Latvia are EU member states with a similar trans-national EIA context as Lithuania.

Overall, EIA systems of European countries mostly achieve high scores, occupying thirteen out of the top twenty scores. Asian countries’ EIA scores are spread widely. EIA systems from China and Bhutan emerge with the highest scores, while those from the Maldives, Kyrgyzstan and Bangladesh are among the lowest scoring. China’s EIA system ranked sixth within all BRI countries and came out on top in Asia with an overall score of 0.77, followed by the one of Bhutan (0.76). EIA systems from Middle Eastern countries on average obtained middle ranking scores. Here, Israel’s EIA system obtained the highest score (13th overall). Iraq’s EIA system obtained the lowest score in the region (58th position). Low scores are obtained by EIA systems of Turkmenistan (0.11), the Maldives (0.12), Kyrgyzstan (0.12), Bangladesh (0.16), Bosnia (0.16), Uzbekistan (0.17), Tajikistan (0.17), Iraq (0.19), Azerbaijan (0.19) and Afghanistan (0.24). Belarus, as a non-democratic state, is the only European country with a relatively low overall score (0.24) for their EIA system, ranking 56th.

We suggest that the lower the score the more urgent the need to critically review an EIA system – and to improve it, if BRI investment is sought. In this context, the authors suggest that any investment be connected with acceptable EIA standards. Some of the lowest-ranking nations face several other challenges, such as civil instability, border security issues and poverty (Cederman & Pengl, 2019). Generally speaking, lowest scores can be attributed to an overall weak institutional governance (see also Yale University, 2018). The Chinese EIA system scores strongly on criteria such as EIA administration, procedure and government support. Of the lower income developing countries in Asia, Bhutan’s EIA system ranks seventh for overall score, reflecting well developed environmental regulations. There is a strong commitment here to integrate EIA into decision-making processes and there is a comprehensive EIA implementation procedure (Donelley et al., 1998; National Environmental Commission, 2012).

Correlation analysis between EQI and GDP per capita scores shows that there is some correlation of an EIA system’s comprehensiveness (or potential effectiveness) and a country’s GDP per capita. However, relationships are complex. Generally speaking, results are somewhat hampered by a lack of time-series data. We observed a significant positive correlation between income, measured by GDP per capita, and the overall EQI scores (p<0.001) (Fig. 4).Countries with higher GDP achieve higher scores, with a few notable exceptions, including e.g. Kuwait, Turkey and Bahrain. Also, China and Bhutan obtain higher EQI scores than expected, given their GDP per capita figures. Taken together, the findings from the correlation analysis are consistent with suggestions that environmental regulation stringency is enhanced with higher levels of economic development, even though the situation is complex and there are many outliers, meaning that explanatory power of GDP per capita is not very strong. This is in line with what Esty & Porter (2002) reported on the relationships of environmental quality and economic development. They established that there were significant differences in environmental performance among countries with similar levels of economic development. Samimi et al. (2010) argued that EPI and economic growth is positive. Similar suggestions were made by Fatma Tektüfekçi & Nilgün Kutay (2016) with regards to the relationship between EPI and GDP. Le et al. (2019) also observed a substantial difference in environmental performance in low, middle- and high-income countries, and higher income countries generally perform better.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Criteria | Weigh | Attributes | Weigh | Score | Weighed Score | Score Criteria | Weighed score criteria |
|  |  | No. | Name |  |  |  |  |  |
| Legislation | 0.263 | L1L2L3L4L5L6 | The system is based on clear legal provisions. Legal provision for SEA. EIA system is linked with other environmental laws and regulations.EIA public participation (PP). Legal specification for timeframe. Transboundary EIA | 0.2500.1500.1000.2000.1000.200 | 1.0001.0001.0001.0001.0000.000 | 0.2500.1500.1000.2000.1000.000 | 0.800 | 0.210 |
| Administration | 0.157 | A1A2A3A4 | Detailed EIA guidelines. Availability of EIA reports. EIA review body.Specified sectoral authorities’ responsibilities in the EIA implementation.  | 0.3120.2500.2500.187 | 1.0000.3300.6600.660 | 0.3120.0800.1700.123 | 0.685 | 0.107 |
| Implementation | 0.210 | I1I2I3I4I5I6I7I8 | Screening Scoping or terms of reference (ToR) Environmental Management Plan (EMP) Qualification of EIA consultant.EIS content and submissionPublic Participation EIA follow-up process Compliance monitoring/auditing  | 0.1560.1560.1250.0930.1250.1250.1250.093 | 0.6601.0001.0001.0000.6601.0000.6600.660 | 0.1020.1560.1250.0930.0820.1250.0820.061 | 0.826 | 0.173 |
| Decision-making | 0.210 | D1D2 | Incorporation of EIA in decision-making.Transparency of EIA decision-making. | 0.6250.375 | 1.0000.000 | 0.6250.000 | 0.625 | 0.131 |
| Administrative support | 0.157 | S1S2S3 | EIA system given adequate resources.Training and capacity building.Across-government coordination and support. | 0.4160.3330.250 | 1.0001.0000.660 | 0.4160.3330.165 | 0.914 | 0.143 |
| Final score |  |  |  |  |  |  |  | 0.764 |

