GREEN GRIDS INITIATIVE

Climate Compatible Growth

WAPPP

Which grids are green?

Climate Finance Principles to Unlock Green Grids Financing

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Background

The Green Grids Initiative (GGI) aims to accelerate the construction of the new infrastructure needed for a world powered by clean electricity. It convenes an ecosystem of key decision makers representing political, industrial and financial institutions who bring a wealth of experience in T&D investments, can address real-world barriers and speed up project development. This position paper has been produced by a taskforce of the GGI Finance Working Group, a collaboration of international public and private financial institutions as well as infrastructure and climate finance experts.

MEMBERS OF THE GREEN GRIDS INITIATIVE (GGI) FINANCE WORKING GROUP[7]

African Development Bank
Asian Development Bank
Asian Infrastructure Investment Bank
Agence Française de Développement
Climate Bonds Initiative
Climate Compatible Growth Programme[8]
Climate Parliament
Department for Energy Security and Net Zero, UK
European Bank for Reconstruction and Development
European Investment Bank
Foreign Commonwealth and Development Office, UK
Green Climate Fund
Gridworks
HSBC
International Energy Agency
International Renewable Energy Agency
Lucetia Group
Société Générale
Sterlite Power
Transition Zero
UN Economic and Social Commission for Asia and the Pacific
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[8] Funded by UKaid

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Key Messages

Currently, there is a lack of clear unified criteria for defining a "Green Grid". The financial world remains divided on which grids qualify for green and climate finance.

This lack of consensus risks holding back the investments, co-financing and securitization needed to develop the grid enhancements and interconnections essential for the transition to renewable energy, especially in the fossil fuel intensive emerging markets and developing economies (EMDEs) where financing is needed most.

Through proposing Climate Finance Principles for Green Grids[9], the Green Grids Initiative aims to overcome the lack of consensus and to set out a basis for interoperability, dialogue and trust among different stakeholders. This will facilitate co-financing, securitization and the scale-up of investments on the full, global scope of grid infrastructure expansion and transformation, subject to an effective and measurable decarbonization and sustainability performance. The hope of this position paper is that the Climate Finance Principles proposed will be adopted by key financial institutions and form the basis for a harmonized definition for what constitutes a "green grid".

With the launch of this position paper at COP29 GGI initiates a consultation process that will run for 3 months. Stakeholders' feedback and case studies will help refine the approach, with the goal of building consensus among a critical mass of investors.

The Annex to this position paper includes examples of projects and investment initiatives already aligned with **these Principles**. We will continue collaborating with partners to build support and develop the number of validated use cases over the coming year to grow investor confidence. The Green Grids Initiative will monitor the use of the Principles and develop more detailed guidance to support their application.

[9] Based on the Sustainability-Linked Loan Principles (SLLP)

WHY GRIDS?

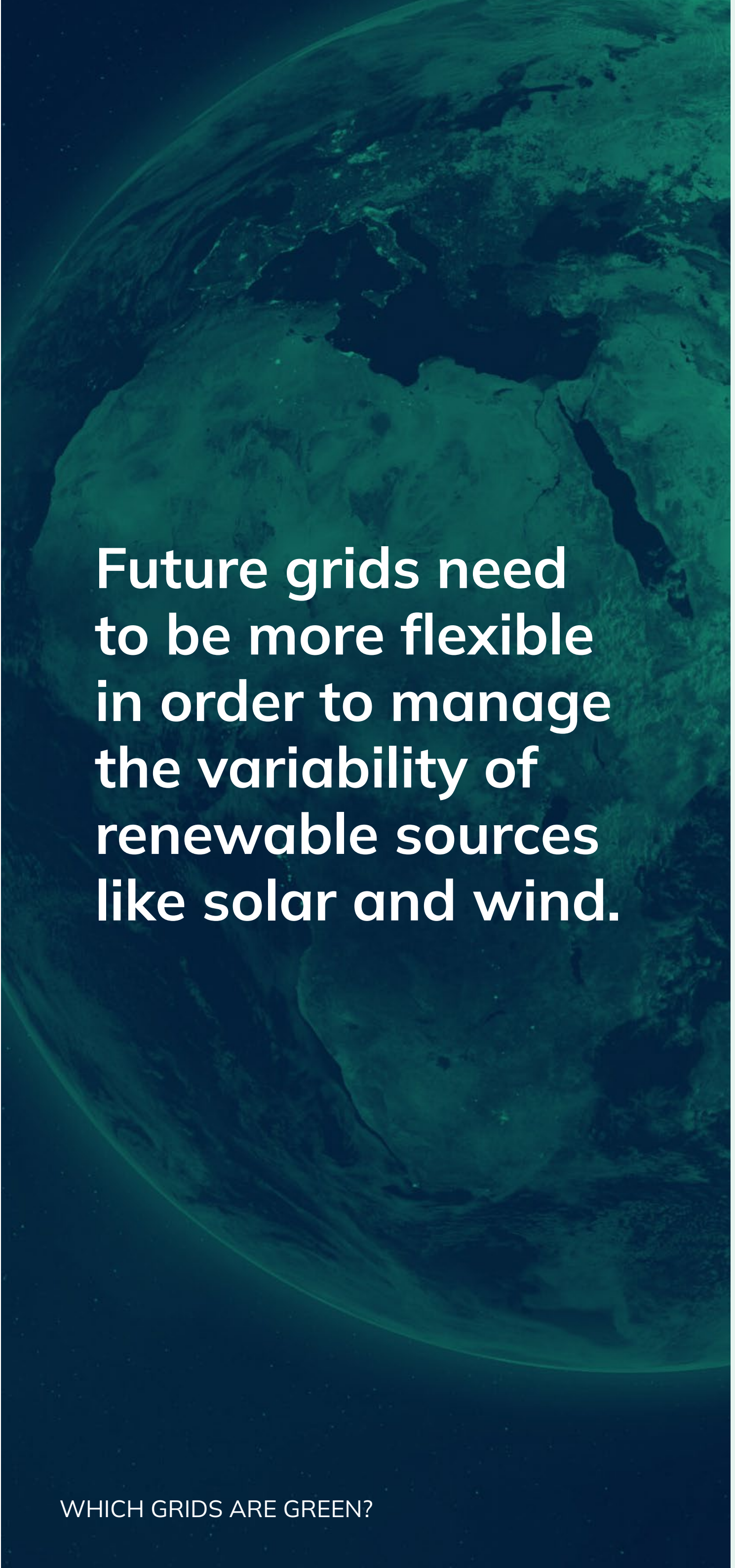
There is no transition without transmission.

The upgrade and expansion of electricity grids is essential to achieve net zero and stay within the boundaries of the Paris Agreement[10]. Without grid capacity, new renewable energy sources and projects cannot be connected to decarbonize the overall energy system. Grids underpin key technologies including electric vehicles and clean hydrogen. They enhance energy security and resilience, and they increase energy access globally.

Grids enable a just energy transition. Investing in grid infrastructure could reduce the global costs of the energy transition by nearly $3 trillion USD. These investments deliver returns through increased trade and economies of scale, reducing costs to consumers and enabling economic growth. According to the World Bank each US dollar invested in regional transmission in Southern Africa could unlock $21 in economic benefits. Furthermore, new grid connections could close about 45% of the current gap to achieving Sustainable Development Goal 7, which targets universal electricity access by 2030, with decentralized solutions addressing the remaining need.

