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## UNDERSTANDINGS OF 'GLOBAL RESPONSIBILITY' EXPRESSED BY CIVIL ENGINEERS WORKING IN LONDON

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### ABSTRACT

This paper discusses the term 'global responsibility', how it emerged and why, and analysis of interview data collected from nine civil engineers working in London regarding their understandings of the term. Professional Bodies often take the lead in envisioning change, by identifying the direction their professionals should take to help address society's evolving needs and aspirations. Often, such Bodies charge academia with addressing society's evolving needs through research, outreach, and preparing the next generation of professionals. In the UK, leaders in civil engineering have pressed for individual and collective action to facilitate sustainable development and decrease occurrence of corruption. Nevertheless, under the current model of professional conduct, finances (typically the extractive side of the economic pillar) continue to take precedence over the environmental and social pillars. In response, the United Nations has encouraged use of the term 'global responsibility' to expand public perceptions of what quality life should entail. This paper represents a first step in comparing how common use of the term in UK civil engineering compares to its

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originally intended meaning, and what London-based engineers are doing to facilitate it.

## 1. INTRODUCTION

In the UK, leaders of Professional Bodies in civil engineering [1] [2] have pressed for individual and collective action to facilitate sustainable development and decrease occurrence of corruption [3], which had become particularly evident in large-scale infrastructure projects. According to the Brundtland commission [4], "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainable development implies concern for environmental and social sustainability as well as financial aspects, as conveyed in the three pillars (environment, society, economy) that should be given balanced consideration in decision-making. Nevertheless, financial profit has tended to be the focus of the business model within which civil engineering typically operates, and it relies heavily on indicators like Gross Domestic Product that are extractive rather than generative or re-generative in nature [5]. Many civil engineers have called for more holistic visions of success.

The United Nations has encouraged use of the term 'global responsibility' to expand public perceptions of what quality life should entail. The specific term has not gained a wide footing, however, and seldom appears in literature on civil engineering.

Despite not using the term, Professional Bodies in engineering have increased their attention to various dimensions of global responsibility, further codifying ethics, sustainability, and sustainability development and frequently highlighting and promoting cases for educators and practitioners to use as precedents [6].

Engineering Professional Bodies also have looked to higher education institutions (HEIs), asking them to equip emerging graduates with the skills and abilities necessary to enact global responsibility and incorporating such aspects into conditions for accreditation.

Considering the UK specifically, Professional Bodies provide grants, guides and frameworks, and other forms of support to HEIs to help them teach ethics and sustainability [6]. They provide continuing professional development (CPD) activities to help members develop new knowledge and skills, they require early-career engineers to engage with some dimensions of global responsibility in order to become Chartered, and have recently enacted requirements for Chartered engineers to maintain portfolios of CPD.

In this study, we interviewed nine civil engineers who work in London, asking about decisions they had made recently related to 'global responsibility' and, subsequently, asking them to define the term for us. In this paper, we report how they define the term—assessing to what degree this aligns with the United Nations' definition—and we identify what this implies for higher education and ongoing professional development.

## 1.1 Existing definitions

Kung published a seminal book on the topic in 1991, called published *Global responsibility: In search of a new world ethic* which promoted “Planetary Responsibility” as the slogan for the future, encouraging “an ethic of responsibility in place of an ethic of success or disposition”. This new ethic would encompass “responsibility for our neighbours, the environment and the world after us” and would define “ethics as a public concern” [7, p. viii].

In 2005 the United Nations, in collaboration with companies and business schools, launched a Globally Responsible Leadership Initiative (GRLI) “to catalyse the development of globally responsible leadership and practice in organisations and societies worldwide” [8, footer] and facilitate “deep systemic change across three domains: how we live and make a living, how we learn, and how we lead” [8, ¶1]. Despite efforts to promote a holistic vision, the most commonly-cited aspect appears to be Corporate Social Responsibility (CSR), which Chen and Scott [9] describe as corporate citizenship and as “a self-regulating business model that helps a company be socially accountable—to itself, its stakeholders, and the public” (¶1). They do so by “operating in ways that enhance society and the environment, instead of contributing negatively to them” (¶2). Related to education, the European Federation of National Engineering Associations (FEANI) aims to strengthen “the position, role and responsibility of engineers in society” (p.42) and has mentioned the term ‘global responsibility’ in its newsletter [10]. Nevertheless, the term does not commonly appear in engineering literature and appears to be more commonly mentioned in Europe than other English-language areas of the world.