Table 3: EQI result for China

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Country | Final EIA Score | Rank | RGS |  |  |  |
| Lithuania | 0.87 | 1 | 1 |  |  |  |
| Moldova | 0.85 | 2 | 2 |  |   | Europe |
| Hungary | 0.84 | 3 | 3 |  |   | Middle East |
| Latvia | 0.8 | 4 | 4 |  |   | East and Southeast Asia |
| China | 0.77 | 5 | 5 |  |   | Central Asia |
| Estonia | 0.77 | 6 | 1 |  |   | South Asia |
| Bhutan | 0.76 | 7 | 1 |  |  |  |
| Bulgaria | 0.72 | 8 | 6 |  |  |  |
| Croatia | 0.71 | 9 | 7 |  |  |  |
| Georgia | 0.71 | 10 | 8 |  |  |  |
| Czech | 0.68 | 11 | 9 |  |  |  |
| Slovenia | 0.64 | 12 | 10 |  |  |  |
| Israel | 0.6 | 13 | 1 |  |  |  |
| Poland | 0.59 | 14 | 11 |  |  |  |
| Vietnam | 0.57 | 15 | 2 |  |  |  |
| Romania | 0.55 | 16 | 12 |  |  |  |
| Singapore | 0.53 | 17 | 3 |  |  |  |
| Macedonia | 0.53 | 18 | 13 |  |  |  |
| Egypt | 0.52 | 19 | 2 |  |  |  |
| Malaysia | 0.5 | 20 | 4 |  |  |  |
| Yemen | 0.49 | 21 | 3 |  |  |  |
| Indonesia | 0.48 | 22 | 5 |  |  |  |
| Albania | 0.48 | 23 | 14 |  |  |  |
| Russia | 0.48 | 24 | 15 |  |  |  |
| Brunei | 0.46 | 25 | 6 |  |  |  |
| Cambodia | 0.45 | 26 | 7 |  |  |  |
| Slovakia | 0.45 | 27 | 16 |  |  |  |
| Laos | 0.44 | 28 | 8 |  |  |  |
| Oman | 0.44 | 29 | 4 |  |  |  |
| Thailand | 0.43 | 30 | 17 |  |  |  |
| Armenia | 0.43 | 31 | 9 |  |  |  |
| Montenegro | 0.43 | 32 | 18 |  |  |  |
| Syria | 0.42 | 33 | 5 |  |  |  |
| UAE | 0.42 | 34 | 6 |  |  |  |
| Pakistan | 0.42 | 35 | 2 |  |  |  |
| Nepal | 0.42 | 36 | 3 |  |  |  |
| Qatar | 0.41 | 37 | 4 |  |  |  |
| India | 0.41 | 38 | 7 |  |  |  |
| Bahrain | 0.4 | 39 | 8 |  |  |  |
| Lebanon | 0.4 | 40 | 9 |  |  |  |
| Myanmar | 0.38 | 41 | 10 |  |  |  |
| Philippines | 0.36 | 42 | 10 |  |  |  |
| Palestine | 0.36 | 43 | 11 |  |  |  |
| Iran | 0.34 | 44 | 11 |  |  |  |
| Kuwait | 0.33 | 45 | 12 |  |  |  |
| Turkey | 0.33 | 46 | 19 |  |  |  |
| Jordan | 0.32 | 47 | 20 |  |  |  |
| Saudi Arabia | 0.32 | 48 | 5 |  |  |  |
| Sri Lanka | 0.32 | 49 | 13 |  |  |  |
| Ukraine | 0.32 | 50 | 14 |  |  |  |
| Mongolia | 0.29 | 51 | 12 |  |  |  |
| Kazakhstan | 0.28 | 52 | 1 |  |  |  |
| Timor-Leste | 0.27 | 53 | 21 |  |  |  |
| Serbia | 0.27 | 54 | 13 |  |  |  |
| Afghanistan | 0.24 | 55 | 6 |  |  |  |
| Belarus | 0.24 | 56 | 22 |  |  |  |
| Iraq | 0.19 | 57 | 23 |  |  |  |
| Azerbaijan | 0.19 | 58 | 15 |  |  |  |
| Tajikistan | 0.18 | 59 | 2 |  |  |  |
| Uzbekistan | 0.17 | 60 | 3 |  |  |  |
| Bangladesh | 0.16 | 61 | 24 |  |  |  |
| Bosnia | 0.16 | 62 | 7 |  |  |  |
| Kyrgyzstan | 0.12 | 63 | 4 |  |  |  |
| Maldives | 0.12 | 64 | 8 |  |  |  |
| Turkmenistan | 0.11 | 65 | 5 |  |  |  |

