Environmental, Social and Governance-related Challenges in the Construction Industry (CIC 2023)

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Abstract

The construction industry is faced with several Environmental, Social and Governance (ESG) challenges and opportunities that include, but are not limited to, a massive carbon footprint, the physical impacts of climate change, green building certifications, supply chain, innovative product design, pollution control, health and safety, diversity and inclusion, community development, business ethics, and biodiversity. With these ESG issues front and centre in daily headlines, investors, shareholders and all other stakeholders are demanding greater transparency in relation to the construction industry's interaction with the environment and the society in which they operate and upon which they depend for long-term business continuity. ESG factors are becoming fundamental nonfinancial information for the long-term valuation of a company, for the investment decision-making process and in determining capital allocations. All the key players in the construction industry, including engineering and construction services firms, manufacturers and distributors of construction materials, buildings products and furnishing companies, real estate developers, and real estate services companies, need to convince stakeholders that they are delivering optimal outcomes when it comes to the triple bottom line of people, planet and profit. In this paper, we will address and discuss the following questions: What are the key ESG challenges and opportunities that construction industry is facing? How are these key ESG challenges identified and acted upon? What are the enablers used by the construction industry to address and manage ESG factors? Among these enablers, we will look in details at the Global Sustainability Assessment System (GSAS) and its capability to satisfy the investors ESG disclosures needs.

Keywords: ESG; Climate change; Construction industry; Disclosure; Investors; Green Certifications; GSAS; Financial impact

1 Introduction

In this paper we will look at the ESG challenges and opportunities of the construction sector be it the construction companies, engineering firms, real estate developer, real estate service providers and construction material manufacturers. The key idea of this paper is to explore these ESG topics from an investors point of view. What information investors are expecting on ESG topics in order to make investment decisions about a project or a company operating in the construction sector. First, we will start with a high-level overview of the common ESG topics of the construction industry and then we will look more closely on how companies identify those topics. We will then focus on the ESG topics that are of interest to investors basing our selection on the Sustainable Accounting Standards Board (SASB) of the

International Financial Reporting Standards Foundation (IFRS). We will then discuss the efficiency of using green certifications by the construction sector in meeting the investors' expectations (focusing specifically on the Global Sustainability Assessment System – GSAS certification scheme). We will identify where the GSAS certification comply and where it does not comply with investors' expectations and information needs such as reputational, legal, operational, market, climate change and social risks, as well as ESG opportunities and financial integration of ESG information.

Section 2 will cover the most common ESG opportunities and challenges of the construction sector, while section 3 will touch on ESG identification and planning. Section 4 will zoom in on the investors ESG expectation and material topics. Finally, Section 5 will discuss GSAS versus the investors ESG expectations and section 6 will conclude the paper.

2 Key ESG Challenges and Opportunities

2.1 ESG Challenges

2.1.1 Environmental Challenges

According to the World Green building Council (2019), the building and construction industry is responsible for 39 % of the global GHG emissions where 28% comes from operations and 11% from construction and materials manufacturing and transportation. It is estimated that the Iron and Steel manufacturing energy use generate approximately 6.1 % of global carbon emissions and the cement industry is responsible for 3.4% of the global GHG emissions (World Resources Institute, 2022).

With the global fight on climate change, the construction sector find itself challenged to reduce its carbon footprint. In addition to being a key contributor to the global carbon emissions finds, the construction sector finds itself at risk from the physical impacts of climate change. These include extreme weather events resulting in the disruption of the construction materials supply chain and subsequently delays and increase in prices for the construction process. Temperature and sea level rise due to global warming will respectively cause an increase of operations costs (maintenance, heating and cooling) and physical damage to the built environment structure caused by flooding and water submersion.

In addition to climate change, the negative impacts of the construction industry on the environment are numerous. It starts with the pollution caused by the raw materials extraction required for the construction of an asset all the way through the negative impacts of the construction activities and the pollution generated by the operations of the built environment. This pollution is linked to the outputs of a manufacturing plant during the production process such as wastewater, solid waste, hazardous waste, air emissions (GHG emissions and key pollutants such as dust, NOx, SOx, Ozone, Sulphur) and it can be also linked to the transportation of the produced material.

The construction phase produces very similar pollution types including wastewater (dewatering and sewage), dust, emissions from construction equipment, construction waste, hazardous waste, domestic waste and can also cause a risk of pollution to the soil and ground water via the excavation and drilling activities. The built environment also can be a risk of pollution from the generation of wastewater and domestic waste and a risk to the indoor air quality from chemical products used in the building finishing process.