## 2. METHODOLOGY

This project uses thematic analysis alongside grounded theory [11] to “perform a simple and preliminary study of an area where there is little previous research” [12, p.156], in this case regarding to the emergence of the term ‘global responsibility’. Thematic analysis using grounded theory has proven to be highly effective for this type of exploratory research [11]. Consistent with this methodology, semi-structured interviews with open-ended questions were conducted to assess how participants experienced or perceived the topic [13]. The study was designed to find out how participants themselves defined, in their own words, ‘global responsibility’ and was approved by UCL Ethics. This exploratory study was conducted by a team of engineering education researchers at the request of Engineers without Borders UK (EWB-UK), who defined the topic, sample size, and scope of work. Sampling was pragmatic and purposeful. The nine interview participants were recruited by EWB-UK and included three women and six men (see Table 1 for demographic information). EWB-UK solicited participants via email, newsletters, Tweets, and a webpage explaining this “Research looks into global responsibility in engineering” and “aims to understand whether and how global responsibility impacts on decision in the engineering profession”. A schedule of interview questions was prepared and applied in a conversational, semi-structured way.

*Table 1. Participant Demographics*

	Sex	Grad. Date	Degrees Held	Prof. Years	Employment Sector (Type of Work)	Charter Status
P1	F	2016	M.A. & M.Sc. (Sustainable Development)	3-5	Sustainable Development (Consulting & Research)	N/A (Ph.D. Under-way)
P7	F	2015	M.Eng. (Civil & Environmental Engineering)	3-5	Structural Engineering (Infrastructure & Building Design)	Underway
P8	M	2014	M.Eng. (Civil & Architectural Engineering)	3-5	Structural Engineering (Building Design)	Chartered
P3	F	2014	M.Eng. (Civil Engineering)	3-5	Structural Engineering (Building Design)	Underway
P9	M	2012	M.Eng. (Civil & Structural Engineering)	5-10	Rail (Design Management)	Chartered
P4	M	2010	M.Eng. (Civil & Structural Engineering)	5-10	Structural Engineering (Infrastructure Design)	Chartered
P6	M	2010	M.Eng. (Civil Engineering)	5-10	Rail (Infrastructure Construction Planning)	Underway
P5	M	2006	B.Sc. (Geoscience)	10-15	Ground Engineering (Construction Costing)	Chartered
P2	M	1982	M.A. & M.Sc. (Civil Engineering)	30-35	Rail (Design Management)	Chartered

One-hour semi-structured interviews with open-ended questions were conducted, professionally transcribed, and then verified for accuracy by the research team. Open, axial, and selective coding were used to determine themes and categories and analyze data. Weekly peer-debriefings were held with core research team. In addition, an expert Advisory Panel coordinated by EWB provided guidance throughout the process.

### 3. RESULTS

Participants provided a solid understanding of typical concerns and experiences working in civil engineering in London. The open-ended nature of the questions allowed participants to raise any topics that came to mind.

#### 3.1 Initial thoughts on ‘global responsibility’

Mentions related to the environmental pillar were more frequent than mentions of the social pillar or the sub-set of ethics and anti-corruption, which often surfaced only with prompting from the interviewer. When asked about ‘global responsibility’, most of these nine engineers:

- indicated it’s an ambiguous term and asked for our definition;
- used the Brundtland Commission’s words (longevity, future generations) to describe the concept;
- explicitly referenced the three pillars (social, economic, environmental).

Most participants arrived at the interview expecting to discuss topics related to EWB but indicating they were not familiar with the term ‘global responsibility’, *per se*.

*P4: When I knew this was like an Engineers Without Borders type [activity], I thought it was maybe about international development type definition of global*

*responsibility. But then, actually, in terms of what my work is, the global responsibility is about understanding social implications of engineering, of the work we do—and that can be wherever it is in the world.*

Interview data revealed that, to these civil engineers, ‘global responsibility’ is nebulous, ambiguous, and multi-layered term. Although these specific words were not seen as a familiar grouping, all participants did associated the term with the three pillars—environmental, social, and economic.