Table 2: Country ranking with regards to EIA scores

Note: RGS is the regional score of a country.

Kyrgyzstan

Turkmenistan

Maldives

Afghanistan

Belarus

Iraq

Bangladesh

Bosnia

Israel

Bahrain

Turkey

Kuwait

Bhutan

bhu

China

Moldova

Lithuania

Singapore

Qatar

Fig 4: The result of Pearson-corelation between GDP per capita and final EIA score

Table 3 below ranks five criteria for each country. Results are briefly described below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| country | Legislation | Administration | EIA Procedure | EIA Decision Making | EIA Support |
| Estonia | 1 | 10 | 4 | 26 | 6 |
| Hungary | 1 | 9 | 23 | 3 | 11 |
| Lithuania | 1 | 5 | 16 | 3 | 1 |
| Moldova | 4 | 4 | 2 | 3 | 31 |
| Czech | 5 | 14 | 8 | 24 | 9 |
| Slovenia | 6 | 6 | 14 | 2 | 15 |
| Latvia | 7 | 16 | 1 | 3 | 13 |
| China | 8 | 6 | 3 | 10 | 6 |
| Singapore | 9 | 18 | 27 | 10 | 4 |
| Croatia | 10 | 21 | 10 | 10 | 14 |
| Poland | 11 | 60 | 29 | 1 | 50 |
| Israel | 12 | 17 | 18 | 3 | 1 |
| Slovakia | 12 | 12 | 14 | 39 | 19 |
| UAE | 12 | 51 | 19 | 10 | 10 |
| Cambodia | 15 | 50 | 25 | 40 | 44 |
| Bhutan | 16 | 22 | 12 | 3 | 37 |
| Romania | 17 | 19 | 21 | 10 | 18 |
| Russia | 17 | 29 | 21 | 10 | 21 |
| Bulgaria | 19 | 6 | 5 | 10 | 23 |
| Bahrain | 20 | 44 | 5 | 40 | 5 |
| Kuwait | 20 | 11 | 43 | 40 | 8 |
| Indonesia | 22 | 55 | 37 | 40 | 36 |
| Laos | 22 | 39 | 60 | 36 | 50 |
| Georgia | 24 | 1 | 8 | 24 | 38 |
| Macedonia | 25 | 53 | 34 | 3 | 50 |
| Pakistan | 26 | 34 | 33 | 26 | 25 |
| Mongolia | 27 | 64 | 60 | 40 | 41 |
| Oman | 28 | 23 | 20 | 26 | 20 |
| Turkey | 28 | 27 | 44 | 40 | 17 |
| Myanmar | 30 | 51 | 56 | 40 | 50 |
| Thailand | 31 | 38 | 41 | 40 | 50 |
| Egypt | 32 | 62 | 64 | 10 | 43 |
| Malaysia | 32 | 58 | 36 | 36 | 22 |
| Qatar | 32 | 2 | 11 | 26 | 25 |
| Saudi Arabia | 32 | 49 | 24 | 40 | 12 |
| Belarus | 36 | 44 | 5 | 40 | 27 |
| Nepal | 37 | 23 | 56 | 26 | 48 |
| Sri Lanka | 37 | 15 | 42 | 40 | 30 |
| Palestine | 39 | 64 | 63 | 40 | 40 |
| Philippines | 40 | 36 | 50 | 40 | 41 |
| Vietnam | 41 | 58 | 30 | 34 | 34 |
| Tajikistan | 42 | 63 | 65 | 40 | 50 |
| Maldives | 43 | 57 | 38 | 40 | 16 |
| Brunei | 44 | 3 | 47 | 26 | 3 |
| Ukraine | 45 | 23 | 17 | 40 | 39 |
| Azerbaijan | 46 | 48 | 53 | 40 | 33 |
| Syria | 47 | 12 | 54 | 10 | 47 |
| Albania | 48 | 60 | 46 | 40 | 32 |
| Yemen | 49 | 46 | 51 | 10 | 45 |
| Jordan | 50 | 39 | 49 | 10 | 50 |
| Bosnia | 51 | 31 | 12 | 40 | 27 |
| Armenia | 52 | 32 | 39 | 40 | 35 |
| Kazakhstan | 53 | 39 | 26 | 10 | 50 |
| Bangladesh | 54 | 30 | 39 | 40 | 50 |
| Iran | 54 | 55 | 48 | 10 | 50 |
| Iraq | 54 | 39 | 31 | 40 | 50 |
| India | 57 | 33 | 55 | 26 | 46 |
| Montenegro | 58 | 23 | 52 | 10 | 50 |
| Uzbekistan | 59 | 46 | 35 | 40 | 50 |
| Afghanistan | 60 | 34 | 58 | 35 | 49 |
| Kyrgyzstan | 60 | 39 | 60 | 40 | 50 |
| Lebanon | 60 | 53 | 32 | 26 | 24 |
| Turkmenistan | 60 | 19 | 44 | 40 | 50 |
| Serbia | 64 | 36 | 27 | 36 | 29 |
| Timor-Leste | 65 | 27 | 59 | 40 | 50 |

