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Montalbán-Domingo, L.; García-Segura, T.; Sanz-Benlloch, A.; Pellicer, E. (2022). Factors and Indicators to Assess Sustainable Development Goals (SDG) in Public Works Procurement. American Society of Civil Engineers. 328-336.
<https://doi.org/10.1061/9780784483954.034>



The final publication is available at

<https://doi.org/10.1061/9780784483954.034>

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Additional Information

Factors and Indicators to Assess Sustainable Development Goals (SDG) in Public-Works Procurement

Laura Montalbán-Domingo, Ph.D.,¹ Tatiana García-Segura, Ph.D.,²
Amalia Sanz-Benlloch, Ph.D.³; and Eugenio Pellicer, Ph.D.,M.ASCE⁴

¹Assistant Professor, School of Civil Engineering, Universitat Politècnica de València, Valencia, Spain. Email: laumondo@upv.es

²Assistant Professor, School of Civil Engineering, Universitat Politècnica de València, Valencia, Spain. Email: tagarse@upv.es

³Associate Professor, School of Civil Engineering, Universitat Politècnica de València, Valencia, Spain. Email: asanz@upv.es

⁴ Professor, School of Civil Engineering, Universitat Politècnica de València, Valencia, Spain. Email: pellicer@upv.es (Corresponding author)

ABSTRACT

The construction industry is under obligation to address sustainability, especially, after the United Nations established 17 Sustainable Development Goals (SDGs). To achieve these 17 SDG, promoting the development of sustainable infrastructures is key to transform the behavior of the construction sector; and public procurement has been highlighted as the tool to link the success of infrastructure projects with the goals of the SDGs. However, the assessment of the performance of companies and projects against the SDGs has not been currently resolved, and research in this matter is scarce, being a topic of great relevance to be addressed. Therefore, this research, through an extensive literature review, analyzes the factors and indicators to assess the social sustainability of the SDG in public procurement of civil engineering projects. This study provides insights into the challenges regarding the implementation of the SDGs and is a point of departure for future research and development of practical solutions.

INTRODUCTION

In 2015, the international community ratified the UN's 17 Sustainable Development Goals (SDGs from now on) (United Nations 2015). These 17 goals were defined based on 169 targets in order to hold the international community responsible for the implementation of the goals (Goubran 2019), and 193 nations signed to address this global challenge (Mansell et al. 2020).

The construction industry has a strong responsibility and great potential in achieving the United Nation's 17 Sustainable Development Goals (SDGs) (Gade

and Opoku 2020). This sector is the one that provides the most employment, estimating that in 2025 it will employ more than 70% of worldwide. Within the construction industry, there are two main kinds of projects: civil engineering projects and building projects. Civil engineering projects provide basic services to people through the design, construction and maintenance of infrastructures such as roads, railways, tunnels, bridges, airports, mines, dams, ports and harbors, water supply and sewerage systems and flood mitigation works (Mansell et al. 2020). Civil engineering projects are responsible for maintaining stable economic growth and promoting employment and social. However, this kind of projects does not just have beneficial impacts (Thacker et al. 2019). In comparison with building projects, civil engineering projects are usually critical infrastructure projects that cause significant disturbances to the existing communities and environment (Thacker et al. 2019). In this regard, numerous authors have claimed the need of promoting sustainability in this kind of projects; this can be addressed through SDG measurement in the construction industry (Mansell et al. 2020; Thacker et al. 2019).

Currently, there are three main barriers to measure SDGs in the construction industry. First, there is a lack of understanding about the influence of civil engineering projects on achieving the 17 SDG. After the definition of the 2030 Agenda, researchers have been studying the SDGs (Goubran 2019). Some authors have analyzed how the activities of different economic sectors intersect with the SDGs and their targets; however the analysis of the interaction between the construction industry and the SDG has been rather limited (Goubran 2019).

