Guidance Note

Integrating ESG factors into financial models for infrastructure investments

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Disclaimer: Views expressed are those of WWF Switzerland and Dr. Barbara Weber and do not necessarily reflect those of external reviewers.

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1. Introduction

Purpose

This Guidance Note aims to illustrate how the consideration of ESG factors may inform the forecasting of financials, such as revenues, operating costs and capital expenditure, etc. in the context of assessing an infrastructure asset. These financials form the basis of financial models, e.g. discounted cash flow (DCF) models and ultimately of asset valuations.[1] A valuation is performed, for example, in the context of annual reporting or the acquisition or divestment of an asset.[2]

By way of example, this Guidance Note selects twelve ESG factors and identifies their potential risks and opportunities for infrastructure assets as they may emerge throughout an asset's life cycle (development, construction, operation, and decommissioning). It then sets out to quantify these risks and opportunities for the purpose of developing or adjusting the financial forecasts of such assets.

Recognizing that the journey towards a better understanding of ESG integration in the context of infrastructure investing has just begun, this Guidance Note is work-in-progress. It offers ideas that invite investors to develop their own thinking about ESG integration. It does in no way aim to provide a standardized, recipe-style approach to ESG integration into financial models.

Background

In 2018, WWF and Cadmus interviewed more than 20 infrastructure investors and related stakeholders about how investors evaluate the sustainability of infrastructure assets.[3] It became clear that most investors typically use ESG factors in the context of a qualitative go/no-go screening rather than integrating them in the financial model. While investors do see the relevance and potential financial impact of ESG issues on their assets, they report to have neither the data nor suitable integration methodologies available to take ESG integration a step further.

Policy and regulatory context

As the finance community has embarked on a journey towards alignment with the sustainable development goals (SDGs), it is increasingly working hand in hand with policy makers to better understand the nature and relevance of ESG factors in investment decision making. The most significant recent policy developments – which may not all be specific to infrastructure, but which are all relevant - include the following:

> The G20 continue to make infrastructure a priority for the next years and in 2018 have drafted the G20 "Roadmap to infrastructure as an asset class".[4] Subsequently, the Infrastructure Data Initiative (IDI)[5] was launched and intends to provide much needed information about the performance of infrastructure against a range of metrics, including environmental and social measures.
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> The Task Force on Climate-Related Financial Disclosures (TCFD) published their implementation recommendations for the financial sector in June 2017, advising on how to translate climate change related risks and opportunities into financially relevant metrics.[6] Since then, adoption has steadily risen.

[1] Investors need mechanisms to assess the present and future value (i.e. price) of an infrastructure asset as part of their investment decision-making. The choice of valuation technique will depend on the specifics of the assets and the type of transaction (e.g. debt vs. equity). Broadly, there are three categories of equity valuation methods: (1) Market prices of comparable transactions, (2) public-market-based equivalents and (3) cashflow-based valuations (e.g. Discounted Cashflow Modelling). Particularly the third approach is popular in the industry for assessing direct, unlisted infrastructure transactions.

[2] While there is an increasing number of publications available relating to publicly traded equities with respect to these ESG integration processes (e.g., *A Practical Guide for ESG Integration in Equity Investing* by the PRI, retrieved from: https://www.unpri.org/download?ac=10), very little guidance exists for unlisted infrastructure assets. An excellent basis for such considerations is the many emerging standards and tools that help evaluate and quantify ESG aspects of infrastructure assets, such as SAVi, SuRe, Envision, GRESB, etc. *State of the Practice – Sustainability Standards for Infrastructure Investors*, Stanford University, 2018 provides an in-depth review of these frameworks. It can be retrieved at: https://www.guggenheiminvestments.com/GuggenheimInvestments/media/PDF/WWF-Infrastructure-Full-Report-2018.pdf

[3] *Valuing Sustainability in Infrastructure Investments: Market Status, Barriers and Opportunities - A Landscape Analysis (2019),* WWF/Cadmus, retrieved from: https://www.wwf.ch/de/unsere-ziele/sustainable-finance-nachhaltige-finanzfluesse-foerdern

[4] *Roadmap to Infrastructure as an Asset Class*, 2018 retrieved from: http://www.oecd.org/g20/roadmap_to_infrastructure_as_an_asset_class_argentina_presidency_1_0.pdf

[5] See for more information: http://www.oecd.org/daf/fin/private-pensions/lti-workshop-sustainable-infra.htm

[6] *Final Report: Recommendations of the Task Force on Climate Related Financial Disclosures*, June 2017, retrieved from: https://www.fsb-tcfd.org/publications/final-recommendations-report/

Based on the recommendations of the High-Level Expert Group (HLEG), in May 2018, the EU Commission presented the first legislative proposal on requirements for institutional investors regarding disclosure of the integration of environmental, social and governance (ESG) factors in their risk processes.[7]

Of particular importance for pension fund investors, the EU amended the Institutions for Occupational Retirement Provision (IORP) II Directive. The Directive entered into force on January 1st, 2019, requiring all pension funds to include ESG considerations. Consequently, the International Organisation of Pension Supervisors (IOPS) is developing guidelines on the application of ESG factors in the supervision of pension fund investment.[8]

Target Audience

The target audience of this Guidance Note is financial investors, strategic investors or sponsoring government agencies at all levels (analyst, management and board) who are investigating how to translate the findings of an ESG due diligence or of ongoing ESG monitoring into concrete numbers, and to integrate these into a financial model.

It addresses both, investors who already hold and regularly re-assess their infrastructure assets for risk management, governance, and reporting purposes, as well as those who undertake a first-time comprehensive due diligence of an asset for the purpose of an acquisition or divestment.

How to read/use this Guidance Note?

This Guidance Note demonstrates how and where to integrate the results of a comprehensive ESG assessment in the financial model. It provides concrete examples as to how investors may benefit from the derived ESG-insights by illustrating ways to approximate and quantify these insights and thus linking them to expected revenues, costs, necessary capital expenditures, financing requirements or reserves, which, in turn, inform the financial model.