Water management is another important issue for the construction sector as the production of construction materials, in addition to being energy intensive; it also requires substantial volumes of water. Water scarcity can affect construction material manufacturers by affecting day-to-day

operations, increasing the cost of water acquisition, and facing tightening regulations and possible fines. Water scarcity is an environmental and a social challenge for the construction industry as companies will have to respect the communities' needs for water access and operate in an environment with high competition on water resources.

Water management is also an important topic for the construction sector during the construction phase where contractors need to use water for the construction activities and dewater for excavations and foundation laying purposes.

On the biodiversity front, infrastructure projects and large real estate developments present a significant risk especially when they are located in an ecologically sensitive area. Developers should avoid if possible, building in sensitive areas and find ways to protect/restore those areas. With biodiversity as a top item on the agenda of United Nations and the Conference of Parties, the construction industry will be faced with more pressure to look after biodiversity by conserving, protecting, restoring and managing sustainably ecosystems for the coming decades.

2.1.2 Social Challenges

The health and safety issues has been and will remain a high priority for engineering and construction firms as a well as for the construction materials manufacturing. Even though incidence rates and nonfatal injuries are significantly lower than what they used to be a 100 years ago, fatality and injury rates in these sectors are high compared with other industries as a result of workforce's exposure to powered haulage and heavy machinery accidents, fall accidents and exposure to hazardous chemicals.

Beyond the construction phase, engineering and construction firms should ensure the safety and integrity of their work by avoiding errors or inadequate quality in the project design and construction phases. If companies perform poorly on that front, they can face high costs to redesign, repair work and legal liabilities, reputational damage. Moreover, when designing, the impact of climate change, which might affect structural integrity and must be taken into account. In this instance, compliance with minimal applicable codes might not be sufficient.

2.1.3 Governance Challenges

The construction industry is perceived as a male white dominated sector and is now expected to promote the inclusion of women in leading roles and to increase ethnic diversity. Gender and diversity are becoming important competitive differentiator.

In addition, companies in the construction industry must deal with risks related to bribery, corruption and anti-competitive practices. The fact that several companies in the construction sector have international reach makes the ethics issue more complex to manage especially when it comes to cultural differences and different ways of doing business between geographical locations. Ethical breaches can have serious consequence on companies such as large fines and reputational damage.

2.2 ESG Opportunities

It is well proven these days, that while green buildings can cost more than conventional buildings, they outperform them on many fronts such as operation cost, staff productivity, return on investment and attracting capital.

In the same direction, the construction industry is focusing on sustainable building materials innovation to manufacture and use materials and processes that are more resource efficient and that protect the health of the construction workers as well as the buildings users. This is a business driver for construction

materials companies because it is a way to increase revenues but also to decrease production costs as some materials will require less raw material and energy in their production process.

Real estate developer/owner need to play a role in influencing tenants' sustainability behaviour by the way they structure their agreements, contracts and relationships with tenants. By managing the sustainability of their tenants, they can manage the overall sustainability impacts of their assets. By managing upstream, the impacts of tenants they can align their financial interests with the ones of their tenants. This can drive asset value appreciation, increase tenant demand and satisfaction, decrease operation costs and risks related to buildings codes and regulations.

Real estate services provider can contribute to the sustainability of the buildings they service by reducing the sustainability impacts of a built environment through data management, energy procurement, energy and water benchmarking, resource efficiency improvement and activities related to green certifications. They can also contribute further by arranging leases that incentivize both the owner and tenants to enhance sustainability performance while resulting in a better financial performance for both parties. These services can increase revenues, client retention, tenant demands, and improve asset values; also, it can decrease operating costs and improve tenant experience.

Finally, studies have shown that there is a high correlation between corporate diversity and business performance. A study by McKinsey (2019) showed that there is a positive correlation between companies that commit themselves to diverse leadership and business success. They seem better in winning talent; improve their customer orientation and employee satisfaction.

3 ESG Identification and Planning

Identification of ESG issues, integrating them in the business model and disclosing to meet the expectations of stakeholders is becoming a challenging but very important task for all companies. With the ever-changing ESG landscape, it is getting difficult for companies to pin down their ESG scope. When it comes to ESG, Companies must answer strategic questions. Those questions not only look at the influence of ESG factors on the business, but they also address the influence of the business on the ESG aspects. In other words, a company's board and shareholders need to understand how the environmental, social and governance factors can influence the organisation's financial performance, operations and capacity for creating long-term value, at the same time; they must understand the company's activity impacts on the environment, the society and the local/regional economy. This is what a lot of ESG reporting frameworks is calling these days double materiality.