Investment needs are high and there is a financing gap. Over the next 20 years, electricity demand will almost triple. 80 million km of the global grid network will need to be added or replaced, similar to the global total in use today. To meet this demand, annual grid investment must double to over $600bn USD per year by 2030, and then increase to over $1 trillion USD per year from 2035 onwards for net zero. The shortfall is most acute in EMDEs, where annual grid investments declined by 40% between 2015 and 2022, despite rising renewables investments in these regions. By contrast, grid investments have increased by 14% in advanced economies where in the same period.

Grids are not being built fast enough and delays are costly. Grid connections are creating bottlenecks for new clean energy projects. Globally, 3,000 gigawatts (GW) of renewable power projects are in grid connection queues, equivalent to five times the solar PV and wind capacity added in 2022. Delays to grid projects can be particularly costly when they prevent renewable energy projects from dispatching power (e.g. in Vietnam, and Kenya), and slow down deeper reforms (e.g. South Africa). Delaying grid investment risks fossil fuel lock-in to an additional 80 billion cubic metres of gas and nearly 50 million tonnes of coal per year globally from 2030. Delayed grid development increases the risk of economically damaging outages which today cost around USD 100 billion a year, or 0.1% of global GDP.



Future grids need to be more flexible in order to manage the variability of renewable sources like solar and wind.

GRIDS OF THE FUTURE

Transmission and distribution **infrastructure must adapt to support the future decarbonised energy system.** This decarbonized system will feature a greater proportion of geographically dispersed variable generation sources, significantly increased electricity demand, and prosumers of various sizes. The grid must also be resilient enough to withstand and rapidly recover from more intense and frequent climate shocks.

Future grids need to be more flexible in order to manage the variability of renewable sources like solar and wind. They will integrate a more diverse range of generation and storage[11] options, along with technologies for providing grid stability[12]. Future grids will also empower consumers to adapt their demand flexibly and feed distributed generation back into the grid.

Resilience will be achieved by repositioning the physical infrastructure, such as through moving cables underground to avoid increasingly intense weather events, and by enhancing redundancy through techniques like grid meshing. Resilience will further be developed through self-healing features like automated substations, or equipment that can isolate damaged sections and reroute the electricity flows.

Digitalization will enable the simultaneous interaction of the above-mentioned technologies, while also helping grids maintain visibility of demand volumes in the low voltage grid, to manage distribution efficiently and decide where and when to import from interconnectors and reroute electricity. This is especially important for grids that are expected to have millions of new renewables and demand devices connecting at all different voltages. Digital twins will help localize flexibility and carrying capacity close to renewable generation connections and, coupled with Internet of Things (IoT), will be used for preventative maintenance.

[10] At least $21.4 trillion needs to be invested in the electricity grid by 2050 to support a net-zero trajectory for the world (BNEF, 2023) - Accessible on https://about.bnef.com/blog/global-net-zero-will-require-21-trillion-investment-in-power-grids.
[11] Storage technologies can be different in size, technology and duration: for example mechanical storage for wind, BESS for solar PV parks, and pumped hydro. In addition to these, future grids will also integrate additional large sized battery storage at the sole service of the grid. These will be increasingly lithium-ion based, providing ancillary services such as reduction of renewables curtailment, operating reserve, fast frequency response, black start or T&D upgrade deferrals. More often, the same battery can be designed to serve several of these purposes, as well as wholesale electricity arbitrage (this is often referred to as revenue stacking).
[12] Flexibility can be ensured by an increased use of High-Voltage Direct Current (HVDC) systems for interconnectors, fast reactive power devices (such as shunt capacitor banks), Substation Automation Systems (SASs) and Wide Area Monitoring Systems (WAMS) enabling Dynamic Line Rating (DLR).

Current baseline and problem statement

THE BASELINE

Upgrading and expanding existing electricity grids is essential to achieving net zero. However, grids have largely been overlooked by financiers, with green finance predominantly directed towards renewable generation. Capital deployment for grid investments faces multiple challenges including lengthy planning and permitting lead times, difficulty securing concessional finance, lack of performance data, and global supply chain disruptions and related inflationary pressure on projects. Interconnectors, in particular, require regulatory harmonization, extensive feasibility studies and preliminary dialogue within and among the countries involved.

Unlike renewable generation, grids are complex infrastructure projects that do not offer a one-size-fits-all option for investors. Projects range from dedicated lines to connect individual plants; to transmission lines reinforcing enmeshed grids or connecting to isolated sub-grids at the national or local level; to interconnectors between one or more countries. Each project type implies a different investment size, spatial configuration, analysis boundary and overall complexity to investors. While the underlying technology is the same, the projects are often very location- and regulatory-specific. Even when the aforementioned challenges are addressed, climate financiers remain reluctant to finance Transmission and Distribution (T&D) projects as the existing methodologies to identify green grids either exclude a significant number of projects or leave room for substantial reputational risk. Nonetheless, reference cases of successful financing of grids and interconnectors do exist.

For example, the Kimal-Lo Aguirre project, a 1,500 km HVDC line with a transmission capacity per pole of at least 2,000 MW has been Project Financed to a consortium, the process being accelerated by several years due to a voluntary commitment assumed by the generators with the Chilean Ministry of Energy. The agreement involves stopping new coal-fired power plants development and retiring the existing ones, following a schedule.

Public-Private Partnerships (PPPs) can also be used to finance equipment offering specific grid services. Two examples are the South Luzon 20 MW battery storage in the Philippines, whereby the National Grid Company of the Philippines (NGP) procured grid-stabilizing reactive power and other ancillary services from distributed storage owned by AES Power, and the California Honeywell project, where a private operator was contracted to implement a comprehensive set of technical and contractual solutions delivering customer demand response.

THE CONSENSUS DIVIDE: WHICH GRIDS ARE GREEN?

Eligibility for climate and concessional finance is important for project financing because green projects may have better access to private capital. However, since grids transmit power from all generation sources that are connected to them, their environmental impact is more complex to assess than for individual generation projects. Different institutions have taken different approaches to classification, introducing ambiguities about grids' eligibility that create barriers to co-financing and capital aggregation, all while maintaining the reputational risk for investors.

PRIVATE INVESTORS

Grid investments can be a desirable asset class for private sector and institutional investors as they involve sizeable, long-lived infrastructure; in conducive regulatory environments, these can provide stable long-term revenue streams.

However, private investors face reputational risk of greenwashing from badging grid investments as green without a robust justification or the presence of a climate co-financier to act as a "quality stamp".

Taxonomies and labelling schemes for green finance have been developed to address these risks by providing standardized eligibility criteria for investors. A key example is the EU Taxonomy for sustainable finance which defines criteria for economic activities that are aligned with Europe's net-zero trajectory by 2050. However, **the EU Taxonomy scopes out more than 60% of grid investments needed in EMDEs**. It requires either that the current carbon intensity of the grid be below 100 gCO_2/kWh, or that at least 67% of generation capacity added in the past 5 years have had a carbon intensity below this threshold. **This taxonomy is not well suited to grid investment** in high fossil fuel environments such as in Southern Africa and many parts of Southeast Asia. The approach overlooks the fact that grids are coming from different starting points of different grids. Instead of focusing on absolute renewables numbers, it should be recognized that the rate of improvement – or "delta" – is the critical metric. Moreover, these taxonomies typically do not take the demand side (e.g. connection of electric vehicles) into consideration.