For example, the annual ESG risk assessment of an asset already in the portfolio might shed light on the potential future financial implications of anticipated regional water scarcity (e.g. in form of higher water cost or new regulation leading to necessary retrofitting of equipment).

On the positive, an opportunity review may reveal that introducing (energy) efficiency measures today will not only decrease future operating cost as well as improve the environmental footprint, but it may also increase the asset's resale value going forward. The same may hold true when improving health and safety conditions for the workforce.

Limitations

The heterogenous nature of ESG issues and the manifold impacts they may have on the broad variety of infrastructure assets leads to, among others, three major challenges for investors:

- **Lack of counterfactual:** Many of the risks that may be triggered by ESG factors are - or should be – monitored and evaluated through existing risk management processes (e.g. monitoring future regulatory risks). As with most risk management measures though, while costs can be accounted for relatively easily, potential cost-savings through avoided future losses are much less tangible. Lacking this counterfactual, i.e. not knowing the cost of inaction, the forecasting of the financial impacts of these ESG factors will be somewhat incomplete.

- **Shortage of data**: There is a lack of robust, comparable data to facilitate the quantification and monetization of ESG-related risks and opportunities for a specific asset (e.g. cost savings achieved going forward by investing in energy-saving measures today). Thus, for the time being, investors need to work with more or less useful data approximations. Various initiatives have been launched to address the lack of data, such as the G20 Infrastructure Data Initiative, the Global Infrastructure Hub[9] and the TCFD's guidance on implementing their recommendations[10]. Further, LTIIA, GRESB and the EDHEC Infrastructure Hub initiated a collaborative project to study the relationship between ESG and financial characteristics in private infrastructure investments.[11]

[7] EU Commission legislative proposal on sustainable finance retrieved from: https://ec.europa.eu/info/publications/180524-proposal-sustainable-finance_en#benchmarks
[8] For more information: https://www.top1000funds.com/2018/08/pension-funds-want-esg-guidelines
[9] Global Infrastructure Hub: https://www.gihub.org/
[10] *Implementing the TCFD recommendations*: https://www.fsb-tcfd.org/publications/final-implementing-tcfd-recommendations/
[11] Press release: http://www.ltiia.org/wp-content/uploads/2018/03/180320-ESG-Research-Project.pdf

- **Forecasting uncertainty**: There is always an element of uncertainty when it comes to quantifying and monetizing the future impact of ESG factors, even once asset-specific circumstances are known to the investor. The same challenge exists however, with respect to the uncertainty that is inherent in forecasting the impact of traditional business factors or measures, such as the impact of investing heavily in marketing efforts and new store roll-outs or the exchange of key personnel. Nevertheless, it is a limitation that needs to be recognized.

2. How ESG issues can impact financial models of infrastructure assets

Over their lifetime - from development to construction to operation all the way through to the decommissioning phase - infrastructure assets will face all kinds of ESG issues. These will vary depending on asset type, sector, size, geographic location and stage in the life cycle. Some of these issues may originate outside the asset but have impact on its technical ability to operate or on its profitability (e.g. temperature rise, increased water scarcity, changing regulations, tariffs). Other issues may be caused by the asset itself and impact its surrounding environment and communities (e.g. water effluent, quality of life of the communities around it, labour conditions, etc.). In the latter case, we speak of externalities. These can and increasingly will impact the asset's financial performance via various feedback loops (e.g. protests of the surrounding community). It is thus important to realize that both directions of impact (impact ON the asset, and impact FROM the asset) may have financial consequences for the investors,[12] particularly if they are "universal owners"[13].

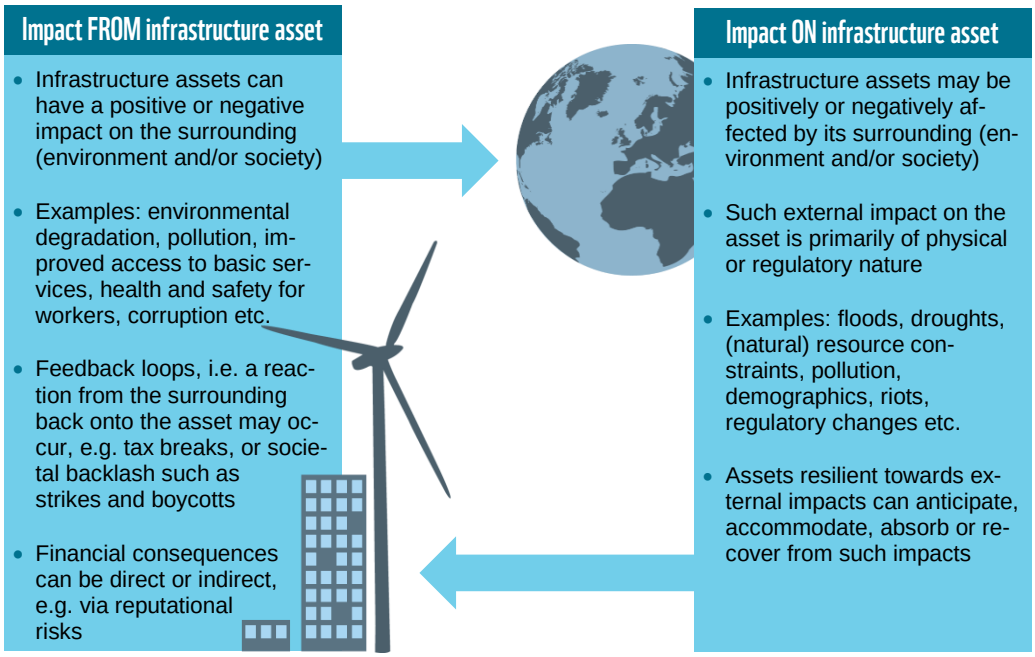

Figure 1: ESG impact on and from an infrastructure asset
Source: adapted from B Capital Partners AG