Like mentioned above, the EGS landscape is not easy to navigate. Identifying what ESG topics can drive business value is not always evident for companies. Companies in the construction industry, like all other sectors, will look at the global ESG or sustainability disclosure frameworks to identify their material ESG topics (whether to understand which ESG topics are material to the sector or what is the materiality assessment process they need to undertake) and then they will start collecting data on the identified ESG topics and try to build a sustainability vision and strategy based on the collected data.

The data collection process is usually an eye-opener for companies going through the materiality process as it can reveal the strength and weakness of a company when it comes to ESG and help them identify the material ESG topics to their business.

The ESG topics we have described earlier in section 4, although they are the most common themes within the construction industry, are not applicable to all companies operating in the sector. This is why ESG reporting frameworks advice companies to go through the ESG materiality process and

identify the topics that are company specific based on accurate and timely data collection, companies' activities, geographical location and stakeholders' expectations.

The construction industry and more specifically the companies involved in design, construction and operations of the built environment often reduce the above process to simply getting their projects/assets certified under the globally recognized green certifications schemes such as GSAS, LEED, BREEAM, CEEQUAL, ENVISION, WELL. Although, these certification schemes are efficient in making the built environment significantly more sustainable they do not always offer the best solutions to a full ESG strategy, implementation and disclosure. These schemes do not often cover all the ESG material topics and are not 100% aligned with the expectations of the investors.

4 ESG Expectations of Investors

As we mentioned in the previous section, even though companies within the same sector have ESG common themes, each company will approach the identification of its ESG material issues uniquely based on their sector and business model specifics as well as geographical context and the expectations of the stakeholders. According to Sustainability Accounting Standards Boards (SASB), investors are interested to understand the financial impact of ESG on companies. A CFA Institute survey showed that 76% of institutional investors and 69% of retail investors expressed interest in ESG as a way to contribute to more holistic financial analysis (CFA ESG Certificate Training Material, 2021). Particularly, when it comes to the construction industry, investors would like to focus on the following ESG common topics that are considered to have a financial impact on organizations operating on the construction sector:

Table 1: ESG Construction Industry Common topics (as per the SASB standards)

E	S	G
• Energy and water Management • Air Quality • Climate Change adaption • Sustainability services • Environmental Impacts of Project Development • Lifecycle Impacts of Buildings & Infrastructure • Wood Supply Chain Management	• Structural Integrity & Safety • Workforce Health and Safety • Chemicals in Construction Products	• Management of tenant • Sustainability Impacts • Competitive Behaviour (Pricing Integrity and Transparency • Business Ethics • Diversity and Inclusion • Product Innovation • Climate Impacts of Business Mix

According to SASB, the above ESG factors are among the most common topics shared by companies in the construction industry. A study by Guggenheim Investments, WWF, KPMG, Mott MacDonald (2020) describe what investors are looking to understand when it comes to ESG factors and companies involved in delivering infrastructure projects: reputational risk, regulatory risk, operational risk, market risk, physical and climate risk, social risk, opportunity insights, social impact, financial integration of the ESG factor. ESG factors can have a financial impact on the companies whether through being a risk or an opportunity, which is crucial information for investors in their investment decision-making process.

5 GSAS and ESG Investors Expectations

This section will focus on the Global Sustainability Assessment System of the Gulf Organisation for Research and Development (GORD) that is used in Qatar for green buildings and infrastructure in attempt

to understand how this rating system satisfy the investors ESG expectations and how it falls short of providing investors the information they need. The GSAS criteria will be assessed against the ESG factors for the construction sector that were identified and described in the previous section by identifying whether they are covered by GSAS. Following that we will also discuss whether GSAS can be in effective tool for investors to make a decision to whether to invest in a project or a company in the construction sector or not. First, we will start by presenting a high-level description of each GSAS categories that we will consider. As per the GSAS Design & Build Assessment Manual (2019) and the GSAS Construction Management Assessment Manual for building and infrastructure (2019), and GSAS Operations the rating system has eight (8) categories of sustainable criteria which are as follow:

a. [The Urban Connectivity category is concerned with the design of the proposed development having a direct impact on the adjacent buildings, properties, neighbourhood and the larger urban community…] it contains six (6) criteria: proximity to infrastructure, proximity to amenities, load on local traffic conditions, public transportation, green transportation and neighbouring acoustics.