Other existing standardization approaches, like the Climate Bonds Initiative and the ASEAN Taxonomy, have followed the same or similar classification criteria as the EU Taxonomy and suffer from the same constraints when it comes to financing grids in higher-carbon EMDE regions. While it is possible that **these approaches may be adapted in the future** to be more appropriately tailored to regional contexts, this will require time and substantial international dialogue on interoperability and inclusiveness.

Furthermore, the very lack of a consensus is limiting the ability to aggregate finance (both concessional and private) for an infrastructure that by its own nature requires large-sized upfront investments (T&D CAPEX are typically in the tens of $millions to $billions). Due to the size of these projects, the need for co-financing and concessional financing is particularly high.

ELIGIBILITY FOR MDBs

Grid investments in EMDEs often need concessional financing, as these regions face numerous challenges: limited creditworthiness of utilities, heightened regulatory and country risks due to market structure and energy dispatch regulations, low end-user tariffs, and expropriation rules that might erode investment profitability. These factors demand specific contractual and insurance risk management provisions.

Some MDBs and bilateral agencies apply Common Principles that allocate climate finance based on the share of additional low-carbon non-nuclear generation[13] on the system over a 10-year period, covering 5 years before and 5 years after the new infrastructure begins operation[14]. In regions such as Southeast Asia and Southern Africa, where fossil fuel intensity is greater, the long lifespan of fossil fuel plants often results in relatively low climate finance allocation, even where most new capacity additions are renewable. This methodology also carries a residual reputational risk, as financing T&D infrastructure based on future decarbonization may lead to locked-in or increased fossil fuel generation if countries' institutional or regulatory changes hinder long-term decarbonization[15].

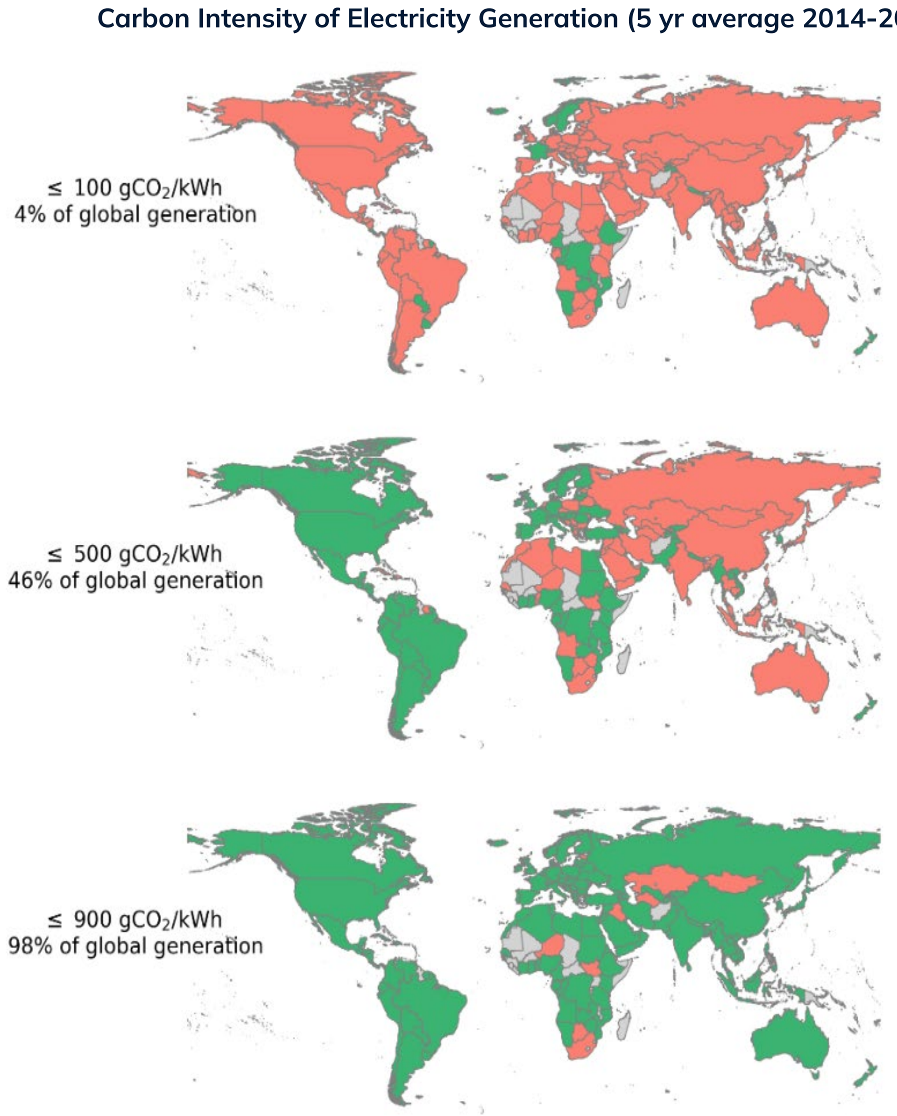
Climate financiers require that projects quantify their emission reduction impacts.

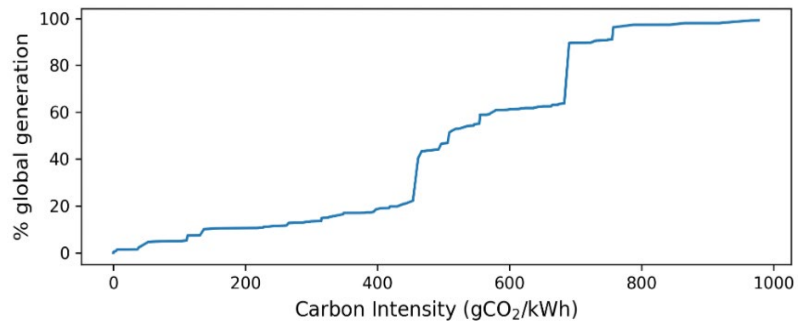
ELIGIBILITY FOR CLIMATE FUNDS

Climate funds like the Green Climate Fund (GCF) do not currently specify a classification methodology for grids projects, creating ambiguity around the eligibility of this asset class for climate finance. In addition, **climate financiers require that projects quantify their emission reduction impacts**, raising methodological questions about how to measure and monitor these impacts. Key challenges include defining project boundaries[16], the timescale of emission reductions being assessed, and incorporating scenario and risk-based approaches to system development[17]. Within this framework, Payment-by-Results Financing (PBR) offers a solution for risk mitigation if supported by robust and effective tools for forecasting and monitoring decarbonization and sustainability KPIs such as grid carbon footprint, installed renewable capacity and connected EV charging points.

[13] Taken as a share of the total generation mix.
[14] MDB-IFC Common Principles, 2023 - Accessed on: https://www.eib.org/attachments/documents/mdb_idfc_mitigation_common_principles_en.pdf
[15] Being a long-term investment with implementation times longer than 5–8 years, grid infrastructure projects surpass the institutional/political longevity of many countries and therefore are more exposed not only to country and regulatory risk, but to any volatility connected with institutional changes, including the use of funds for fossil fuel-linked generation or T&D initiatives other than those aimed at grid decarbonization and resilience.
[16] As grids are a network-based infrastructure, defining project boundaries is not easy: for interconnectors, the physical infrastructure itself defines the boundaries of the project but for sub-national initiatives in highly meshed and localized grids, a definition of which type of generation and/or demand is enabled by the T&D infrastructure might be complex, as the infrastructure will conduct electrons from both existing/future renewable and connected fossil fuel generation assets.
[17] Including the potential short-term increase in fossil fuels connections once the T&D project is implemented.