Specific ESG-related factors or issues - irrespective of them having an impact ON or FROM the asset - may have a direct or indirect, positive (business opportunity) or negative (business risk/threat) impact on infrastructure assets. Positive impact may lead to financial gain, negative impact to financial loss. As such, both affect the financial statements of the organisation that holds the assets and their investors one way or the other.[14] Given the above, investors are well advised to integrate ESG assessments into the standard due diligence as well as ongoing risk management and monitoring processes throughout an asset's life cycle. Further, a systematic approach to ESG analysis may not only help to identify risks but also opportunities such as potential for resource efficiencies and reduction of the company's environmental footprint. It may further foster innovation and staff retention, enhance community relations, as well as provide and protect the social license to operate.[15]

Naturally, in addition to the outcomes of these assessments being reflected in the financial model, they should also become part of the regular reporting to inform and support senior management and board members in setting a strategic direction and in fulfilling their fiduciary duty.

[12] *Infrastructure as an Asset Class. Second Edition.* Weber et al. (2016), Wiley.
[13] *Universal Ownership. Why externalities matter to investors* (2011): "Large institutional investors are, in effect, "Universal Owners", as they often have highly-diversified long-term portfolios that are representative of global capital markets. Their portfolios are inevitably exposed to growing and widespread costs from environmental damage caused by companies."
[14] *Sustainable Infrastructure. A Business Case.* (2019) Weber. Sustainable Infrastructure Alliance.
[15] *PRI Primer on Responsible Investment for Infrastructure*. Derived from: https://www.unpri.org/infrastructure/primer-on-responsible-investment-in-infrastructure-/2700.article

3. ESG risks and opportunities

To highlight how ESG factors can impact a financial model, a conceptual framework, which builds on the work of the TCFD, is applied.[16] In the TCFD framework, risks are grouped into the categories of "Transition" and "Physical" and are juxtaposed with a set of different opportunity-categories.

The framework applied in this Guidance Note introduces two main adaptations to the TCFD framework: (i) it considers the entire ESG realm, this is, it goes beyond climate-related issues, and (ii) it applies identical categories to both the risk and opportunity side, and as such, simplifies the framework: 1. Transition risks and opportunities, with the sub-categories of a) reputational, b) regulatory/legal, c) operational, and d) market; and 2. Physical risks and opportunities.

1. **Transition risks and opportunities,** in this paper, are split into four sub-categories: (a) reputational, (b) regulatory/legal, (c) operational, and (d) market. In the terminology and categorisation introduced above (see Figure 1), reputational and operational risks and opportunities belong to those, which are caused by or have an impact stemming FROM the infrastructure asset on their surrounding environment. Regulatory/Legal and Markets belong to those, which originate from the surrounding environment and have an impact ON the infrastructure asset in question.[17]

   (a) **Reputational**: A reputational risk is a threat or danger to the standing or good name of an asset or organisation. It tends to affect an organisation indirectly. For instance, reputational risks arising from social and governance issues such as child labour, corruption or from increasing community resistance (e.g. due to mass displacement caused by a hydropower project) might result in a loss of revenue. On the other hand, a reputational opportunity such as community engagement, a sustainability certification or good health and safety standards, may generate better staff retention and hence, lower costs.

   (b) **Regulatory/Legal**: The possibility of new regulatory requirements create uncertainty for investors. Risks arise because it is unknown whether, when, and how the regulator "tightens the screws" on environmental or health and safety standards etc. At the same time, opportunities arise when preferential tax schemes or government subsidies create incentives for investors to adopt new technologies, or to implement energy efficiency measures.

   (c) **Operational**: Operational risks and opportunities, by definition, are in the control of, and emerge within, the operations of an infrastructure organisation. They are typically technology-, process- (e.g. resource efficiency, speed, weight) or staff-related (e.g. productivity, personnel costs) and are directly reflected in the EBITDA line of the P&L of an organisation.

   (d) **Market:** Changes of the market environment are outside the control of the organisation. ESG issues can cause supply shortages and lead to price hikes for inputs (e.g. biomass) or they may affect demand via changes in consumer or societal preferences (e.g. public versus private transport or green versus fossil-based electricity).

2. **Physical risks and opportunities**: ESG risks/opportunities stemming from the environment such as droughts, floods, or thawing ground (or from society albeit more rarely) and having a physical impact ON real assets, are categorised as physical risks or opportunities.

In the following, specific ESG factors that are argued to trigger the above-mentioned risks and opportunities for infrastructure assets and organisations, are introduced.

[16] The TCFD's grouping of climate-related risks and opportunities have become a generally accepted reference within the financial sector.
[17] *Sustainable Infrastructure. A Business Case.* See footnote 14.

4. Selected ESG factors

For the purpose of arriving at a short-list of ESG factors for which the potential impact of ESG factors on infrastructure financials shall be exemplified, a two-step process was followed: First, a long-list of widely recognised ESG factors was derived by screening and distilling common elements of approximately 20 ESG assessment tools and/or frameworks. Of those frameworks, the following were reviewed in greater detail: CDC, CEEQUAL, EIB, Envision, GRESB, IFC, ISCA, SASB and SuRe.