*P9: how many times have I heard the term global responsibility? Not loads. (...) I think in my eyes, its closely linked to sustainability, which is three pronged with environmental, social and financial. And by acting sustainably—considering all three of those branches—I think you are fulfilling a global—. You are thinking about global responsibility. But (...) to me, it's not a buzz word, in the industry. Where did I hear about it? Through perhaps some industry materials. But I don't know. In my eyes, it's not something which you hear loads.*

Nearly all participants discussed it in terms of considering impacts their decisions have on future generations as per The Brundtland report [4]:

*P2: You go into civil engineering because you're building for the future generations. You're not going in there to mortgage it for the future.*

Yet, most also admit they typically focus on environmental aspects in their efforts to be responsible:

*P6: I see it as quite tied towards the environment, which it probably isn't. I'm sure there's social aspects, and probably economic aspects, as well. But (...) I'm aware probably through other part-time work I've had, there is a big drive with multinational companies about ‘global corporate responsibility’ which links into charity work of all kinds. That's a separate issue, really, to me, so my understanding of global responsibility links quite closely to environmental sustainability.*

*P9: I find it, an almost all-encompassing term. Like you've literally had a positive influence on every person on the planet (...) I find it very hard to really pinpoint how one has contributed towards global responsibility (...) Sustainability, on the other hand doesn't have that (...). I now have the liberty to specify, as I said earlier on, the materials, or any replacements of materials, which could have an environmentally positive impact.*

Whereas others quite naturally incorporated social considerations, with understanding of their own vantage point and inherent biases:

*P7: I guess I live in a Western world and I have Western views, like I say about equality, and specifically things about the Sustainable Development Goals. I think there's a lot under global responsibility that you could filter down into those goals, but essentially, traditionally, it came under environmental politics and there's three pillars in there—environmental, economic, and social? I guess this is what I'm trying to say is this is kind of social side which probably stretches the traditional view of environment. Yes, that's how I related it to global responsibility.*

### **3.2 Definitions of ‘global responsibility’**

The interviewees resisted providing any *a priori* definition, but instead started the interview by asking participants to discuss “an instance in your recent work as a civil engineer where you made decisions related to ‘global responsibility’” and then, at the end of each interview, asking participants to summarize their definition of the term. Answers at this point resembled the following:

*P3: I think I would fall back on the definition of sustainability and I would say that it's making sure that we don't compromise the future generations' needs, on a global scale, or on a small scale, really, by the needs of today. So, it's making sure that we're not using things irresponsibly now, that will hinder the future generations. I think that's how I would define it.*

They often see this with regard to infrastructure projects:

*P5: Within civil engineering, I would say it's carrying out projects, creating infrastructure, without having a detrimental effect—a lasting detrimental effect—and minimizing that effect on the world.*

*P8: I would define "global responsibility" as minimizing the negative externalities of your work. Again, whatever they may be, because a lot of my work will have—. In a global impact sense, the main impact that I will have is climate change, so carbon and embodied carbon, as an example. Looking slightly lower then, they'll be on to supply chain, logistics and procurement. Then, other bits will be on the local environment, literally where they build the building and what impact of that is. A global impact to me has, it covers everything from very local impacts, because this space now, for a person to use, it has an impact on the people around it and the society around it up to, yes, this will impact the entire plan.*

In addition to mitigating negatives, they seek to stress positives:

*P8: I said global responsibility is minimizing those negative impacts. And I guess, conversely, maximizing the positive outcomes. But that's sometimes harder to point to. You can say, "I'll save carbon." It's hard to point that your good resource stewardship has resulted in—.*

*P9: It would be making conscious decisions, conscious decisions, about actions you're going to take, that will have a positive impact on society, and on the planet in terms of sustainability and its longevity.*

*P4: Engineering and international development is about providing maybe a facility or a place for learning or something that people can use in the future rather than building for the sake of it. And social implications of large engineering schemes in developed countries is about how people use and what's going to happen after you've finished building this building.*

Several saw inclusivity and diversity as crucial elements:

*P2: I think it is a global responsibility to look at all users.*

They had differing views on how individual and collective the actions should be.