Figure 1: Source: Source data: electricity and emissions data for main producer electricity and CHP plants from World Energy Balances 2020 Edition (IEA, 2020) andWorld CO2 Emissions from Fuel Combustion (detailed estimates) (IEA, 2020)





PROBLEM STATEMENT

The guiding question of our research was how to overcome the consensus divide in a way that aligns with the existing methodologies acceptable to climate financiers, addresses reputational risks, and enables financing for the full scope of grid infrastructure expansion and transformation across all countries, subject to effective decarbonization and sustainability performance.

Proposed Climate Finance Principles for Green Grids

The Climate Finance Principles proposed below have been co-developed with members of the GGI Finance Working Group which includes representatives of all investor types. This position paper initiates a dialogue and formal consultation process aimed at gathering feedback and endorsement from key development, climate and finance actors. Recognizing the diversity of methodologies and needs within the ecosystem, the Principles are designed to:

Establish a trusted common ground to secure climate financiers' support and encourage investment in grid projects in more carbon-intensive environments by helping to address reputational risks;

Create a basis for interoperability that facilitates dialogue and, ultimately, the much-needed co-financing and securitization

Provide a solution for regions excluded by current methodologies, offering a framework that could evolve into a global, overarching standard where harmonized approaches are needed.

PROPOSED SOLUTION

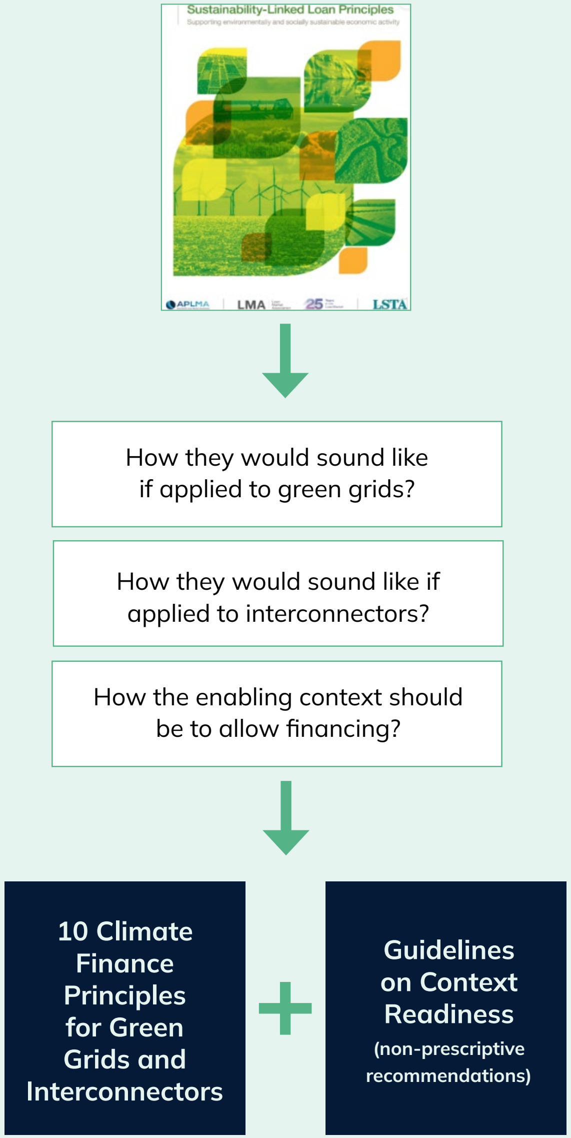
We took inspiration from the Sustainability-Linked Loans Principles (SLLP) and asked ourselves:

- How would they sound if applied to green grids and interconnectors?
- How should the enabling context be to allow co-financing?

From this reflection, we derived:

- **10 Climate Finance Principles for Green Grids and Interconnectors**
- **Guidelines on Context Readiness (non-prescriptive recommendations)**

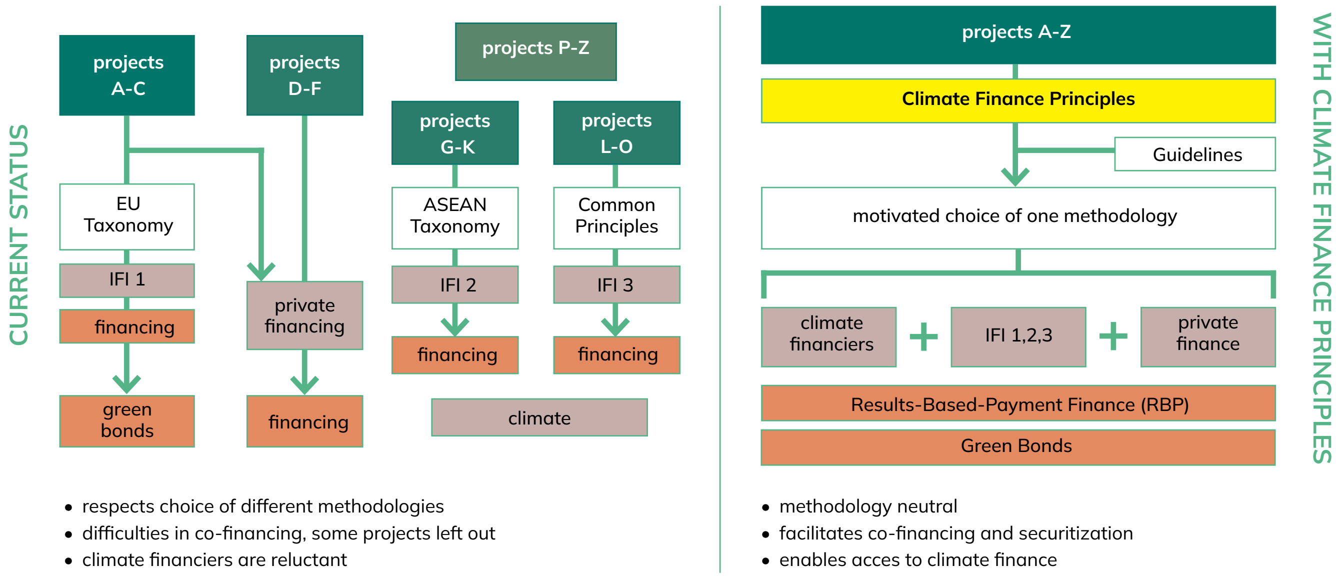
Figure 2 - Deriving the 10 Climate Finance Principles for Green Grids from the SLLP: thought process



It is our vision that the Principles could enable Payment-by-Results (PBR) Financing and Securitization for Transmission and Distribution Infrastructure with participation from climate financiers, multilateral lenders and private investors.

By applying the 10 Climate Finance Principles, stakeholders can overcome the methodological divide and mitigate reputational risks to an acceptable level for climate financiers. This shift transforms the financing landscape from a fragmented one where the projects most in need of concessional finance are excluded to a more inclusive framework. In this new scenario, every Principles-compliant project is eligible for concessional financing, and can aggregate co-financing and access securitization from a broad spectrum of financial actors, both public and private, including climate financiers. This level of multi-stakeholder coordination is essential for an effective transition.