Environment		Social		Governance	
Degradation / Pollution	Air (climate) – GHG emissions	Labour	Child labour	Board Issues	Independence of board chair
	Air (health) – other pollution		Discrimination / Inclusion		Board composition
	Water		Gender and diversity (inclusion)		Committee structure / independence (e.g. audit, risk, compensation)
	Ground / Contamination		Freedom of association		Executive compensation
	Noise and Light		Health and safety (employees, customers suppliers)		Voting system (one share / one vote)
	Biodiversity		Labour standards and working conditions		Fiduciary duty
Resource efficiency sourcing / use / treatment	(Raw) materials incl. supply chain	Stakeholder	Employee engagement	Operational issues	Bribery and corruption
	Energy		Societal preferences		Fraud / cyber security
	Water		Community benefit (e.g. access, inclusion,development, social enterprise partnering)		Lobbying activities
	Waste		Other stakeholder relations		Political contributions
	Physical - **impact on asset,** e.g. flood		Physical - **impact on asset,** e.g. riots		Whistle-blower protection

Table 1: ESG factors – comprehensive long list
Source: adapted from B Capital Partners AG

Second, the long-list was reduced to a short-list of twelve ESG factors (see Table 2) that are typically among those considered key to an ESG assessment in the context of infrastructure.[18] In the following, this short-list is taken to illustrate the causal chain from ESG factors via risks and opportunities to financial implications for infrastructure organisations. Please note that the list claims neither to be comprehensive nor complete. Further, in the context of the selection process, no view is taken on materiality. If and to what extent any of the twelve selected ESG factors has a material impact on any given infrastructure organisation or asset will be revealed by the asset-specific ESG due diligence process.

The selected twelve ESG factors are categorised into two groups: First, ESG factors whose – direct or indirect – impact on specific elements in the financial statements of the infrastructure organisation in question is

[18] For the avoidance of doubt, the other ESG factors in the long-list may be equally key, depending on the case. No statement is made about the potential materiality of the factors not taken into the short list but only about those, which are part of it.

comparatively easy to demonstrate and quantify. Second, those where the causal chain from the ESG-factor, via risks/opportunities to elements in the financial model is more difficult to demonstrate and/or difficult to quantify. Notwithstanding the difficulty of quantification, if and when any of these risks materialise, they can, in the worst case, be critical for the survival of the organisation or asset. They hence require at least equal attention as the first group.

Selected ESG factors	
A) Quantifiable	**B) Difficult-to-quantify**
Degradation and Pollution	**Degradation and Pollution**
1. Air (health) & water pollution (E)	7. Biodiversity and habitat (E)
2. Air (climate) - GHG emissions (E)	8. Physical climate change impacts (E)
Resource Efficiency – Sourcing, Use, Treatment	**Labour**
3. Energy (E)	9. Health and safety (S)
4. Water (E)	**Community & Stakeholders**
5. Solid waste (E)	10. Stakeholder engagement (S)
6. (Raw) Materials and supply chain (E / S)	**Governance – Operational Issues**
	11. Corruption (G)
	12. Fraud & cyber security (G)
ESG factors, which are in this category, mainly belong to the sub-group of "E"-related ESG factors. This is not by design and surely not a statement about the importance of "S" and "G"-factors. It is merely a reflection of the fact that their respective impact on the financials of an asset is often quite immediate. (Example: investments in technology/measures to decrease carbon intensity increase CapEx and have the potential to decrease future carbon cost/tax). Notwithstanding, note that any of the "E"- factors listed above may not only trigger "E" but also "S"-related risks (e.g. pollution leading to demonstration and riots, leading to costly project delays). This may happen sooner or later, directly or indirectly.	ESG factors in this category are difficult to quantify by their very nature. In addition, and part of the quantification problem, the causality of the ESG factor on the financial performance of an asset may be difficult to demonstrate in the first place. For example, investing in stakeholder engagement during the planning and construction phases (increasing OpEx) not only increases the likelihood that investors meet the due diligence expectations set forward by the UN Guiding Principles on Business and Human Rights[19] and the OECD Due Diligence Guidance on Responsible Business Conduct[20]; it likely also reduces the risk of future community opposition and project delay related to it. A clear causality is difficult to prove though (first obstacle). Assuming one could prove it, by how much would one be able to reduce provisions allocated to the event of project delays caused by the surrounding community (second obstacle)? Another example: What is the right amount for a potential unforeseen fine due to fraud? How would it be accounted for?

Table 2: Twelve exemplary ESG factors

[19] https://www.ohchr.org/documents/publications/GuidingprinciplesBusinesshr_eN.pdf
[20] http://www.oecd.org/investment/due-diligence-guidance-for-responsible-business-conduct.htm

5. Connecting the dots – ESG factors and financial models

To help the reader "connect the dots" and follow how the selected ESG factors may impact the financial performance of infrastructure organisations, Figure 2 below gives an overview of a variety of potential impact pathways from the selected ESG factors to specific items in the financial model. This is followed by two tables, which illustrate the impact pathways in greater detail: Table 3: Quantifiable ESG factors and Table 4: Difficult-to-quantify ESG factors.

Step by step, these two tables take the reader through exemplary impact pathways for each of the selected ESG factors. To this end, they list potential risks and opportunities that may be triggered by such ESG factor, and how, why and where the particular risk or opportunity discussed may materialise in a particular item of the financial model.[21] The next column, metrics, suggests potential ways to quantify the identified risk or opportunity. This is followed by corresponding units of measure.[22]

This Guidance Note is work in progress and a modest attempt to illustrate how potential ESG-triggered financial impacts can be estimated or measured, quantified and monetised so that they can be fully integrated into a financial model. Of course, operational realities, and the reality of financial models, are more complex. For example, positions may be interlinked (increased CapEx will reduce taxes and increase depreciation going forward). A dynamic model can easily replicate that, but a static table cannot.

Again, this Guidance Note is not meant to be prescriptive but provides examples to encourage investors to develop their own thinking on ESG integration. It aims to support the (infrastructure) investment community's journey toward alignment with sustainable development goals (SDGs).