Second, the SDG should be boosted through public procurement but there is a lack of knowledge about how to translate the SDG to organizational and project level. Public procurement is the key element for bringing the industry about sustainability. For this reason, most governments have addressed the integration of sustainability in public procurement encouraging the inclusion of economic, environmental, and social aspects in their purchasing activities. However, to ensure successful adaption and implementation of the SDGs in public procurement of the construction industry, these should be assessed at organizational and project levels (Gade and Opoku 2020). In this regard, important limitations still exist to integrate SDG in public procurement mainly because the targets of each SDG have been designed to be used at global, regional and national level. This fact causes a gap between theory and practice (Mansell et al. 2020), being reduced the applicability at organizational or project levels due to the lack of understanding about how to measure SDG performance at these levels (Gade and Opoku 2020; Mansell et al. 2020). Additionally, public tendering focuses on the selection of the project team through a regulated system based on a fair and an objective competition. Therefore,

defining quantitative and semi-quantitative indicators is essential to avoid the subjectivity and ensure the transparency, objectivity, and equitability of bid-selection processes.

Third, there are important challenges to measure social SDGs at organizational or project level since the social dimension of the SDG has been little studied (Gade and Opoku 2020). There are few sources that explore the comprehensive role of construction activities play in the 2030 Agenda from a social perspective (Goubran 2019; Mansell et al. 2020). According to these barriers, this paper aims to address this gap by exploring how the social dimension of sustainability intersect with the SDG in the construction stage of civil engineering projects.

SOCIAL FACTORS IN PUBLIC-WORKS PROCUREMENT

In order to contribute to the inclusion of the social dimension of sustainability in public procurement, Montalbán-Domingo et al. (2019) identified the eight key social categories that should be taken into account in public tendering of the construction industry: cultural heritage, employment, health and safety, local development, professional ethics, public participation, training, and user impact. Additionally, Montalbán-Domingo et al. (2021) proposed a method to include these social factors in public procurement of civil engineering projects, focusing on the infrastructure life-cycle construction stage and design-bid-build delivery. This method gathered twenty-two final factors sorted into three organizational levels (Table 1). The country-level collects those social factors that, by being part of the human rights, their non-compliance must not be tolerated at any level. The company-level entails those social factors that are essential to the assessment of the corporate social responsibility of construction companies involved in the procurement procedure. Finally, the project-level gathers the social factors linked to the project and, thus, assesses the commitment of the construction companies to the project.

Table 1: Levels, categories and factors to assess social sustainability in public-works procurement (Source: Montalbán-Domingo et al. 2021)

Level	Category	Factor
Country: Human Rights	Professional Ethics	Child labor
		Forced labor
		Freedom of association and collective bargaining
		Corruption
		Respect of indigenous rights
Company: Corporate Social Responsibility	Employment	Respect of intellectual property rights
		Employment creation
	Occupational Health and Safety	Job stability
		Social benefits and social security
	Local Development	Occupational health and safety performance
Professional Ethics	Social value	
		Non-discrimination and equal opportunities

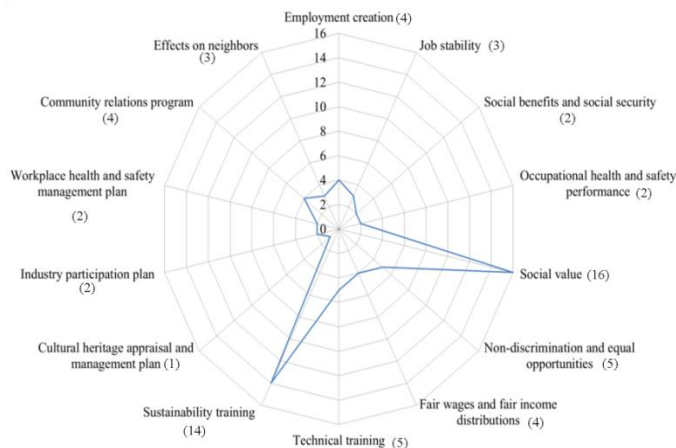
		Fair wages and fair income distributions
	Training	Technical training Sustainability training
Project: Social Commitment in the Project	Cultural Heritage	Cultural heritage appraisal and management plan Collaboration with historical or cultural preservationists
	Employment	Industry participation plan
	Occupational Health and Safety	Workplace health and safety management plan Work health and safety management officer
	Public Participation	Community relations program
	Users' Impact	Effects on neighbors