Table 3: Country ranking of EIA criteria

*Legislation*

In general, all countries around the world have statutory requirements for EIA enacted through various laws and regulations. EIA is also increasingly recognized as a universally accepted principle of law (Yang, 2019) and mandatory in every country reviewed (Bond et al., 2020). However, the degree and quality of assessment practice varies substantially. Estonia, Hungary and Lithuania stand out with the highest scores. China out-ranks most countries in all regions except Europe. This has been said to be associated with China’s early implementation of EIA and its now firmly established EIA system (Khadka & Shrestha, 2011).

SEA has also been institutionalized in several countries across the BRI. The European Union SEA Directive has been the main driver of SEA in Europe. Some of the countries that were part of the Soviet Union and that became independent post 1990 (i.e. the countries referred to as newly independent states – or NIS, including Armenia, Azerbaijan, Belarus, Georgia, Ukraine) do not have SEA requirements and therefore obtain lower scores. In East and South-East Asia, SEA has evolved from EIA and its format varies from country to country.

While China, Indonesia and Vietnam conduct SEA to comply with legal frameworks, other countries' SEAs have mostly been driven by donor requirements (Loayza, 2012). The Mediterranean Environmental Technical Assistance Program (METAP) is very important in initiating national EIA and SEA in the Middle-East (El-Fadl & El-Fadel, 2004). In the South Asian Region (SAR), only Bhutan has requirements for SEA under its Environmental Assessment Act (Annandale, 2012). 58% of the SEAs for the 43 identified World Bank-supported SEAs undertaken in SAR between 1993 and 2012 were conducted in India, followed by Pakistan and Nepal (Lima, 2015; Loayza, 2012). Based on the EIA legislations, there are hardly any countries with transboundary or global EIA requirements with the exception of a few European countries where national legislation asks for attention to be given to transboundary impacts of large-scale projects in line with the UNECE Espoo Convention. In most of Asia and the Middle East, there are only declarations of intent of following the provision of the Espoo Convention (if the country has ratified it). However, there is no evidence of compliance (Heaton & Burns, 2014). Formal provisions for public participation are also highly variable in BRI countries, although some legal requirements exist in most countries. Even in high-scoring countries, public participation only starts when the EIA has already been progressing for some time, rather than at the start of it (Brombal et al., 2017).