b. [The Site category is concerned with the design of the proposed development having a direct impact on both the site of the development itself as well as any adjacent sites…] it contains 15 criteria: land preservation, waterbody preservation, biodiversity preservation, vegetation, drain and storm water contamination, rainwater runoff, heat island effect, shading, accessibility, external lighting, light pollution, noise pollution, eco-parking, mixed use, and construction practices.

c. [The Energy category is concerned with improving the design and energy performance of the development having a direct and positive impact on both the consumption of resources and environmental quality including climate change, fossil fuel depletion, air pollution and human comfort, health and well-being…] it contains six (6) criteria: thermal energy demand performance, energy use performance, CO_2 emission, energy sub-metering and renewable energy.

d. [The Water category is concerned with water conservation for indoor and outdoor use…] it contains three (3) criteria: water demand performance, water reuse performance and water sub-metering.

e. [The Materials category is concerned with the conservation of natural resources and the use or reuse of materials and structure to have the least environmental impact…] it contains seven (7) criteria: locally sourced material, materials eco-labelling, recycle content of materials, materials reuse, existing structure reuse, design for disassembly, responsible sourcing of materials.

f. [The outdoor and indoor environment concerned with the quality of the indoor and outdoor environment for the comfort, health and well-being of workers, occupants and users...] It has twelve criteria: dust control, noise and vibration control, thermal comfort, natural ventilation, mechanical ventilation, lighting, daylight, glare, views, acoustics, low-VOC materials and airborne contaminants.

g. [The Culture & Economic Value category is concerned with the cultural impacts in the design of the built environment and support of the national economy…] it contains two (2) criteria: heritage and cultural identity and support of national economy.

h. [The Management & Operations category is concerned with the design of the development for use during the operational phase and for the management and operations of the construction activities. The development should plan for and implement sustainable and effective building management and operations practices…] it contains nine (9) criteria: system commissioning, waste management, welfare facilities, construction health and safety, workers accommodation, facility management, leak detection systems, automated control system, and transportation systems in building.

The below tables 2 to 5 identify what construction sector specific ESG factors the GSAS scheme covers and how does it satisfy the need for information and analysis for investment decision making. Tables 2 to 4 list the ESG factors versus GSAS coverage while table 5 takes is a deeper dive into the ESG metrics

that investors can use in their evaluation of companies versus GSAS coverage. The checkmarks indicate GSAS contribution to investors' requirements and the blanks indicates no contribution.

Table 2: GSAS coverage of the Environmental Factors in ESG

GSAS Categories / ESG	Energy	Air Quality	Water	Climate Change adaption and Carbon footprint	Sustainability services	Environmental Impacts of Project	Lifecycle Impacts of Buildings & Infrastructure	Wood Supply Chain
Urban Connectivity/Considerations		✓		✓	✓			
Site		✓	✓			✓		
Energy	✓			✓			✓	
Water			✓					
Materials						✓	✓	✓
Outdoor/Indoor Environment		✓			✓			
Cultural and Economic Value								
Management and Operations	✓	✓	✓		✓		✓	

Table 3: GSAS coverage of the Social Factors in ESG

GSAS Categories / ESG	Structural Integrity & Safety	Workforce Health and Safety	Chemicals in Construction Products
Urban Connectivity/Considerations			
Site			
Energy			
Water			
Materials			✓
Outdoor/Indoor Environment		✓	✓
Cultural and Economic Value			
Management and Operations			

Table 4: GSAS coverage of the Governance Factors in ESG

GSAS Categories / ESG	Management of tenant Sustainability Impacts	Competitive Behaviour (Pricing	Business Ethics	Diversity and Inclusion	Product Innovation	Climate Impacts of Business Mix
Urban Connectivity/Considerations	✔					
Site						
Energy	✔					
Water	✔					
Materials					✔	
Outdoor/Indoor Environment	✔					
Cultural and Economic Value						
Management and Operations	✔					

An initial look at the above tables indicates that GSAS seems to cover all of the E and 2 out of 3 of the S factors that are potentially material to investors while it falls short in covering most of the G factors (covering only 2 out 6). As a general note, GSAS is project oriented, and it is not unusual for a certification scheme not to be informative on and/or not to have criteria that address corporate level requirements. As such, important G topics are not addressed by the GSAS scheme as it does not inform investors on whether the company in question is conducting business with integrity and transparency while not engaging in unethical behaviour such as bribery, child labour or whether a company encourage diversity and inclusion in the workplace. Finally, the scheme does not inform investors on the business mix (hydrocarbons related projects/assets versus renewable energy projects/assets) and the risk of a company of having cancelled projects or stranded assets because if high carbon intensity and regulations that are getting more stringent on carbon emissions.