HOW SOCIAL FACTORS AND SDG INTERSECT

The aim of this paper is to explore how the inclusion of social criteria in public-work procurement of civil engineering projects can influence directly or indirectly on supporting the SDGs. Focusing these analyses solely on the previous literature could be limited by the individual bias of the researchers; therefore, to overcome this limitation, 12 experts were involved through the focus group technique. Selecting a heterogeneous panel of experts to participate in the focus group is important to reduce the chances of experiential biases and confirmation and optimism biases in the group consensus (Bhandari and Hallowell 2021). Thus, three profiles of experts were identified: (Profile 1) public procurement procedures and project delivery methods; (Profile 2) construction of civil engineering projects; and, (Profile 3) social sustainability in the construction industry. The following criteria characterized the experts involved in the focus group (Hallowell and Gambatese 2010): (A) having at least 10 years of professional experience in the construction industry regarding any of the three profiles (100% Profile 1; 100% Profile 2; 100% Profile 3); (B) holding an advanced degree in the fields related to the three defined profiles (100% Profile 1; 100% Profile 2; 100% Profile 3); (C) primary or secondary author of at least three peer-reviewed journal articles (25% Profile 1; 75% Profile 2; 75% Profile 3); (D) manager in a private company (50% Profile 1; 100% Profile 2; 0% Profile 3); (E) faculty member at an accredited institution of higher learning (50% Profile 1; 50% Profile 2; 75% Profile 3); and, (F) doctoral degree (50% Profile 1; 50% Profile 2; 75% Profile 3). Every member had broad expertise in any of the established profiles and held at least a civil engineering degree. The focus group discussed how the social factors at company level and project level intersect with the 169 targets. First, the focus group assessed whether the corporate social responsibility and the social commitment of a construction company in a civil engineering project can influence directly or indirectly the attainment of each target. Second, the experts identified the social factors that can influence each target. The result of the focus group showed that 93 of the 169 targets of the agenda (55%) were found to be dependent on the construction stage of civil engineering projects (see Table 2). The company level

influences more indirectly (78 targets) than directly (42) the attainment of the targets. This is because the social value and sustainability training can strongly impact on achieving the SDGs (see Figure 1).

Figure 1: Number of SDG influenced by each social factor



The aim of the social value factor is to promote contractors and subcontractors to act in a socially responsible way through the assessment of suppliers for a range of social criteria, participating in social programs and voluntary activities, and involving the local community in the organizational operations (Popovic et al. 2018); therefore, construction companies can act directly and, specially, indirectly, through the collaboration with non-governmental organizations. Additionally, the sustainability training factor is key to improve the sustainability performance of the construction industry (CIRIA 2001). This factor has an important indirect impact on achieving the SDGs since implementing training strategies at organizational level can have an important effect on the social progress of organizations (Popovic et al. 2018).

On the other hand, Table 2 shows that the project level presents higher direct influences (11 targets) than indirect (4 targets). Construction companies play an important role to improve sustainable performance during the construction of civil engineering projects. Factors such as community relations programs and effects on neighbors are essential for the attainment of the SDG targets (see Figure 1). According to CEEQUAL (2010), collecting, evaluating, and incorporating community input into each phase of the project life cycle is key to ensure the effective implementation of the project. Moreover, construction projects can affect existing services and can cause severe social costs (CEEQUAL 2010); thus, the consideration of this social factor in public procurement can impact directly on SDG such as Sustainable Cities and Communities (SDG11) and Life below Water (SDG 14).

Table 2: SDG targets are directly and indirectly influenced by social factors

Sustainability Development Goals	Total Targets	Company: Corporate social respons.			Project: Social commitment in the project			Total targets covered by some of the social factors
		D	I	B	D	I	B	
1. No poverty	7	0	1	2	0	0	0	3/7 (43%)
2. Zero hunger	8	0	2	0	0	0	0	2/8 (25%)
3. Good health and well-being	13	1	3	7	4	1	0	11/13 (85%)
4. Quality education	10	1	3	6	0	0	0	10/10 (100%)
5. Gender equality	9	0	3	4	0	0	0	7/9 (78%)
6. Clean water and sanitation	8	0	7	0	0	0	0	7/8 (88%)
7. Affordable and clean energy	5	0	5	0	0	0	0	5/5 (100%)
8. Decent work and economic growth	12	4	1	2	1	0	0	7/12 (58%)
9. Industry, innovation and infrastructure	8	1	4	1	2	0	0	8/8 (100%)
10. Reduced inequalities	10	0	0	3	0	0	0	3/10 (30%)
11. Sustainable cities and communities	10	0	7	1	2	3	0	8/10 (80%)
12. Responsible consumption and production	11	2	4	1	0	0	0	7/11 (64%)
13. Climate action	5	2	1	2	0	0	0	5/5 (100%)
14. Life below water	10	0	3	0	1	0	0	3/10 (30%)
15. Life on land	12	0	2	0	0	0	0	2/12 (17%)
16. Peace, justice and strong institutions	12	2	4	0	1	0	0	6/12 (50%)
17. Partnerships for the goals	19	0	0	0	0	0	0	0/19 (0%)
	169	13	50	29	11	4	0	94/169 (56%)