Correlation between a country's GDP per capita and the strength of its EIA legal requirements is positive and significant (p<0.001), but weak (Fig.5). This result suggests that political commitment and donor organizations' support play an important role and GDP is only one of many factors affecting EIA legislation.

Kuwait

Qatar

Singapore

Bhutan

Belarus

Azerbaijan

Armenia

Ukraine

China

Hungary

Lithuania

Estonia

Fig 5: The relationship between GDP per capita and strength of EIA legislation

*Administration*

Georgia achieved the top score for EIA administration, followed by Qatar, Brunei, Moldova and Lithuania. Georgia’s high score can be explained in particular by public access to EISs being mandatory (The Legislative Herald of Georgia, 2013). Bulgaria, China and Slovenia hold joint sixth place (Fig. 4). A total of eleven European countries are in the top twenty countries with regards to EIA administration. Somewhat surprisingly, some lower-income countries with lower overall scores (such as Turkmenistan, Syria, and Sri Lanka) also obtain scores within the top twenty. This result is associated with the involvement of international donor organizations, including the World Bank and the Asian Development Bank in the drafting of EIA legislation and guidance in developing countries (Brew & Lee, 1996). The EU also contributes to the development of administrative structures and capacity building and the establishment of environmental policies in the Middle-East, especially in Egypt, Israel, Jordan, Lebanon, Syria and Palestine (Brew & Lee, 1996).

China and Bhutan have comprehensive EIA guidelines. This is not surprising, as these two nations have made considerable efforts in recent years in enhancing their environmental governance regimes (Castillo, 2015). Most of the European and South-East Asian countries also have comprehensive guidance for EIA in place (Swangjang, 2018). Middle-Eastern and Central Asian countries perform comparatively poorly in this regard. EIA statements are publicly available only in some countries, such as Estonia, Lithuania and Bhutan, although they are archived to some extent in practically all BRI countries. Fig. 6 shows the correlation between EIA administration and GDP per capita. Overall, the relationship between the two variables is statistically insignificant (at p= 0.869).

Israel

Singapore

UAE

Syria

Sri lanka

Turkmenistan

Slovenia

China

Bulgaria

Lithuania

Moldova

Brunei

Qatar

Georgia

Fig 6: The relationship between GDP per capita and EIA Administration

*Implementation Procedure*

With regards to ‘EIA implementation procedure’ (i.e. completeness of the EIA process) scores, Latvia, Moldova, China and Estonia obtained highest scores, followed by Bahrain and Belarus (Fig.4). Whilst for Lithuania, the EIA implementation procedure score was lower than those for other criteria, some essential steps were covered, including screening, scoping, EMP, public participation and follow-up.

Screening differs widely among countries. In most of Central Asia, South-East Asia and Europe, screening is conducted based on lists of different types of projects. In the Middle-East, screening is based on very broadly defined categories of activities. A common shortcoming is the absence of screening in many countries altogether, including Latvia, Belarus, Georgia, Russia, Kazakhstan, Kyrgyzstan, Turkmenistan, Ukraine and Albania. In many NIS countries, EIA implementation is deficient. Also, legislation is said to not always be followed (The World Bank, 2002). While most European and East and South-East Asian countries legally require scoping to involve stakeholders, several countries have no scoping procedure in place at all, including Bosnia, Albania, Belarus, Tajikistan, Turkmenistan and Uzbekistan (Cherp, 2001a). Another discrepancy is the lack of requirements for EMP.

Correlation analysis shows that there is a positive and significant, yet weak correlation between the EIA procedure and GDP per capita for each country (Fig.7; at p = 0.0032). Many lower-income countries have higher scores than could have been expected when considering their GDP per capita. Distinct differences also occur amongst countries with similar GDP per capita.