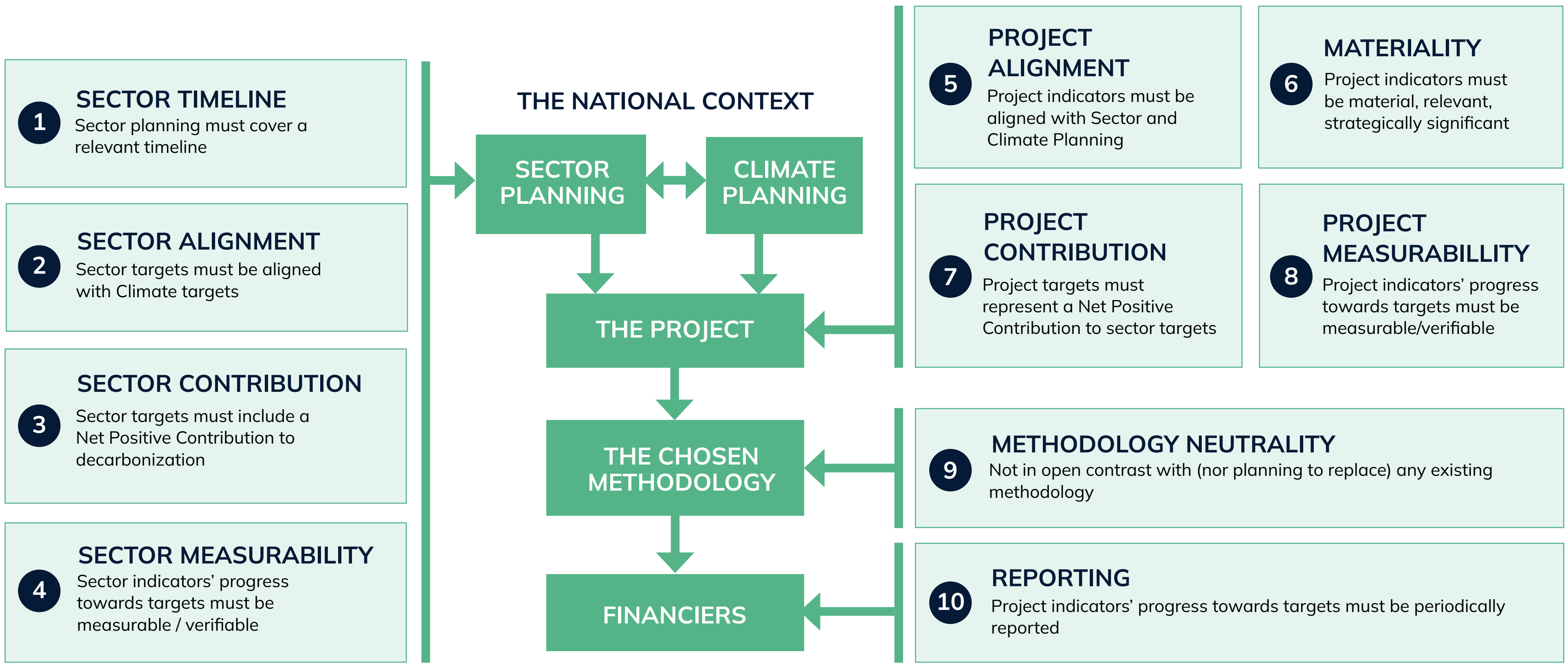
Figure 3 - Visualizing the benefits: the financing ecosystem as-is (left) and with the Climate Finance Principles (right)



The Principles do not contradict or seek to replace any existing Green Grids qualification methodologies; rather, they offer a wider overarching framework as a basis for interoperability. By bringing stakeholders together, the Principles will ensure that each financial actor can operate with its own specific de-risking capacity and products.

10 CLIMATE FINANCE PRINCIPLES FOR GREEN GRIDS

The following diagram shows the 10 Climate Finance Principles as applied onto the wider context of project financing and national planning. The Principles are outlined in the boxes below, together with further guidance on their application to interconnectors. For each Principle, this is followed by ancillary considerations and recommendations.



1 Sector Timeline

Sector planning must cover a relevant timeline

While national strategic plans for generation, T&D, and demand electrification typically cover a timespan consistent with lending tenors, the choice of timeframe for monitoring and verifying project indicators (be it grids or interconnectors) needs to be consistent with the generation planning. This alignment is crucial as it is the generation planning that will determine the carbon trajectory of the system, regardless of the extent to which the details of transmission planning are known in advance. In particular, the planning horizon can legitimately be significantly longer than the standard 10 years, and more aligned with the lifecycle of the planning process.

2 Sector Timeline

National Sector targets must, at a minimum, be qualitatively[18] aligned with Climate targets[19].

Interconnectors should demonstrate alignment with the Climate targets of at least one of the connected geographies. To verify the Sector Alignment Principle, a third-party opinion on planning maturity and alignment could be a requirement.

Example - Since November 2021 several Just Energy Transition Partnerships (JETPs) have launched including in Indonesia, Vietnam, Senegal and South Africa.

A shared feature of the JETPs is that they all have tangible financial commitments to accelerate the energy transition in their host countries. Another commonality among the JETPs is that they have all developed (or are developing, in the case of Senegal) investment plans to map out how the JETPs will deliver on their decarbonization goals. All investment plans published to date emphasize the central role of grid investments, providing a clear acknowledgement of their importance to the overall energy transition. The JETP political declarations have clear timelines and targets providing a clear overall political commitment to the energy transition.

Investments under the JETPs should qualify as climate finance, whether they directly support renewable generation or grid investments, as all are counted toward the targets to mobilize finance to accelerate the energy transition outlined in the political declarations. In practice, the JETPs must align closely with the countries' sector plans, particularly in EMDEs, where these plans often directly link to the projects tendered for investment by the government or the national utility.

The JETP political declarations should clearly fulfil Principles 1, 2 and 3 in the cases where national planning documents align closely with the JETP targets. The existence of a JETP should further support the achievement of the Principles. If a grid investment is acknowledged as part of a JETP, then it must be assumed that it aligns with the JETP political declaration, which itself aligns with the countries' legally binding climate targets at a minimum, if it is not more ambitious. The project will also be evaluated against its sector contributions and assessed to ensure it is net positive in terms of both decarbonization and just transition considerations. Therefore, the existence of a JETP and the classification of a grid investment as JETP compliant would likely indicate that it is also compliant with the Principles of this position paper.

3 Sector Contribution

National Sector planning should ideally coordinate generation with transmission and distribution strategies. The related targets must include a Net Positive Contribution to decarbonization, expressed as a grid carbon footprint trajectory. Other key indicators could also be included, such as the share of (or volume of) electricity coming from renewables and low-carbon sources, projected new electrified demand, and energy savings from reduced grid losses.

For Interconnectors, the related planning should demonstrate a net positive contribution to the overall system comprising the connected geographies, while ensuring a non-negative contribution (i.e. not worsening) to each of the connected geographies. While grid carbon footprint is of ultimate interest, in countries where energy demand is growing rapidly, it is possible to achieve significant reductions in grid carbon intensity without necessarily decreasing the absolute grid carbon footprint.