Note: D: Direct; I: Indirect; B: Both

In order to show how social factors intersect with each SDG, Table 3 gathers the targets of each SDG, which are covered by each social factor. The United Nations (2008) highlighted the significant impact of jobs creation on social progress. In line with this, the inclusion of criteria related to employment creation factors can reduce the poverty (SDG 1); work on guaranteeing decent work and economic growth (SDG 8), and reducing inequalities (SDG 10). On the other hand, the social benefits and social security can contribute, through offering healthcare services or voluntary health promotion services and programs for preventing harm (Popovic et al. 2018), to achieving the SDGs Good Health and Well-being (SDG 3) and Gender Equality (SDG 5). Fair wages and fair income distributions can impact over the SDG 1 (No Poverty), SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), and SDG 11 (Sustainable Cities and Communities). A fair salary is necessary to meet the needs of workers and their families, and guarantee a minimum wage to contribute to stability and prosperity in communities (Popovic et al. 2018). Regarding the cultural heritage appraisal and management factor, this can influence SDG 11 (Sustainable Cities and Communities) impacting on the target 11.4 (Strengthen Efforts to Protect and Safeguard the World's Cultural and Natural Heritage).

Table 3: How each social factor influences each SDG

	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SDG7	SDG8	SDG9	SDG10	SDG11	SDG12	SDG13	SDG14	SDG15	SDG16
Number of targets	7	8	13	10	9	8	5	12	8	10	10	11	5	10	12	12
Employment creation	1.2							8.1;8.5;8.6	9.2;9.5	10.1;10.2						
Targets	14%							25%	25%	20%						
% of targets																
Job stability				4.2				8.1;8.5;8.8	10.1;10.2							
Targets				10%				25%	20%							
% of targets																
Social benefits and social security			3.1;3.2;3.4;3.7;3.8		5.6											
Targets			3.9													
% of targets			46%		11%											
Occupational health and safety performance			3.2;3.4;3.5;3.6					8.8								
Targets			38%					8%								
% of targets																
Social value	1.1;	2.1;2.2	3.1;3.2;3.3;3.4;3.5	4.2;4.3;4.4;	5.1;5.2;5.3;5.4	6.1;6.2;6.3;6.4;6	7.1;7.2;7.3;	8.6;8.7	9.5;9.a;9.	10.3	11.1;11.2;1	12.6;12.7	13.1;13	14.3	15.1;15	16.1;16
Targets	1.2;1.5		3.6;3.7;3.8;3.9;3.	4.5;4.6;4.7;	5.5;5.6;5.b	6.6.a;6.b	7.a;7.b		b;9.c		5;11.6;11.	12.8;12.	3;13.a;	2	2;16.3;1	6.4;16.6
% of targets	43%	25%	85%	80%	78%	88%	100%	17%	50%	10%	80%	27%	80%	10%	17%	42%
Targets				4.3;4.5	5.1;5.4;5.5			8.5;8.8	10.2;10.3							
% of targets				20%	33%			17%	20%							
Non-discrimination and equal opportunities	1.1;1.2		4.2					8.5;8.8		11.1						
Targets	29%		10%					17%		10%						
% of targets				4.3;4.4;4.5;				8.2	9.1;9.4	11.c		13.1				
Targets				4.6;4.a				8%	25%	10%		20%				
% of targets				50%				8%	25%	10%		20%				
Sustainability training												12.2;12.4	13.1;13	14.1;14	15.1	
Targets	2.1;2.2	3.6;3.9	4.7;4.a	5.1	6.3;6.4;6.6;6.a	7.2;7.3	8.4	9.1;9.4	10.2	11.6;11.c		12.5;12.	2;13.3;	2;14.3		
% of targets	25%	15%	20%	11%	50%	40%	8%	25%	10%	20%		6;12.7;12	13.b			
Targets												.8				
% of targets												55%	80%	30%	8%	
Cultural heritage appraisal and management										11.4						
Targets																
% of targets																
Industry participation plan									9.2;9.3	11.a						
Targets									25%	10%						
% of targets																
Workplace health and safety management			3.2;3.4;3.5;3.6;3.9					8.8								
Targets			38%					8%								
% of targets																
Community relations program			4.a		9.1				13%	11.3;11.7						
Targets			10%							20%						
% of targets																
Effects on neighbors			3.6							11.2;11.6						
Targets			8%							20%						
% of targets																
Percent of total targets	43%	25%	85%	100%	78%	88%	100%	58%	100%	30%	80%	64%	80%	30%	17%	50%