*P1: I think that the word global in this responsibility means a collective responsibility.*

*P7: global responsibility (...) has a variety of scales. And the fact that you use the word 'global' insinuates that, "Do I as an individual living and working in London, have a responsibility to deliver something, or work in a way that takes the overall globe into account?" And I guess, yes.*

Being globally responsible has both collective and individual components:

*P7: For me, is a very personal, individual thing. I don't feel like it comes from a collective. And I feel like dealing with global issues that come under the 'global responsibility' umbrella are \*dealt with\* by the power of the team, the power of the*

*group, united vision, united thoughts and united strategy on these things. I think that's how things change. But when it comes to global responsibility, I feel like it comes from a place within. And where your ethics lie, and where your interests lie. And how aware you are, through your own personal experiences and upbringing, of some of the many problems that face society.*

Unlike the engineer quoted above, most participants did not inherently associate 'global responsibility' with ethics and anti-corruption, but discussed the topic when prompted:

*P3: I suppose my observations of corruption don't necessarily—maybe it's me being naïve—they don't necessarily link to global responsibilities, as such.*

*P6: Yes, so the ICE [Institution of Civil Engineers] themselves have a Code of Conduct which will be linked to various things we discussed, so sustainability and sustainable development, has its own objective as well as two separate, but abiding by the Codes of Conduct which probably do cover corruption.*

Some participants identified a connection to public health, safety, and welfare:

*P8: health and safety (...) is always on the core ones in structural engineering. In the global sense you don't sense you don't your building to fall down! But, also then again, we try to make sure it's constructible. We're not injuring people. We're not using harmful materials. There's always a lot of—from asbestos, right down to just chemicals and paints and things. (...) There's the hierarchy of needs. Ultimately, we need a safe building and then below that you need to be safe to construct.*

Mentions of job-site health and safety were more frequent:

*P5: in my experience, it's the large infrastructure jobs which focus more on quality, environmental, and health and safety. (...) Health and safety is extremely good in this country. And can be very poor in other countries. Constructing safely is often extremely slow, and extremely expensive.*

The barriers sometimes feel palpable and overwhelming. They consider what they can achieve:

*P1: I think there's many layers to it [global responsibility]. And, then you can take it to pieces and then try to sub-define that in different domains, in different professions, what this responsibility might mean, what are your limitations, what would you be capable of achieving? [...] The more you start to be conscious about this, the more you realize the amazing amount of barriers you are going to be encountering.*

The scope of decision they are allowed to make presents a core limitation. An early-career engineer noted his limited sphere of influence but explained this should grow over time:

*P6: I focus quite heavily on sustainable development of the built environment. I think you get quite, quite skewed, by your profession. I probably think of it: I think I have a global responsibility as an engineer, I have a slightly different global responsibilities as a human. I can't really describe ways in which how that perhaps an easier way to affect the outcome. It's become probably ever more apparent, isn't it, with the media coverage of things. Some people suggest we should stop eating meat, that that's the best thing we could do. But then as an engineer, we just think about the built environment we live in.*

Some participants found peace in identifying opportunities for improvement:

*P2: in sustainable development, you're always looking for ways in which people have built sustainability into the designs of what they do quite often with carbon footprint, so what material we use did you think of, et cetera, et cetera, et cetera. Should always be part of the way civil engineers thinking.*

Although participants spoke at length about the limited scope of their own day-to-day work, they also identified aspects of global responsibility that they do have the purview and ability to affect.

*P6: I can only really work in my globe which, obviously, how many millions of times smaller than that—the actual planet. I can only really affect things in my sphere. I think that's probably the practicality of being an engineer coming out. I'm limited by what I can affect. As my career develops, maybe there's scope to think that I will increase. Get in charge of perhaps a whole project, a framework of projects, or something like this. Depending on my position within an organization.*

### 3.3 Mentions to environmental, social, ethics and corruption topics

Table 2 provides frequency counts regarding how many participants mentioned various aspects of the environment.

*Table 2. Frequency of environmental mentions*

<b>Environmental topic</b>	<b>Participants</b>	<b>Mentions</b>
Materials	8	89
Carbon or climate	8	49
Water	6	41
Site or land	6	19
Retrofit	4	14
Pollution	4	10
Logistics	3	14
Resourcing	4	7
Electric power	2	8

Table 3 identifies how many participants discussed each social topic and the number of times the topic was mentioned during the interviews. Although the research team initially considered health and safety to be a social topic, participants had repeatedly raised it when asked about ethics, and therefore the team chose to report both job-site health and safety, and public health and safety in Table 3.