Singapore

Qatar

Lithuania

Belarus

Bahrain

China

Moldova

Latvia

Estonia

Fig 7: The relationship between GDP per capita and EIA Procedure

*Decision-making*

Poland and Slovenia receive the top two scores with regards to integration of EIA results in decision-making. Bhutan, Hungary, Israel, Latvia, Lithuania, Macedonia and Moldova all share the third highest score. In these countries, project decision-making is said to be fairly transparent, with regulatory requirements for the incorporation of EIA results into decision-making in place. China scores within the top ten countries, making it one of the two Asian countries with higher scores (the other being Singapore). Implementation of both, EIA and SEA in most NIS countries within Europe and Central Asia should be closely looked at in order to improve decision-making effectiveness. Lack of transparency is observed in many South-East Asian, South-Asian and Middle Eastern countries.

Whilst decision-making has a positive and significant correlation with GDP per capita (at p=0.000), this relationship is weak. This is not surprising, though, looking at the scores in Fig. 8. Hence, stringency and transparency of environmental regulation and overall economic development do not progress in parallel. In practice, the comparison of results suggests that having robust EIA legislation, administration and procedural aspects in place does not directly translate into implementation of EIA results in decision making.

Slovakia

Czech

Bahrain

Kuwait

Qatar

Singapore

China

Moldova

Bhutan

Macedonia

Lithuania

Latvia

Israel

Hungary

Slovenia

Poland

Fig 8: The relationship between GDP per capita and EIA decision-making

*Administrative Support*

Israel and Lithuania top the list with regards to administrative support for EIA scores. The governments of these countries are said to provide adequate financial and technical resources and regular capacity building activities for the execution of EIA (Gabbay, 2002; Kruopiene et al., 2009). There is also a formal mechanism for cross-government coordination of the EIA process. Brunei, Singapore and Bahrain have third, fourth and fifth highest scores, respectively. In general, high-income European countries exhibit stronger legislation, administration, procedure and long-standing governmental commitments to EIA. Lower income-countries suffer from insufficient technical and human capacity and are easily overstretched with regards to financial resources when conducting EIA (Aung et al., 2020; Kolhoff et al., 2013). Those countries also need support for increasing awareness and capacity.

Administrative support is strongly correlated with GDP per capita (R2=0.661 at p<0.001) (Fig. 9). Consistent with environmental-economic theories (Hanna, 2017), our results suggest that effective administrative support requires resources necessary to effectively implement legislation that are more readily available in higher income countries.

Poland

Qatar

Bahrain

Singapore

Brunei

Lithuania

Israel

Fig 9: The relationship between GDP per capita and EIA Administrative support

Conclusions

In order to be able to improve environmental regulation, awareness and performance for BRI countries, good environmental data are required at local, national, regional and global levels. In this paper, we made the first ever attempt to build an index-based EIA repository (based on an EIA Quality Index - EQI - score) for BRI countries. Data generated in this context offer important clues as to where there is a need for improvement. Financial support should be connected with a requirement to create EIA systems that perform well. The comparative review presented in this paper shows that, a considerable degree of variance was observed among countries with regards to aspects, attributes and criteria. EIA systems of European countries overall tend to attain high scores. The EIA system in China is sixth within all BRI countries and ranked top in Asia. Results reveal that there is a great disparity among the countries in terms of EIA systems. It is therefore crucial to prioritize environmental cooperation and take environmental issues into account at the early stage of project implementation. The integrated framework we provided in the study might help to support better decision-making at the project approval level.

In the paper, we tested how GDP per capita of a country is associated with EQI scores, providing preliminary empirical evidence for cross-country differences. Whilst there is some correlation of EQI sores and GDP per capita, this relationship is not significant. While the correlations between GDP per capita and overall EQI scores as well as for the criterion administrative support for EIA are statistically significant and clear, underlying legislation, completeness of EIA procedure and influence on decision-making are not and the quality of the existing environmental regime as well as requirements by international donor agencies play important roles. The rigor and structure of environmental regulations as well as the ability to enforce compliance appears to play a particular important role (similarly to what was observed by Fischer & Gazzola (2006)). EIA systems improve with regards to stronger administrative support as GDP grows. This includes the development of skills of those involved in EIA as well as and more rigorous capacity-building.