[18] Most of the time alignment between National Sector planning and climate programming by the National Designate Authorities (NDAs) is weak; therefore, mandating a quantitative matching between the respective decarbonization target might be unrealistic.
[19] This principle implicitly encourages countries to align their national energy and climate planning. We have observed cases in which energy generation develops in the opposite direction of the decarbonization targets outlined by the NDA: should this occur, projects in these countries might not verify the Principles and would therefore be ineligible.

Demanding a sufficiently ambitious net positive contribution towards decarbonisation, while also considering electrified demand, focuses on the catalytic role of plans and projects, rather than adopting a “zero tolerance” stance towards fossil fuel connections.

Electrification of demand in sectors such as transportation, heating and cooling can result in a significant reduction in real-world emissions, as electrified end devices like EVs and heat pumps are far more energy-efficient than their fossil fuel combustion equivalents, regardless of the electricity source.

Furthermore, a net positive contribution approach implicitly recognizes that different grids possess varying resources and start from different baseline conditions, rather than penalising them based on their initial position. For smaller-scale investments in meshed AC grids, such as individual transformers or individual equipment, restricting to Principles 1, 2 and 3 – especially with an emphasis on positive sector contributions – can ensure climate finance accessibility for second-tier financial institutions. However, for smaller investments, fossil fuel radial lines or transformers mainly connecting fossil fuel radial lines should be excluded.

Ultimately, demanding a total absence of fossil fuel-derived electricity within the grid in the short to medium term is unrealistic. Even if all existing fossil fuel generation were to be immediately decommissioned – which is, in itself, unfeasible – key strategic facilities such as hospitals or military establishments would still incorporate fossil fuel generation infrastructure in their distribution networks for emergency backup. Moreover, financing agreements must also be flexible enough to allow a reasonable redefining of targets in response to regulatory and policy changes, which are common over the long lifespan of an electricity system. However, clear boundaries and conditions to the redefinition should be established to ensure that redefinition remains motivated, reasonable and proportional.

Finally it is important to note that decarbonisation targets may be part of a broader set of targets pursued within national sector planning, which can also include socio-economic performance, efficiency or resilience. Each of these targets will have KPIs that contribute to the overall performance assessment of the country’s strategic plan.

4 Sector Measurability

Within national sector planning, progress of the chosen indicators must be measurable and verifiable against established targets.

For interconnectors, measurable and verifiable data will be required from all connected countries. The Principle, therefore, remains the same, even if the simulation and computation might be slightly more complex.

For decarbonisation, Principle 4 means that simulation and computation should be used to verify the grid’s carbon footprint and to monitor other key indicators, such as the share of renewable electricity at the country or subnational level and the electrified demand connected over time. Several computation methodologies and grid simulation software such as PLEXOS, PSSE and OSeMOSYS allow tracking of grids’ decarbonisation over time, as the example in Annex shows.

The carbon intensity of the grid (typically measured in gCO2/kWh) is preferable to the renewable energy share as an indicator because it captures the benefits of large hydro, nuclear power, battery storage, and substitution towards lower-carbon fossil fuels like natural gas. In addition, it is important to specify that we are talking about energy shares rather than capacity shares, as intermittent renewables often have low capacity factors.

In this context, national sector planning must outline data and collection mechanisms. The data should be accessible and updated regularly (at least annually), and the collection mechanisms should be robust. Third-party assessments could include a validation of these processes. In addition, demand data – both current and projected – will be needed over time to validate outputs. Therefore, it is recommended that promoters engage in early dialogue with national entities (such as utilities) to obtain these data. Outlining the data and the collection mechanisms is essential.

5 Project Alignment

Project indicators must align with national sector planning and, at a minimum, be qualitatively aligned with Climate Planning.

To effectively measure the project's contribution to national sector targets, the indicators selected to assess project performance should be coherent with those used in national sector planning. For decarbonisation, this means that the same indicators (i.e. grid carbon footprint and share of electricity from renewable energy sources, etc) must be used for both the sector planning and the project. The same principle applies to other performance targets, and where a quantification is not possible a qualitative alignment should be outlined (for example, to prove alignment between project and National Climate programming).

For interconnectors, coherence with the indicators used by the connected geographies should be demonstrated. Again, a third-party opinion on project maturity and alignment could be made a requirement.

6 Materiality

Project indicators must be material, relevant and strategically significant.

Decarbonisation indicators will be essential when seeking climate financing;, however, they are likely not the only indicators being considered. Climate financiers might also look at performance related to access or system resilience, among other factors . Socio-economic indicators such as those related to a just transition may also be very relevant to a particular project and other more technical parameters can also be captured, such as losses or flexibility. In evaluating this Principle, financiers should look at whether the chosen indicators capture the paradigm shifting capacity of the project, rather than focusing on absolute performance metrics.

When choosing indicators, it will be also important to define the project's Spatial Boundaries to effectively scope the choice and analysis of key project indicators and targets. Grid projects can vary widely, ranging from the addition of a few transformers to the implementation of international interconnectors, as the table below shows:

TYPE OF PROJECT	SCOPE OF ANALYSIS
Dedicated lines and equipment to connect a particular plant to the grid	Scope of analysis should be the plant connected
Transmission or Distribution lines and equipment that reinforce an enmeshed national grid	Scope of analysis should be the entire national grid of the country
Transmission lines and equipment that connect (or reinforce the connection between) two isolated domestic sub-grids (e.g. archipelago)	Scope of analysis should be the combination of sub-grids' overall carbon footprint (overall net positive contribution) i.e. the system composed by the newly built/retrofitted physical infrastructure with all the new connections directly linked to it
Interconnectors or transmission lines that connect two or more different countries	Scope of analysis should be the combination of national grids' overall carbon footprint (overall net positive contribution)

7 Project Contribution

Project targets must represent a net positive contribution to sector targets.

For interconnectors, projects should demonstrate a net positive contribution to targets of at least one geography without worsening either of the others.

This again reflects the need for projects to be ambitious and to play a catalytic role within the wider energy system. Net positive contribution to decarbonisation will again be expressed as a carbon footprint trajectory as well as the other metrics previously noted.

8 Project Measurability

Project indicators' progress towards project targets must be measurable and verifiable.

For interconnectors, project progress data should ideally be provided for each of the connected geographies and for the overall system formed by the interconnection.

Again, simulation and computation should be used to verify the grid carbon footprint or the share of renewable electricity enabled by the project (i.e. within the spatial boundaries of the project indicators), with the same tools utilized to verify national sector planning and the choice of accessible and updatable data and robust collection mechanisms will be in order. Verification tools should preferably be open source and established. A third party could be used as a performance validator.