A deeper dive into the metrics to be disclosed in relations to the ESG topics (table 5 below), shows that while GSAS seems to cover most of the E factors, it only provides 25 out of 38 corresponding E metrics that can be useful to investors. Metrics such as scope 1 GHG emissions, strategy to manage scope 1 GHG emissions, percentage of GHG emissions under emissions-limiting regulations, air pollutants, percentage of water withdrawal in high or extremely high baseline water stress locations, environmental policies, and water management policies are not covered by GSAS. The metrics gap gets bigger when we look at the Social and Governance side where GSAS provide only 1 out of 7 and 5 out of 21 of the S and G topics respectively. Metrics that helps investors get a sense of the social and financial risks or on how the board and upper management manage and oversee those risks are mostly what is lacking from the GSAS schemes. These include metrics such as the potential revenue from capturing more market share of a certain sustainable product or practice versus the actual market share, monetary losses due to legal proceedings, conducting business in countries scoring low on the transparency International's Corruption perception index, contractual agreements with tenants when it comes to sustainable requirements, policies and practices on bribery and human rights, the diversity and inclusion practices and so on as listed in the below table.

Table 5: ESG metrics for investors (as per the SASB standards)

	Metrics	GSAS Coverage
E	Total Energy Consumed	✔
	Percentage of grid Electricity	✔
	Percentage of Renewables	✔
	Energy consumption data coverage as a percentage of total floor area by property subsector	✔
	Total Energy consumed by portfolio area with data coverage by property subsector	✔
	Percentage of eligible portfolio that has an energy rating	✔
	Percentage of eligible portfolio that is certified to energy star	
	Like-for-like percentage change in energy consumption for the portfolio year-on-year	✔
	Weight of end-of-life material recovered	✔
	Percentage of recovered materials recycled	✔
	Total weight of wood fibre materials purchased	✔
	Percentage of wood fibre from third-party certified forestlands	✔
	Percentage of wood fibre per certification standards	✔
	Percentage of wood fibre not certified by a third party	
	Gross global scope 1 emissions	
	Percentage of Scope 1 Emissions covered under emissions-limiting regulations	
	Air emissions of the following pollutants: NO_x, SO_x, PM_{10}, Dioxins/Furans, VOCs, PAHs, Heavy Metals	
	Total fresh water withdrawn	✔
	Recycled percentage of fresh water used	✔
	Water consumption data coverage as a percentage of floor area	✔
	Water consumption data coverage as a percentage of floor area in regions with high or extremely high baseline water stress by property subsector	
	Total water withdrawn by portfolio area with data coverage	✔
	Total water by portfolio area with data coverage in regions with high or extremely high baseline water stress	
	Amount of waste generated	✔
	Percentage of waste that is hazardous	✔
	Percentage recycled	✔
	Terrestrial acreage disturbed	✔
	Percentage of impacted area restored	✔
	Number of environmental incidents	✔
	Number of commissioned projects certified under a green certification scheme	✔
	Area of properties located in 100-year flood zones	✔
	Floor area and number of buildings under management that obtained energy rating	
	Long-term and short-term strategy to manage scope 1 emissions, analysis of performance against those targets	
	Description of water management risk and mitigation measures	
	Environmental management policies and practices	
	Discussion of processes to assess and manage environmental risks	
	Description of effort to manage product lifecycle impacts and meet demand for sustainable products	
	Management and assessment process of risks and hazards associated with chemicals in products	