The findings introduced in this paper carry important baseline information and policy implications. While economic advancement can be a key mechanism for effective EIA, a weak correlation between GDP and various EIA criteria implies that a nation’s broader legal and other institutional underpinnings, and international support are crucial for achieving EIA effectiveness. BRI projects can help developing countries to modernize their economies. In this context, they should also aim at improving regulatory systems and environmental performance. EIA can play an important role in achieving this and should be designed, so that it can – at least potentially – be effective.

Results on EQI-GDP relationships presented are not significant. Therefore, future research should therefore explore this relationship, using systematic econometric techniques when national level environmental data for these countries become available.

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Annex 1: EEI Criteria scores by country

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Country | Legislation | Administration | EIA Procedure | EIA Support | EIA Decision Making | Final EIA score | Rank |
| Afghanistan | 0.231 | 0.680 | 0.286 | 0.059 | 0.213 | 0.24 | 55 |
| Albania | 0.348 | 0.190 | 0.450 | 0.307 | 0.000 | 0.48 | 23 |
| Armenia | 0.299 | 0.490 | 0.479 | 0.292 | 0.000 | 0.43 | 32 |
| Azerbaijan | 0.380 | 0.600 | 0.335 | 0.306 | 0.000 | 0.19 | 57 |
| Bahrain | 0.616 | 0.440 | 0.721 | 0.881 | 0.000 | 0.40 | 39 |
| Bangladesh | 0.283 | 0.600 | 0.479 | 0.000 | 0.000 | 0.16 | 62 |
| Belarus | 0.497 | 0.440 | 0.711 | 0.354 | 0.000 | 0.24 | 56 |
| Bhutan | 0.700 | 0.600 | 0.679 | 0.281 | 0.749 | 0.76 | 7 |
| Bosnia | 0.314 | 0.500 | 0.679 | 0.354 | 0.000 | 0.16 | 61 |
| Brunei | 0.395 | 0.950 | 0.443 | 0.896 | 0.413 | 0.46 | 25 |
| Bulgaria | 0.633 | 0.830 | 0.661 | 0.576 | 0.625 | 0.72 | 8 |
| Cambodia | 0.714 | 0.390 | 0.627 | 0.163 | 0.000 | 0.45 | 26 |
| China | 0.800 | 0.830 | 0.735 | 0.855 | 0.625 | 0.77 | 6 |
| Croatia | 0.733 | 0.210 | 0.698 | 0.776 | 0.625 | 0.71 | 9 |
| Czech | 0.900 | 0.270 | 0.099 | 0.826 | 0.536 | 0.68 | 11 |
| Egypt | 0.516 | 0.170 | 0.212 | 0.192 | 0.625 | 0.52 | 19 |
| Estonia | 1.000 | 0.170 | 0.769 | 0.855 | 0.413 | 0.77 | 5 |
| Georgia | 0.600 | 1.000 | 0.699 | 0.276 | 0.536 | 0.71 | 10 |
| Hungary | 1.000 | 0.290 | 0.635 | 0.800 | 0.749 | 0.84 | 3 |
| India | 0.283 | 0.290 | 0.301 | 0.142 | 0.413 | 0.41 | 37 |
| Indonesia | 0.615 | 0.120 | 0.539 | 0.291 | 0.000 | 0.48 | 22 |
| Iran | 0.283 | 0.120 | 0.437 | 0.000 | 0.625 | 0.34 | 44 |
| Iraq | 0.283 | 0.440 | 0.587 | 0.000 | 0.000 | 0.19 | 58 |