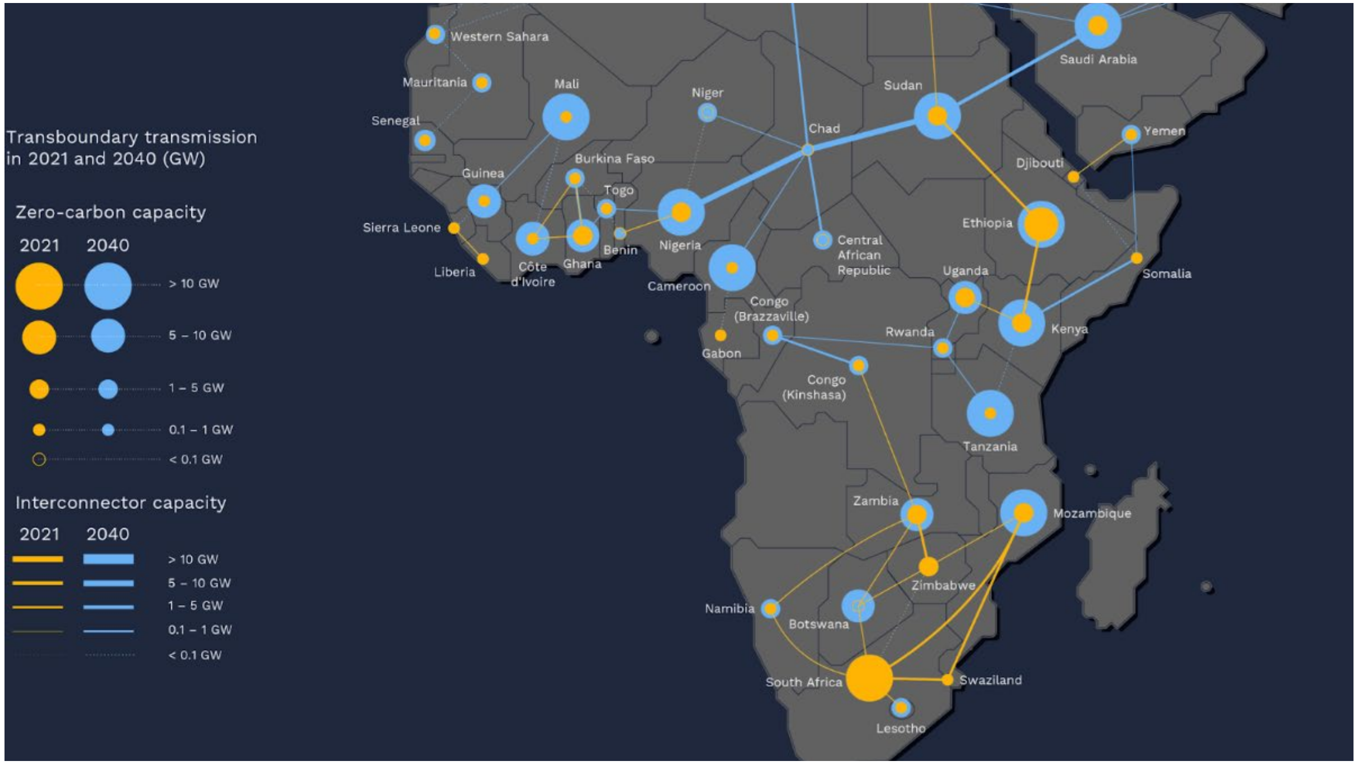


Figure 5 - High-level example of grid simulation at regional level, visualising the contribution of interconnections to the increase of zero carbon capacity (Source: TransitionZero, 2023)

9 Methodology Neutrality

Climate Finance Principles for green grids are methodology neutral[21] and go beyond methodologies to help determine whether a project is aligned with low-carbon developing pathways and the Paris Agreement.

This Principle could be applied to other project indicators, favouring harmonization and ease of co-financing, aspects that are particularly important for Interconnectors.

10 Reporting

Progress of project indicators against project targets must be periodically reported. An annual reporting, either independently compiled or verified, should be sufficient. This should capture both sector planning evolution and progress against sector and climate targets, relevant regulatory changes, and finally project progress with quantified net positive contribution to sector targets as defined in the most updated version of the sector planning.

[21] That means they are not in open contrast with (nor planning to replace) any existing methodology. The Climate Finance Principles advocate for a robust justification/rationale underpinning further determinations of eligibility.

COMPATIBILITY WITH THE METHODOLOGIES AND LOW HANGING FRUITS

The Principles can be used for a wide range of grid projects, from relatively simple dedicated lines connecting a plant to the grid, through to more complex transmission lines that reinforce the meshed national grid, or transmission lines that interconnect two different countries. For the more complex types of projects, emissions impacts may need to be quantified. The Principles can help guide decisions about the methodologies to be used and the scope of emissions to be incorporated into the analysis, including both geographical scope, as well as the timescales over which emissions need to be assessed.

While assessing compliance with the Principles entails simulation/calculation, the universe of Transmission and Distribution projects also include some projects having lower or no reputational risk, standing as low hanging fruits for concessional and climate finance. Namely:

Interconnectors or grids solely dedicated to the distribution of renewable power: for example the Linsan-Maneha, the line securing the evacuation of production from the Kaléta and Souapiti hydropower plants in Guinea, which will be evacuating 100% renewable power already before commissioning. This is indicated as an eligible "green grid" investment by all the existing methodologies and its very reason for existence is decarbonization; therefore, it automatically verifies the Principles.

Grid-level equipment increases a grid's flexibility (and as such enabling a higher share of low-carbon generation to be connected). Carving out this type of investment to a level that is palatable to multilateral lenders, however, might be feasible for interconnectors but not necessarily for national or subnational projects which are normally smaller in size. This further highlights the importance of unblocking the methodological divide to allow concessional finance to enable both greenfield and retrofit projects embedding grid flexibility and resilience technologies.

Application to Climate Finance

ADOPTING AND USING THE PRINCIPLES

The proposed Climate Finance Principles for Green Grids provide investors with a standardized high-level approach to assessing the eligibility of grids projects for climate finance, with a view to reducing risks (particularly reputational risk) for all types of investors.

They have been developed in response to a finding that different types of investors use disparate eligibility criteria, and **over 60% of grid investments in EMDEs are not eligible** for concessional funding under current climate finance rules, even when planned new investments in these regions are strongly tilted towards renewables. As such, the Principles are expected to be of particular use in countries and regions that are at an early stage of their energy transitions where existing electricity systems have a high proportion of fossil fuel-fired generation, a situation pertaining in many emerging and developing economies (EMDEs). Grid investments are essential to enabling these energy transitions, but current classification schemes tend to exclude climate finance in these contexts, which creates reputational risk for investors and can slow down investment.[22]

BLENDED FINANCE, CO-FINANCING AND PRIVATE INVESTMENTS ATTRACTION

Grid projects that have already agreed funding under existing climate finance methodologies (e.g. MDB Common Principles or EU Taxonomy) will be unaffected by the introduction of these Principles as compliance with a methodology already implies alignment with the Principles[23]. Furthermore, the Principles are adaptive to new or updated sustainable finance taxonomies (e.g. the ASEAN Taxonomy) that may be developed in future to respond to regional investment needs. This avoids the Principles creating a hiatus during the period of their introduction.