*Table 3. Frequency of social mentions*

<b>Social topic</b>	<b>Participants</b>	<b>Mentions</b>
Community	7	56
Access	7	44
Longevity / future generations	5	46
Developing nations	4	21
Gender and diversity	4	13
Efficiency having social benefit	4	6

Table 4 identifies the number of participants who discussed each category related to ethics and indicates who brought each of these topics forward. Six of nine participants associated on-site Health and Safety with ‘global responsibility’ without any prompting from the interviewer. However, most participants did not inherently link ‘ethics’ and ‘anti-corruption’ activities to the term.

*Table 4. Frequency of ethics and corruptions mentions*

Ethics topic	Participants	Mentions
<b>Participant-identified topics</b>		
Occupational health & safety	6	19 relevant passages with 26 mentions of safety
Public health & safety	3	15 relevant passages; 19 mentions of safety
<b>Advisor-identified topics</b>		
Ethics	2 unprompted, 9 total	14 mentions of the word by participants
Corruption	1 unprompted, 4 total	8 mentions of the word by participants
Bribery	0 unprompted, 3 total	2 explicitly, 1 implicitly through description

Overall, it is in the selection of materials, planning for efficient use of resources, use and development of new technologies and in pushing back against poor decisions that they described their best opportunities for facilitating change. For these engineers, infrastructure projects are seen as having the greatest ability to influence both social and environmental sustainability.

*P4: I suppose that—main sort of global responsibility thing—is considering sustainability in everything we're doing. So, I'm working on a big infrastructure project at the moment and there's a lot of consideration about minimizing the direct ways that we can influence sustainability as engineers, which is minimizing the material which we use, and minimizing the harm of the materials, we're using. That's sort of thought as part of a global problem that we need to, it's not isolated it's your project, it's a global issue, that you are having to consider.*

Such projects allow the engineers greater flexibility in addressing social needs than smaller scale projects for profit-driven clients.

*P4: in terms of what my work is [designing infrastructure projects for mostly private clients], the global responsibility is about understanding social implications of engineering, of the work we do, and that can be wherever it is in the world.*

## SUMMARY

Based on the narratives provided by these nine civil engineers, we can confidently state that:

- some specific environmental topics (e.g., material selection, carbon emissions) are of central concern in day-to-day work.
- the sample group had a collective sense that global responsibility involves protecting future generations and working toward environmental and social stability.
- the sample group is able to identify aspects of global responsibility that the projects they work on affect.

Concern has been growing for how to teach these subjects and how to infuse industry with new knowledge and skills that reflect values of global responsibility. “This new view that engineers will have of themselves will require new knowledge and skills” asserted Fuchs and Bochar [11, p. 44], emphasizing that changes have “to be made to engineering-study-programmes, as these are the primary resource for

attaining new knowledge and expertise". As leaders of FEANI, Fuchs and Bochar [11, pp. 44-45] insist:

*[engineers] can no longer limit ourselves to addressing technical issues as we did in the industrial age. Instead, we need to take a holistic view of the economic, ecological and social impacts of our actions—and always do so from a global perspective. Our objective here must be to ensure that every engineer adopts an international point of view so as to enable him or her to contribute to the improvement of the quality of life for everyone on the planet. Such “holistic expertise” will enable engineers to think and learn in an interdisciplinary manner and develop products that address the social and global challenges we face.*

Based on the interviews we conducted, it appears that civil engineers in London (those who would volunteer an interview on global responsibility at the request of EWB-UK) do recognize the facets of the term intended by developers of the term. They do not, however, naturally describe ‘ethics’ as a specific subset of sustainability as it has been categorized in the past decades by professional engineering organizations. Interestingly, the new Demonstrated Ability requirements posed by American Society of Civil Engineers (ASCE) Committee on Education [14] have pulled ethics out, making it a distinct category that now falls beside—rather than within or sub-set to—sustainability. Moreover, the Committee has recommended that the medium and higher levels of ethics (with regard to Bloom’s Taxonomy) be demonstrated in practice, via structured mentorship, as they are more advanced than could be demonstrated at the undergraduate level of university.

In other papers, our research team will identify the challenges that these engineers described facing in their attempts to enact global responsibility and discuss more about what this implies for higher education and professional development of engineers in the UK.

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