	Metrics	GSAS Coverage
S	Percentage of eligible products meeting VOC emissions and content standards	✓
	Amounts of defect and safety relate work costs	
	Percentage of fresh water withdrawn from regions with high or extremely high baseline water stress	
	Total recordable incident rate	
	Near miss frequency rate	
	Full time employees	
	Contract employees	
G	Description of how building energy management considerations are integrated into property investment analysis	
	Percentage of products that qualify for credits in green certifications	✓
	Potential revenue from capturing 100 % of a market share of a given sustainability product category	
	Current market share compares to the potential revenue at 100% market share	
	Amount of monetary loss as a result of legal proceedings associated with integrity and transparency	
	Total amount of monetary losses due to defects and safety-related issues	
	Number of active projects	✓
	Number of commissioned projects	✓
	Total backlog (value of projects not completed as of close of reporting year)	
	Amount of backlog for hydrocarbon related projects	
	Amount of backlog for renewal projects	
	Amount for backlog for projects associated with climate change mitigation	
	Active projects in countries of 20 lowest rankings in Transparency International's Corruption perception index	
	Backlog in countries of 20 lowest rankings in Transparency International's Corruption perception index	
	Total amount of legal proceedings monetary for bribery or corruption or anti-competitive practices	
	Policies for prevention of bribery, corruption and anti-competitive practices	
	Number of assets by property sub-sector	✓
	Number of new leases that has a cost recovery clause for resource efficiency	
	Percentage of tenants that are separately metered for grid electricity and water withdrawals	✓
	Revenue from energy and sustainability services	
	Floor area and number of buildings under management that are provided with sustainability services	

This been said, we will discuss in Table 6 using the above ESG factors and metrics how GSAS contribute or does not contribute to providing the information investors need to obtain on a company operating in the construction sector as well as what practices they would want to see.

Table 6: Summary of GSAS versus investor's ESG expectations

Reputational Risk	In general, green buildings and infrastructure have a good reputation when it comes to ESG factors, and it is the case for GSAS certified buildings, infrastructure and real estate developments projects. Green certifications build trust in the asset when it comes to water and energy consumption (both environmentally friendly and cost saving, to the indoor quality of the built environment, the site selection and preservation process, etc.) in the health and safety compliance during construction. This attracts both investors and tenants. GSAS certification like many other green certifications is a good tool to ensure investors that there is no reputational risk linked to a proposed or an existing building, community and infrastructure. As seen in the above tables GSAS contributes to the management of the tenant's sustainability, the quality of the indoor environment, to management and operations and to the energy and water consumption as well as to ensure that a project's environmental impacts are minimized and mitigated. Nevertheless, GSAS does not provide insights to investors on social risks and governance practices that might be linked to assets owned or under construction by a company or on the corporate level. GSAS does not cover an important S topic, which is the structural integrity of a built assets that does not give investors insights on whether a company is protected against bad reputation associated to structural failure that can put lives in danger and might weight heavily on the company's financials in the form of financial compensation and repair cost. GSAS also does not provide investors with a sense of how companies are governed when it comes to bribery, competitive behaviour, business ethics and diversity and inclusion. In the world of social media, companies' reputation can take a big hit due to failure on any of those aforementioned topics. A look at the metrics gives us a more in depth understanding on how GSAS can contribute to the reputation protection of a company. GSAS can either provide directly or help to provide to investors metrics such as comparison on year-to-year basis on how energy consumption is evolving which gives investors a solid understanding on the performance of those companies when it comes to energy consumption reduction. GSAS also can help companies provide investors information on how much of their portfolio is monitored and how well it is managed when it comes to energy and water consumption. GSAS can also help provide to investors insights on how waste is managed and what is a certain company portfolio is performing on the recycling front. Looking at the social and governance metrics, GSAS does not seem to contribute to informing investors on reputational risks that can be assessed by knowing how much revenue a company makes from hydrocarbons related projects or from working in corrupted countries.
Regulatory/Legal Risk **Regulatory/Legal Risk**	GSAS does not help investors understand the legal compliance risk of a development or of a company operating in the construction industry. As we see in table 4 above, GSAS does not have criteria when it comes to business ethics or competitive behaviour, which are Governance (G) factors that can pose a significant legal risk on companies operating in the construction industry. GSAS does not provide information to investors on how a company, or a project is protecting themselves against potential fines or lawsuits from structural failures and incidents related to their assets (see Table 3). Being GSAS certified does not provide the investors with information to decide whether his investments or potential investment are protected against structural integrity failures and safety accidents. Looking closer at the metrics, it is clear that GSAS does not help investors getting information such as the amount of monetary losses due to legal proceedings or defects and safety-related issues. Companies will not be able to inform investors by using GSAS on how they are managing anti-bribery and corruption and uncompetitive behaviour or their GHG emissions under emissions-limiting regulations.
Operational Risk	GSAS does provide insights on operational phase of a project/development as it considers the Environmental (E) and Social (S) risk during operations but when it comes to Governance (G)