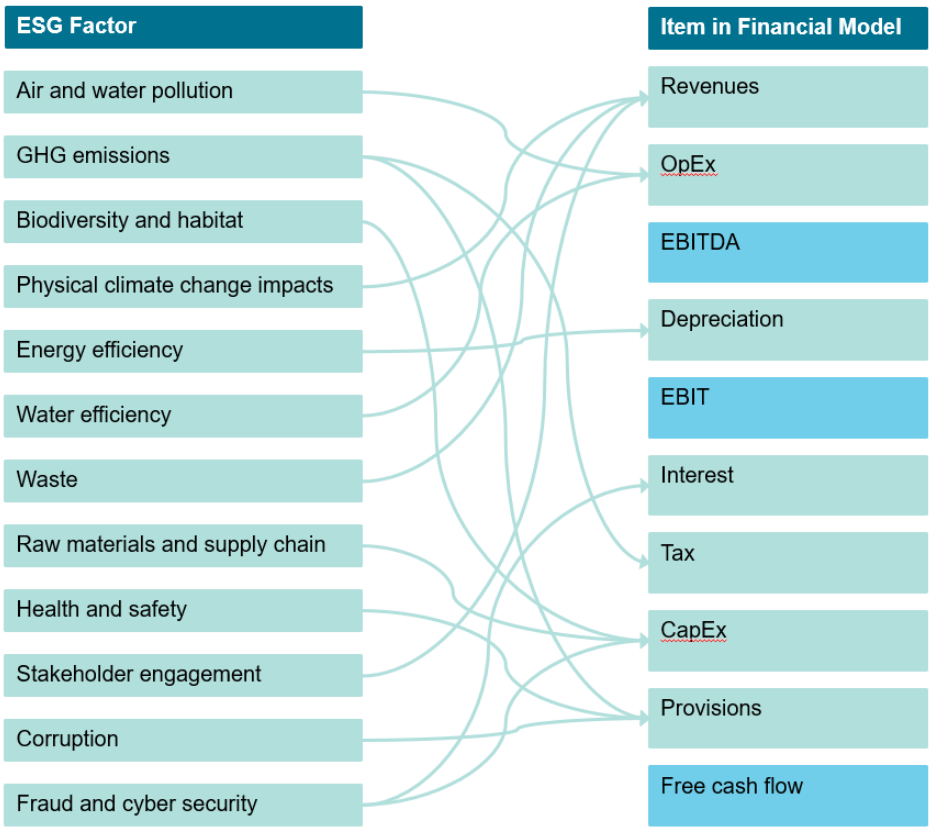

Figure 2: Impact of ESG factors on specific elements in the financial model - examples

[21] Please note that any single risk is likely to trigger through and materialise also in other items of the financial model.
[22] The final choice of the most suitable metrics or metrices will be case-specific, depending on the asset's industrial focus and the management's interest in, and ability of, achieving detail in non-financial accounting.

In the following tables, this Guidance Note makes a modest, first attempt to lay out a variety of impact pathways of the selected 12 ESG factors on financial performance. It explicitly acknowledges – by having selected both, quantifiable (definitely not *easy*-to-quantify!) and difficult-to-quantify ESG factors – that some causal chains are very hard to demonstrate, and that certain risks and opportunities are close to impossible to quantify given the current availability of data sets. The examples are meant to encourage investors to advance their own investigations and considerations on ESG integration.

Table 3: Quantifiable ESG factors – rationale for financial impact of ESG factors on infrastructure organisations – illustration of potential impact pathways

#	ESG Factor	Risk/ Oppty	Risk/ Opportunity Scenario Example	Item in Financial Model	Rationale for Inclusion (Suggestions)	Metrics (Suggestions)	Unit of Measure
Degradation and Pollution							
1	Air pollution (E) / Water pollution (E)	R	Regulatory: - Tightening of regulation regarding pollution limits	Asset write-off CapEx	- Write-offs, asset impairment or early retirement of existing assets may result from tightening of regulation - Investment in technologies/new assets to reduce pollution becomes necessary	- Write-off or impairment value - EUR invested per unit of pollutant reduced (air: e.g. particulate matter (pm2.5), NOx, SOx, volatile organic compounds, lead; water: e.g. oil)	- EUR - EUR/ppm - EUR/m^3 or litre
		R		Provisions	- Provisions may need to be made for potential fines in case of non-compliance with new environmental regulations, which are introduced short-notice and with which the organisation cannot comply immediately	- Fine in EUR per unit of pollutant times the amount of pollution (air: e.g. particulate matter (pm2.5), NOx, SOx, volatile organic compounds, lead; water: e.g. oil) - EUR paid historically in comparable cases for non-compliance multiplied with the probability of occurrence	- EUR/ppm - EUR/m^3 or litre
		R	Reputational: - Community action against the asset, for example after a pollution accident	Provisions	- Provisions may need to be made for potential lawsuits or other legal proceedings	- Fees, settlements, fines paid historically in comparable cases of legal proceedings multiplied with the probability of occurrence	- EUR
		R		Revenues Financing costs	- Reputational damage may lead to loss of revenues, e.g. due to local strikes (decrease/stop of production) or consumer boycott of the organisation (decrease of sales) - If the perceived risk of the organisation increases, the financing conditions provided by lenders may tighten, which will lead to increased financing costs	- Revenues: price of unit of output times number of units of output not produced or not sold - Financing costs: additional interest paid (due to higher interest rate/ lower credit rating)	- EUR/unit - EUR
		R	Regulatory: - Costs for obtaining relevant permit increase - Imposition of a new environmental tax targeting air or water pollution	OpEx Tax	- Overall production cost will increase due to additional discharge cost - Taxes will increase	- EUR paid per permit (possibly related to capacity or output of pollutant of asset) - Dependent on taxation scheme, connected to the asset capacity or to the actual output of pollution	- EUR/ppm - EUR/m^3 - EUR/MWh
		R	Regulatory: - Enhanced disclosure requirements	OpEx	- Monitoring, reporting and auditing costs will increase	- Additional man days needed per asset, as well as consulting and auditing fees	- EUR