| Israel | 0.716 | 0.440 | 0.656 | 0.911 | 0.749 | 0.60 | 13 |
| Jordan | 0.316 | 0.440 | 0.411 | 0.000 | 0.625 | 0.32 | 50 |
| Kazakhstan | 0.297 | 0.440 | 0.617 | 0.000 | 0.625 | 0.28 | 52 |
| Kuwait | 0.616 | 0.730 | 0.459 | 0.840 | 0.000 | 0.33 | 45 |
| Kyrgyzstan | 0.231 | 0.440 | 0.259 | 0.000 | 0.000 | 0.12 | 63 |
| Laos | 0.615 | 0.440 | 0.259 | 0.000 | 0.206 | 0.44 | 28 |
| Latvia | 0.833 | 0.640 | 0.797 | 0.781 | 0.749 | 0.80 | 4 |
| Lebanon | 0.231 | 0.330 | 0.576 | 0.455 | 0.413 | 0.40 | 40 |
| Lithuania | 1.000 | 0.880 | 0.559 | 0.911 | 0.749 | 0.87 | 1 |
| Macedonia | 0.598 | 0.330 | 0.450 | 0.000 | 0.749 | 0.53 | 18 |
| Malaysia | 0.516 | 0.210 | 0.647 | 0.601 | 0.206 | 0.50 | 20 |
| Maldives | 0.398 | 0.230 | 0.504 | 0.709 | 0.000 | 0.12 | 64 |
| Moldova | 0.933 | 0.910 | 0.757 | 0.311 | 0.749 | 0.85 | 2 |
| Mongolia | 0.549 | 0.000 | 0.259 | 0.209 | 0.000 | 0.29 | 51 |
| Montenegro | 0.264 | 0.580 | 0.342 | 0.000 | 0.625 | 0.43 | 30 |
| Myanmar | 0.547 | 0.370 | 0.298 | 0.000 | 0.000 | 0.38 | 41 |
| Nepal | 0.481 | 0.580 | 0.298 | 0.127 | 0.413 | 0.42 | 35 |
| Oman | 0.548 | 0.580 | 0.647 | 0.646 | 0.413 | 0.44 | 29 |
| Pakistan | 0.565 | 0.680 | 0.551 | 0.383 | 0.413 | 0.42 | 36 |
| Palestine | 0.450 | 0.000 | 0.235 | 0.246 | 0.000 | 0.36 | 42 |
| Philippines | 0.448 | 0.480 | 0.399 | 0.209 | 0.000 | 0.36 | 43 |
| Poland | 0.731 | 0.190 | 0.606 | 0.000 | 0.873 | 0.59 | 14 |
| Qatar | 0.516 | 0.920 | 0.693 | 0.383 | 0.413 | 0.41 | 38 |
| Romania | 0.649 | 0.620 | 0.641 | 0.695 | 0.625 | 0.55 | 16 |
| Russia | 0.649 | 0.540 | 0.641 | 0.609 | 0.625 | 0.48 | 24 |
| Saudi Arabia | 0.516 | 0.390 | 0.630 | 0.783 | 0.000 | 0.32 | 49 |
| Serbia | 0.198 | 0.480 | 0.610 | 0.337 | 0.206 | 0.27 | 53 |
| Singapore | 0.783 | 0.620 | 0.610 | 0.892 | 0.625 | 0.53 | 17 |
| Slovakia | 0.716 | 0.710 | 0.661 | 0.655 | 0.124 | 0.45 | 27 |
| Slovenia | 0.899 | 0.830 | 0.661 | 0.754 | 0.788 | 0.64 | 12 |
| Sri Lanka | 0.481 | 0.640 | 0.461 | 0.327 | 0.000 | 0.32 | 48 |
| Syria | 0.365 | 0.710 | 0.310 | 0.137 | 0.625 | 0.42 | 34 |
| Tajikistan | 0.431 | 0.140 | 0.210 | 0.000 | 0.000 | 0.18 | 59 |
| Thailand | 0.533 | 0.460 | 0.473 | 0.000 | 0.000 | 0.43 | 31 |
| Timor-Leste | 0.197 | 0.560 | 0.283 | 0.000 | 0.000 | 0.27 | 54 |
| Turkey | 0.548 | 0.560 | 0.452 | 0.702 | 0.000 | 0.33 | 46 |
| Turkmenistan | 0.231 | 0.620 | 0.452 | 0.000 | 0.000 | 0.11 | 65 |
| UAE | 0.716 | 0.370 | 0.649 | 0.816 | 0.625 | 0.42 | 33 |
| Ukraine | 0.383 | 0.580 | 0.659 | 0.272 | 0.000 | 0.32 | 47 |
| Uzbekistan | 0.249 | 0.410 | 0.548 | 0.000 | 0.000 | 0.17 | 60 |
| Vietnam | 0.448 | 0.210 | 0.595 | 0.301 | 0.248 | 0.57 | 15 |
| Yemen | 0.331 | 0.410 | 0.386 | 0.162 | 0.625 | 0.49 | 21 |