The inclusion of Industry Participation Plan factor can contribute to local firms' employment through involving them in construction projects (ISI 2015); therefore, this factor can impact on SDG 9 (Industry, Innovation and Infrastructure) and SDG 11 (Sustainable Cities and Communities).

Finally, the result of the focus group highlights the lack of influence of the social factors on the SDG 16 (Partnerships for the Goals). This is because the SDG 16 has to be addressed at national level through international partnerships between governments around the world (United Nations 2015).

SOCIAL INDICATORS

Table 4 gathers an example of indicators to assess each one of the social factors. These indicators can be included in public procurement of civil engineering projects to assess the corporate social responsibility of construction companies and the commitment of the construction companies to the project.

Table 4: Example of indicators to assess the social factors

Factor	Indicators	Source
Employment creation	Rate of new employee hires	GRI (2018)
Job stability	Rate of employee turnover and percentage of part-time and temporary workers	CIRIA (2001); GRI (2018)
Social benefits and social security	Cost of employee health and safety and employees that took parental leave, by gender.	CIRIA (2001); GRI (2018)
Occupational health and safety performance	Total expenditure on health and safety training, certificates to demonstrate the occupational health and safety performance of companies, the rate of fatalities or high-consequence work-related injuries, and number of reported occupational diseases	CIRIA (2001); GRI (2018)
Social value	% of suppliers screened using social criteria, % of operations with local community engagement, value of charitable donation in money or time as a proportion of profits, average number of hours spent for voluntary activities per entity per year	GRI (2018);
Non-discrimination and equal opportunities	Percentage of employees per gender; age group; ethnic minorities; young people; disabled people.	GRI (2018)
Fair wages and fair income distributions	Minimum wage and Ratio of the annual total compensation for the organization's highest-paid individual to the median annual total compensation for all employees.	GRI (2018)
Technical training	Total annual expenditure on education and training and average training hours per employee	GRI (2018)
Sustainability training	Expenses to train and promote CSR internally and expenditure on research and development.	Popovic et al. (2018)
Cultural heritage appraisal and management plan	Historic environment management plan and protection measures to avoid accidental damage.	CEEQUAL (2010)
Industry participation plan	Ratio of participation of local firms in the project.	ISI (2015)
Workplace health and safety management plan	A WH&S risk assessment method that identifies project-specific high risks construction activities.	ISI (2015)
Community relations program	Lists of stakeholder groups and periodicity for communicating with the stakeholder groups.	Muench et al. (2011)

Factor	Indicators	Source
Effects on neighbors	Requirements for construction traffic control measures.	Muench et al. (2011)

CONCLUSIONS

The construction industry, and particularly the civil engineering projects, plays an important role to achieve the UN's 17 SDG. However, currently, there is still a limited body of research on how to boost the SDG in an effective way through public procurement. The reasons are that there is a lack of knowledge about how to translate and how to measure the SDG to organizational and project levels. Based on this, the aim of this research is to explore how the inclusion of social criteria in public-work procurement of civil engineering projects can influence directly or indirectly the SDGs. To that end, first, 22 social factors were identified. Their interaction with the 169 targets was analyzed by 12 experts through the focus group technique. The results highlight that 93 of the 169 targets could be influenced in a positive way through the inclusion of social criteria in public-works procurement of civil engineering projects.

Social factors related to the corporate social responsibility of the construction companies can heavily influence the attainment of the targets, mainly, in an indirect way; especially, through the factors Social Value and Sustainability Training. However, the social factors associated with the commitment of the construction company in the project can influence directly to achieve the SDGs. The definition of specific indicators to measure SDGs at company and project level is key to move the construction industry towards the SDGs. Public procurers should give support on how to implement the SDGs in the construction industry. Additionally, tools for measuring and controlling the performance of construction companies with regard to the SDGs should be defined.

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