#	ESG Factor	Risk/ Oppty	Risk/ Opportunity Scenario Example	Item in Financial Model	Rationale for Inclusion (Suggestions)	Metrics (Suggestions)	Unit of Measure
2	GHG emissions (E)	R	Market: - Utility example: clients switch to electricity generated with lower GHG intensity than traditional	Revenues	- Decrease in revenues due to lower demand for conventional, fossil-fuel based electricity	- EUR per unit times reduced amount of energy sold	- EUR - EUR/MWh
		R	Regulatory: - Introduction or increase of price for GHG emissions - Implementation of a carbon tax - Loss of subsidies for high GHG-intensity energy sources	OpEx Tax CapEx	- Production cost increases (OpEx, Tax) - Preventive investment (CapEx) in measures or technology to reduce GHG emissions per unit of output or to reduce energy intensity of processes	- Additional production costs in EUR/GHG emissions in CO2e, scope 1 and 2[23] (respectively EUR/GHG avoided, in the case of a reduction scenario)	- EUR/tCO2e
		O	Regulatory: - Introduction of accelerated green depreciation schedule for green assets	Depreciation Tax	- Accelerated depreciation reduces tax effect in the years to follow	- Difference in depreciation in EUR	- EUR
Resource Efficiency – Sourcing, Use, Treatment							
3	Energy (E)	R	Physical (climate): - Rising temperatures	OpEx	- Higher temperatures may influence the functioning of equipment and lead to e.g. an increase of fuel consumption or lower performance levels (OpEx)	- EUR per additional unit of energy needed	- EUR/MWh
		O	Operational: - Increasing availability of financially viable energy efficient technology	CapEx OpEx	- Investment in energy efficiency measures such as LED lighting, energy efficient engines or turbines, etc. increase CapEx but reduce OpEx going forward	- EUR invested (absolute and per amount of energy saved) - EUR per unit of energy saved times amount of energy saved in MWh; possibly in addition: EUR per CO2e saved times amount of CO2e saved	- EUR - EUR/MWh - %
4	Water (E)	R	Physical: - Increased water scarcity	Revenues OpEx	- Insufficient water supply for water-reliant assets such as hydro-power plants or district heating networks, leads to loss of revenues due to loss of energy production (hydro-power plant), or to increase of operating costs because water prices rise with scarce supply (district heating network)	- Additional EUR per unit of water times amount of units of water - EUR per unit of energy times amounts of units of energy production lost	- EUR - EUR/MWh

[23] Scope 1 and scope 2 refer to the classification used in the Greenhouse Gas Protocol Corporate Standard. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy.

#	ESG Factor	Risk/ Oppty	Risk/ Opportunity Scenario Example	Item in Financial Model	Rationale for Inclusion (Suggestions)	Metrics (Suggestions)	Unit of Measure
		R	Reputational: - Conflicts with the surrounding community on water withdrawal	Revenues Provisions OpEx	- Conflicts with community may lead to project development / construction delays, which in turn may lead to loss of revenues and/or fines for late completion (Provisions) - Increase of operating expenses due to additional community engagement and marketing measures	- EUR per unit of output times amounts of units of output lost - EUR paid historically in comparable cases	- EUR - EUR/unit
		R	Regulatory: - Implementation of more stringent regulation regarding water withdrawal	CapEx OpEx	- Investments in water saving measures may become necessary (CapEx) and may reduce water usage going forward (OpEx) - Implementation of new production processes, which substitute water with more expensive resources leads to higher OpEx	- EUR invested: absolute and per unit of water times amount of water withdrawal reduced - EUR per unit of water times amount of water withdrawal saved - Additional cost in EUR for more costly input materials or processes	- EUR - EUR/m^3 - EUR
-		O	Operational: - Availability of financially viable water (efficient) technology	CapEx OpEx	- Investment in new, water efficient technology, reducing water consumption in the future, increases CapEx today and reduces OpEx going forward - Investments in e.g. desalination plants (CapEx) may improve access to water and reduce the necessity to pay for municipal water (OpEx)	- EUR invested - EUR per unit of water withdrawal times amount of water withdrawal reduced	- EUR - EUR/m^3
5	Solid waste (E)	O	Operational: - Optimisation of processes and recycling of material	OpEx CapEx	- Investment in recycling measures, technologies and processes to decrease waste increase CapEx today and should reduce OpEx going forward because recovered material can substitute new material	- EUR invested in recycling / waste reduction measures - Savings in EUR: amount of (hazardous) material recycled times price of recycled material - Amount of new material avoided times prices of new material - Cost of recycling - Amount of landfill material avoided times price per ton of landfill	- EUR/unit of material - EUR/unit of waste - EUR
		O	Operational: - Recovery /sale of (raw) material or equipment at end of life time/decommissioning	Revenues OpEx	- Recovery and/or sales of (raw) material or equipment may lead to additional revenue and/or reduced OpEx going forward because recovered material can substitute new material	- Price in EUR per unit of sellable or recoverable (raw) material times amount of recoverable (raw) material - Savings in EUR per unit of new material times amount of new material not purchased	- EUR/unit
		R	Regulatory: - Tightened regulation on waste disposal and land restoration	Provisions	- Provisions are made to be able to meet potentially stricter regulation for waste disposal, recycling or land restoration during the decommissioning phase	- EUR paid historically in comparable cases	- EUR

#	ESG Factor	Risk/ Oppty	Risk/ Opportunity Scenario Example	Item in Financial Model	Rationale for Inclusion (Suggestions)	Metrics (Suggestions)	Unit of Measure
6	(Raw) materials, supply chain (E/S)	O	Reputational: - Availability of financially viable environmentally and socially acceptable supplies and services for both, the construction and operation phase	CapEx OpEx	- Socially and environmentally conscious purchase of (raw) material may increase or decrease CapEx (during construction) and/or OpEx (during operations).	- Amount of conflict-free, sustainable or recycled raw material bought times delta of price per unit of recycled material vs. traditional raw material price	- EUR/unit
-		O	Operational: - Purchase of recycled (construction) material e.g. steel, construction material	CapEx OpEx	- The purchase of recycled material as a substitute for new material leads to reduced CapEx (during construction) and OpEx because its costs are typically lower than those for new material - Cost may also decrease because of the lower CO2 footprint of recycled material	- EUR/unit of material saved by purchasing recycled material - Price per unit of CO2 produced in EUR/unit of CO2 saved	- EUR/unit - EUR/tCO2e
		R	Reputational: - Environmental, social or governance issues may be found in the supply chain	Provision	- Dealing with reputational issues is time-consuming and costly (fact finding, communications, legal) and provisions may need to be made to cover for such cases	- EUR paid historically in comparable cases	- EUR