	it does not provide information to the investors on the project governance itself or on the governance of the companies operating in the construction industry. GSAS being a project-oriented scheme, companies cannot expect to meet investors' expectations by only getting their projects certified under GSAS or any other green building/infrastructure certification scheme. They will miss providing investors information they need on the governance project and management practices. Policies and processes on how carbon emissions, environmental impacts, energy and water consumption, product lifecycle and all other ESG related operational risks are not required by GSAS while investors need to understand how these issues are governed within a company. In addition, investors need to get insights on how a company is managing their tenants from a contractual point of view and from operational cost and maintenance point of view. Metrics such as the percentage of tenant metered for energy and water, the number of leases that contains a cost recovery clause for resource efficiency, revenue from sustainable services and green buildings versus from other services and built assets that do not have a good ESG performance can give an investors insight on how companies are performing or can perform when it comes to suitability performance during operations. GSAS does not provide such information to the investors.
Market Risk	GSAS does not provide insights on the climate impact of a company's business mix and on how much a company might be affected by a changing market lead by a change of consumers and social preferences linked to ESG topics. GSAS is silent on the supply chain risks even though it indirectly mitigates the impacts of supply chain interruption of individual projects of a company by requiring local sourcing of material, when possible, through the "Materials" category. It also, indirectly speaks to the evolving consumers preferences (especially among the young generation) that are leaning towards green buildings. GSAS does not provide information for investors on tenants' management and on how a real estate development that was designed to be green will be managed to ensure that sustainability requirements are implemented and maintained during operations specifically through tenants' management and contractual measures. A closer look at the metrics shows that GSAS does not provide information on a metrics related to company's current market share of green products/services/buildings and on the potential revenue from capturing more of that market share. This is an important information to investors as it helps evaluate how flexible a company is to profit from the ESG opportunities and on its capability to continue creating value within a market and consumers preference shift towards sustainable and green built environment. Another metrics that is important to investors and not provided by GSAS is a company's backlog for hydrocarbons related projects versus renewable energy related projects as well as backlog of projects associated to climate change mitigation.
Physical and Climate Risk	Certain categories of GSAS address Energy, Carbon emissions, water consumption, renewable energy, water demand and water reuse, nevertheless, it does not address the physical impact of climate change on the built environment such sea level rise and rise/drop in temperatures. It also does not inform the investors on the financial implications of climate change transitional risks (stranded assets because of stingiest emissions regulations) or of climate change physical impacts (such as sea level rise and rise or drop in temperatures. Finally, GSAS does not provide investors information of the future climate risks so they can assess whether a company or a project would continue to be able to provide value on the long run.
Social Risk	GSAS does address community planning via the Urban connectivity and Cultural and Economic value categories encompassing many social issues related to the built environment and to communities such the quality of life, access to amenities and public transportation, indoor environment quality, green transportation, pedestrian access. By integrating these social aspects to the design and construction of the built environment, GSAS reduce the social risks during operations and can give investors assurance that a given project or company are