Table 4: Difficult-to-quantify ESG factors – rationale for financial impact of ESG factors on infrastructure organisations – illustration of potential impact pathways

#	ESG Factor	Risk/ Oppty	Risk/ Opportunity Scenario Example	Item in Financial Model	Rationale for Inclusion (Suggestions)	Metrics (Suggestions)	Unit of Measure
Pollution and Degradation							
7	Biodiversity & habitat (E)	O	Physical: - Reforestation of surrounding land	CapEx OpEx	- Investments in reforestation (CapEx) may decrease flooding risk (and thereby decrease insurance premiums) and have a positive impact on available water resources. In areas of water scarcity, this may hence reduce the cost of water (OpEx)	- EUR per hectare of wetlands, forest, grassland preserved - EUR saved for reduction in insurance premiums	- EUR - EUR/insured value - EUR/unit

#	ESG Factor	Risk/ Oppty	Risk/ Opportunity Scenario Example	Item in Financial Model	Rationale for Inclusion (Suggestions)	Metrics (Suggestions)	Unit of Measure
		R	Regulatory/ Legal: - Tightening of regulations or other operating requirements regarding the protection of critical species or habitats (for example, stipulations to take measurements to avoid habitat disruptions and to protect animal migration pathways, e.g. reduction of noise or vibration)	Revenues CapEx OpEx	- There may be operating restrictions on certain days of the year or on certain times of the day (e.g. to allow for bird migration) leading to a reduction in sales (Revenues) - Investments into alterations to existing structures, e.g. implementation of sound curtains for offshore wind turbines (CapEx) may become necessary - Adherence to stipulations may lead to increased monitoring and reporting cost (OpEx)	- EUR per unit of energy times units of energy production lost - EUR invested - EUR spent on additional monitoring and reporting	- EUR/unit - EUR - EUR
8	Climate change impacts (E)	R	Physical: - Extreme weather (storms and floods) can lead to disruptions	Revenues	- Example wind farm: Periodic loss of energy production due to shut-down, and as such, loss of revenues	- EUR per unit of energy times units of energy production lost	- EUR/MWh
		R	Physical: - Extreme weather may destroy the asset partially or fully.	Asset book value Revenues CapEx OpEx	- A write-down or write-off of the assets and a loss of revenues may be the immediate result. Investments will be needed to repair or even rebuild the damaged asset (OpEx and/or CapEx). Further, if the probability of extreme weather increases, the probability of damage or destruction of assets increases as well. Insurance policies are likely to increase, which in turn will increase OpEx	- EUR per unit times units of output lost - EUR invested for repair or reconstruction - Increase of insurance premium in EUR p.a.	- EUR - EUR/unit - EUR/insured value
		R/O	Physical: - Changing weather patterns	Revenues	- Changing weather patterns, e.g. more solar irradiation or less rainfall p.a., may reduce the energy production of hydropower plants (see above) while increasing the energy production of PV solar plants: decrease or increase of revenues from energy sales result	- EUR per unit of output times additional or reduced units of output	- EUR/unit
9	Health & safety (S)	R	Operational: - High air or noise pollution, other health hazard and danger levels	OpEx Revenues	- High air or noise pollution levels may lead to illness and hence absence of workforce and raise cost of absences - Reduced productivity due to lack of workforce Shut down/slow-down of operations due to noise pollution for neighbours or flickering (wind farm) (Revenues)	- EUR per working day times working days lost due to illness or injury, not covered by insurance - EUR per unit of energy times units of energy production lost	- EUR/working day lost

#	ESG Factor	Risk/ Oppty	Risk/ Opportunity Scenario Example	Item in Financial Model	Rationale for Inclusion (Suggestions)	Metrics (Suggestions)	Unit of Measure
		R	Operational: - Insufficient health and safety policy in place or lax implementation thereof	OpEx Provi-sions	- The need to perform health and safety audits and to implement corresponding procedures and measures drive up cost, for example by hiring health and safety professional - Health- or death-related compensation payments might need to be provided for	- EUR per audit and recommended measure - EUR paid historically in comparable cases	- EUR - EUR/unit
Community and Stakeholders							
10	Stake-holder engage-ment (S)	R	Reputational: - Complaints from sur-rounding community due to noise pollution for neighbours or flickering (wind farm)	OpEx CapEx	- Conducting (additional) stakeholder dialogues and mediation processes or introducing complaints mechanisms regarding negative impacts on the sur-rounding environment and (indigenous) community increases costs - Further costs incur when alleviating the issues raised	- EUR paid for stakeholder dialogues - EUR invested to implement solutions	- EUR
		R	Reputational/Physical: - Strong community opposi-tion	Reve-nues OpEx Provi-sions	- Strong community opposition -whether physical or not- may prevent or delay development, construc-tion or operation of asset, leading to lost revenues and higher cost (crisis management measures) - Provisions may need to be made for project delay fines or write-offs - Negative publicity may hurt the share price, increas-ing the cost of capital going forward	- EUR loss of foregone sales - EUR additional costs for community en-gagement and managing reputational dam-age - EUR paid historically in comparable cases	- EUR
Governance – Operational Issues							
11	Corrup-tion (G)	R	Regulatory/ Legal: - Employees' and board members' violations of le-gal stipulations	Provi-sions	- Provisions may be made for unforeseen fines and settlements of court cases	- EUR paid historically in comparable cases based on the number of non-compliance cases of comparable projects, number of PEP (Politically Exposed Person) involved in the project, and legal action in compara-ble projects in the region.	- EUR
12	Fraud & cyber se-curity (S/G)	R	Operational: - Increasing probability of cyber-attacks	CapEx OpEX	- Cyber-attacks can lead to interruptions of production and theft of confidential data They require invest-ment into firewalls, network security etc.	- EUR for investments in and maintenance of data security systems	- EUR
				OpEx	- Purchase of insurance for the event of a cyber-at-tack	- EUR per insured value	- EUR
				Provi-sions Financ-ing cost	- Penalties and fines in the case of breach of cus-tomer data privacy regulations - If the perceived risk of the organisation increases, the financing conditions provided by lenders may tighten, which will lead to increased financing costs	- Historical number of non-compliance cases of comparable projects - Financing costs: additional interest paid (due to higher interest rate)	- EUR