	mitigation the social impacts of developments. Nevertheless, besides cultural and heritage sites preservation, GSAS does not provide insight on social issues pre-development or on social issues that might rise post-development.
Opportunities	GSAS helps construction projects and companies developing those projects make the most of the ESG opportunities or being future ready to profit of potential ESG opportunities such advancement in renewable energy, better staff retention, attractiveness to younger investors, lower costs, and tighter regulations, green bonds. Nevertheless, investors need to understand how these opportunities can financially affect a project or a company operating in the construction sector. GSAS operations phase certification could be a very interesting tool to inform investors on the performance of certified assets on the energy, water savings front, maintenance cost, satisfaction of tenants in real time during the life of the building and thus provide backed financial implications of the green building's performance.
Material ESG coverage	GSAS seems to cover all of the E and 2 out of 3 of the S factors that are potentially material to investors while it falls short in covering most of the G factors (covering only 2 out 6). As a general note, GSAS is project oriented, and it is not unusual for a certification scheme not to be informative on and/or not to have criteria that address corporate level requirements. As such, important G topics are not addressed by the GSAS scheme as it does not inform investors on whether the company in question is conducting business with integrity and transparency while not engaging in unethical behaviour such as bribery, child labour or whether a company encourages diversity and inclusion in the workplace. Finally, the scheme does not inform investors on the business mix (hydrocarbons related projects/assets versus renewable energy projects/assets) and the risk of a company of having cancelled projects or stranded assets because if high carbon intensity and regulations that are getting more stringent on carbon emissions. A deeper dive into the metrics to be disclosed in relations to the ESG topics (table 5 below), shows that while GSAS seems to cover most of the E factors, it only provides 25 out of 38 corresponding E metrics that can be useful to investors. The metrics gap gets bigger when we look at the Social and Governance side where GSAS provide only 1 out of 7 and 5 out of 21 of the S and G topics respectively. Metrics that helps investors get a sense of the social and financial risks or on how the board and upper management manage and oversee those risks are mostly what is lacking from the GSAS schemes. These include metrics such as the potential revenue from capturing more market share of a certain sustainable product or practice versus the actual market share, monetary losses due to legal proceedings, conducting business in countries scoring low on the transparency International's Corruption perception index, contractual agreements with tenants when it comes to sustainable requirements, policies and practices on bribery and human rights, the diversity and inclusion practices and so on as mentioned in previous sections.
Financial Integration of ESG	GSAS like many of the other green certification schemes does not provide information to the investors that can be used in financial analysis. This is supported by the fact that GSAS does not provide information on the following metrics: • Like-for-like percentage change in energy consumption for the portfolio year-on-year • Number of commissioned projects certified under a green certification scheme • Amounts of defect and safety relate work costs • Potential revenue from capturing 100 % of a market share of a given sustainability product category • Current market share compares to the potential revenue at 100% market share • Amount of monetary loss as a result of legal proceedings associated with integrity and transparency • Total amount of monetary losses due to defects and safety-related issues • Number of active projects

	• Number of commissioned projects • Total backlog (value of projects not completed as of close of reporting year) • Amount of backlog for hydrocarbon related projects • Amount of backlog for renewal projects • Amount for backlog for projects associated with climate change mitigation • Number of new leases that has a cost recovery clause for resource efficiency • Revenue from energy and sustainability services The above metrics can be easily integrated in the company evaluation exercise for investors to understand what financial liabilities a company have because of ESG risks and what are the potential financial advantages that can be potentially generated by ESG opportunities.

The investors' expectations used in the table are extracted from the study by Guggenheim Investments, WWF, KPMG, Mott MacDonald (2020)

6 Conclusion

ESG topics are growing in importance in the investment community and investors' decisions will require the integration of ESG information in the financial analysis whether to decide to invest in a company or in the built environment. Investors expect companies in the construction sector to provide ESG information that is helpful in the decision-making process and companies operating in the construction sector will need to provide that information to investors as a way to prove that they are integrating ESG factors in their business model. This integration must prove to the investors the company's ability to create value on the long-term by being future ready to mitigate ESG risks or to ride the wave of ESG benefits.

As mentioned previously, GSAS seems to cover all of the E and 2 out of 3 of the S factors that are potentially material to investors while it falls short in covering most of the G factors (covering only 2 out 6). As a general note, GSAS is project oriented, and it is not unusual for a certification scheme not to be informative on and/or not to have criteria that address corporate level requirements. As such, important G topics are not addressed by the GSAS scheme as it does not inform investors on whether the company in question is conducting business with integrity and transparency while not engaging in unethical behaviour such as bribery, child labour or whether a company encourages diversity and inclusion in the workplace. While GSAS seems to cover most of the E factors, it only provides 25 out of 38 corresponding E metrics that can be useful to investors.

The metrics gap gets bigger when we look at the Social and Governance side where GSAS provide only 1 out of 7 and 5 out of 21 of the S and G topics respectively. Metrics that helps investors get a sense of the social and financial risks or on how the board and upper management manage and oversee those risks are mostly what is lacking from the GSAS schemes.

By counting mostly on green certification, such as GSAS, companies can make buildings and the built environment more sustainable and compliant with most ESG factors. Nevertheless, companies must embrace a more holistic ESG strategy where green certification is one of the tools towards a better sustainability performance. Reporting frameworks such as the Global Reporting Initiative (GRI), the Sustainable accounting Standards (SASB), the Task Force on Climate-related Financial Disclosures (TCFD), can be used by companies to make sure they identify their material topics especially ones that are not covered by green as mentioned above. Reporting frameworks such as SASB and TCFD and the upcoming International Sustainability Standards Boards (ISSB) can help companies operating in the construction by providing ESG information that are useful for investors.

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