6. Conclusion

The main motivation for writing this Guidance Note was threefold:

- Illustrate that despite the well-known data shortages and various other limitations, a lot of ESG related risks and opportunities can already today be integrated into financial models, which in turn inform annual reports and acquisition or divestment processes. Their quantification may not yet be perfect but including them is presumably better than leaving them unconsidered in the model altogether;

- Offer ideas that trigger investors' own thinking around the topic of quantification of ESG-related risks and opportunities and thereby, lower or eliminate the threshold of giving the quantification of ESG-related risks and opportunities a go;

- Contribute to making ESG-due diligence integration into financial models a standard.

This Guidance Note was meant to be a discussion starter. To keep it short and crisp, several shortcomings were consciously accepted. WWF and B Capital Partners encourage the investment community and academia to build on and contribute to the work of this Guidance Note going forward:

(i) Examining the potential effect of ESG-triggered risks and opportunities on the discount rate applied in the valuation model and thereby fill in the missing part needed to revalue the asset;

(ii) Deepen the understanding of possible impacts of risks and opportunities on specific items in the financial model;

(iii) Explore real-world cases that demonstrate the causal chains discussed in this Note;

(iv) Support the development of robust data to support the quantification of ESG factors;

(v) Expand the selection of risks and opportunities possibly triggered by any single ESG-factor;

(vi) Demonstrate interrelations among the various items of a financial model in the context of ESG integration;

(vii) Expand the selection of the universe of covered ESG factors.

Appendix A: Description of selected ESG factors in the context of infrastructure

Degradation and Pollution

Air and water	Air pollution concerns NOx, SOx, particulate matter, etc. and is an increasing health concern in urban centres and in regions further away from the source of pollution (acid rain). It is caused by the combustion of fossil fuels and from emissions from industrial processes. Water pollution is the contamination of water bodies, such as lakes, rivers and groundwater, depleting water quality, which make the water toxic for humans and the environment. Major sources of water pollution are rainwater runoff, untreated wastewater and air pollution leading to acidification of oceans.
GHG emissions	The contribution to climate change through greenhouse gas emissions. There are many types of GHG emissions, such as carbon dioxide, methane, nitrous oxide and others. Most man-made emissions of CO_2 are caused by the burning of fossil fuels as well as by cutting and then burning wood of carbon-absorbing forests. The result is global warming and more frequent and extreme weather events.
Biodiversity and habitat	Biodiversity is the variety of plant and natural life in a particular habitat. It is the foundation of many ecosystem services that we benefit from (clean air or water). A loss of biodiversity typically occurs when habitats can no longer support the present species. This may happen due to invasive activities such as sea bottom trawling, urbanization, fossil fuel harvesting, or due to effects of global warming such as flooding or drying of wetlands, etc.
Climate change effects	Climate change is the change in weather patterns over time. Recent climate change is due to the human use of fossil fuels. It is considered one of the greatest challenges our times as it affects all aspects of our lives as it causes changes to physical, social and economic structures in an unprecedented way.

Resource Efficiency – Sourcing, Use, Treatment

Energy	Energy refers to energy consumption and generation from non-renewable and renewable sources (e.g. oil, gas, coal, wind, solar, hydro, biomass) as well as energy transmission and distribution. Energy efficiency (energy output divided by energy input) and sourcing (fossil, renewable, etc.) may have major impacts on the environment and on the cost of running an infrastructure asset.
Water	Water efficiency aims at reducing the water wastage resulting from a specific process. With climate change leading to greater likelihood of droughts in certain areas, water resources become scarcer and water efficiency measures become increasingly important.
Waste	Liquid, solid, gaseous, organic, recyclable and mostly hazardous waste requires proper handling to avoid threat to human health. Reduction, reuse, recycling and waste-to-energy measures are aimed at reducing the amount of landfill-waste.
(Raw) materials and supply chain	The use of raw materials will play a key role during the construction phase, where using recycled materials (such as steel) can reduce cost and improve (energy) efficiency. With increasing global competition for raw materials, efficiency becomes an increasingly important metric.

Labour

Health and safety	The principles of occupational health and safety management include developing a policy, analysing and controlling health and safety risks, providing training, and recording and investigating health and safety incidents at the work place.

Community and Stakeholders

Stakeholder engagement	Engaging stakeholders in dialogue to learn which environmental and social issues matter most and how acceptance and support for the project can be gained.

Governance – Operational Issues

Corruption	Corruption is an abuse of a position of trust in order to gain an undue (private) advantage.
Fraud and cyber security	Fraud is an act or omission made with the intent of making personal financial or property gain (or causing financial or property loss). Cybersecurity relates to actions associated with security risk management processes followed by organisations and states to protect confidentiality, integrity and availability of data and assets used in cyber space. The concept includes guidelines, policies and collections of safeguards, technologies, tools and training to provide the best protection for the state of the cyber environment and its users.

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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