The aim instead is to develop a wider, overarching framework stimulating – among others – an expansion of both new sources of grid investment and investment in new regions by providing clarity and harmonization of funding rules where these currently do not exist. We see the following key areas as key examples:

1. Climate funds can use these Principles to both qualify and monitor performance of projects to increase the flow of finance to grids projects, and help them to prioritize and channel funds to where they will be most catalytic. In particular, Principle 8 of Project Measurability will allow the use of a Payment-By-Results (PBR) approach, which is at the same time familiar to these entities and appropriate to manage reputational risks, as it provides financial incentives to improve the environmental performance of projects.
2. Co-financing and blended finance instruments should also be easier to negotiate between different financing partners with an overall consensus on the green grid identification tied to performance. For example, private finance could be combined with – and de-risked by – climate funds and/or MDB loans whose degree of concessionality could be contingent on the measurable reduction of the carbon footprint of the infrastructure (as per Principle 8).
3. Private financiers who wish to apply a sustainability financing approach to grid projects can use these Principles to help translate generic SLLP principles into a grids-specific context. This may be particularly relevant in countries or regions where the carbon intensity of grids would exclude projects from current taxonomies.
4. Broadening the eligibility criteria for other related financing instruments which currently tend to use the narrower MDB Common Principles as a default, for example IF-CAP (Innovative Finance Facility for Climate in Asia and the Pacific).

[22] By contrast, regions already dominated by low-carbon generation, or with a longer established emission reduction trajectory, are usually already covered by existing classification methodologies.
[23] As emerged from analysis.

PAYMENT-BY-RESULTS FINANCING (PBR)[24]

Payment-by-Results Financing (PBR) is the transfer of money from a financier or funder to a recipient, conditional on the latter taking measurable action or achieving predetermined performance targets.
A fundamental advantage of PBR finance is that risks borne by financiers are mitigated and recipients are incentivized/constrained to perform. If the project fails to deliver the expected results, then financial resources or concessionality could be either reduced, renegotiated or not provided altogether[25].
While some residual risks might remain, this approach signals the commitment from both financiers and recipients to establish a framework granting trust, accountability and proportionality.
On the other hand, PBR finance notoriously requires more intensive negotiations, and it is often heavier on TA and management costs on both sides.

Applying PBR Finance to Green Grids can draw lessons from a wide range of infrastructure sectors and programs[26]. However, there are several conditions for PBR Finance to be effective, notably stakeholders' capacity, robust indicators and MRV framework, appropriate structuring, management of underperformance and flexibility.

STAKEHOLDERS' CAPACITY – this means both financiers' ability to monitor the program and ensure quick disbursement upon delivery of results as well as recipients' capacity in institutional planning, reporting and managing the expected cash flows from the financial instrument.

Institutional recipients should be flanked by personnel with technical and contractual expertise for the structuring phase and potentially benefit from a pre-lending Project Preparation Facility (PPF) aimed at formulating indicators, and Measurement and Verification (MRV) processes. Furthermore, a dedicated Technical Assistance (TA) should be envisioned, based on a situational assessment of recipient structure, systems, and skills.

Capacity assessment should also influence decisions around flow of funds and fiduciary obligations, especially when it comes to define where fund management is positioned within the recipient.

ROBUST INDICATORS AND MRV FRAMEWORK – indicators chosen should be apt to measure results, linked to overall outcomes, limited in number[27] and provide an appropriate incentive effect. While grid carbon footprint will be the core indicator, other aspects of grids technological and socioeconomic performance might be considered[28]. Indicators choice should consider measurability/verifiability, availability of data, detectable changes over time and attribution. A baseline assessment should underpin the definition of both indicators and targets.

MRV should include a data collection[29], validation[30], management and audit system: this is critical to ensure the consistency and accuracy of reporting. The use of independent verifications can help build trust within stakeholders and help resolve disputes that might arise.

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[24] While there are names for specific results-based instruments, there seems to be no taxonomy that structures the space of results-based instruments. The specific instrument names hence have a certain ad-hoc nature and there is some overlap between different instrument names. We utilised the definitions established by UK's DFID (2012), and adopted by ESMAP in its studies "Results-Based Aid in the Energy Sector | An Analytical Guide" (ESMAP,2013) and "Results-Based Financing in the Energy Sector | An Analytical Guide" (ESMAP,2015).
DFID defines the category as a whole as 'payments by results' (PBR). This category is then subdivided into 'results-based aid' (RBA) and 'results-based financing' (RBF).
DFID (2012) also outlines distinguishing features of PBR as being: 1. (Part of) payments based on (previously agreed) results 2. Recipient discretion as to how results are achieved 3. Verification of results by an independent third party as the trigger for disbursement.
[25] Of course, placing additional risk on recipients means a higher reward as compensation, but this makes concessional finance well suited to RBP structures as it already naturally offers more favourable terms than private financing.
[26] Initially, social sector operations were considered to be the best fit for PBR, but recently also energy access, transport, and urban development have seen an increased use of PBR finance within funding and lending operations. A notable example of PBR lending is the World Bank's Results Financing (PforR 2012), in which disbursements to client country governments were linked to their achievement of tangible, transparent, and verifiable disbursement-linked indicators (DLIs) defined and agreed upon by the country in consultation with the multilateral lender.
[27] So as to avoid perverse incentives.
[28] Either individually or aggregated in indexes or multi-tiered frameworks
[29] Including a data collection schedule and clear roles and responsibility
[30] Could utilize benchmarking with control groups

Finally, sufficient dedicated funds should be earmarked for Measurement and Evaluation (M&E).

APPROPRIATE STRUCTURING – This includes a clear definition of the financing scope[31], documented roles and responsibilities for the actors, mapping of the flow of funds, modelling to size the overall financing amount as well as the size of the disbursements linked to performance from time to time.

Crucially, the high upfront capital costs required for T&D investments render ex-post disbursements largely unfeasible, especially in EMDEs with limited fiscal capacity and difficulties in accessing capital markets: solutions could be linking project performance to other "non disbursement" terms such as tenor or interest rate or making disbursements proportional to the share of performance achieved vs expected. or adopting a hybrid and progressive approach whereby the first disbursement is not subject to performance but the subsequent are, and increasingly so[32].

Finally a roll-out period and a communication plan should be considered for the project, to provide feedback on progress and to adjust processes in a spirit of continuous improvement.

MANAGEMENT OF UNDERPERFORMANCE AND FLEXIBILITY – in PBR finance, financiers monitor the recipient compliance with contractual (i.e. performance) obligations, including corrective measures, recourse, remedies and penalties. Beyond the worsening of terms or the reduction of funding, legal remedies should include the right to suspend disbursement and to block or cancel the financing, but not before having taken into account country and program-specific circumstances as well as the recipient displayed commitment to address the identified issues[33]. As legal remedies might become politically sensitive, the first approach should be to warn the recipient and support it towards improvement, applying a graduated approach to suspension.

In parallel it is also important to embed flexibility in the financing agreements, so as to allow restructuring or renegotiations[34] in case of changes in national planning, macroeconomics or enabling factors. Restructuring rules should be clear as to triggering events, processes and responsibilities and should be tiered based on the level of triggering circumstances and changes required.

Financiers can also ensure flexibility via disbursement adjustments, diversification of the PBR portfolio (e.g. including projects with different start dates or in different geographies), or complementary destinations for unspent money. Payments-by-Results (PBR) and Climate Finance Principles – Grids and interconnectors are a capital intensive, large sized type of investment with a long time horizon where the finance recipient (often a national government or a consortium) can control project performance through both implementation and policy.

Compliance with the Climate Finance Principles ensures there is a firm 'line of sight' to project results through project alignment with sector and climate planning (Principle 5), and offers confidence in the existence of a MRV framework (Principles 8 and 10) for a suitable timeline (Principle 1), reducing contractual ambiguity and the reputational risks borne by all stakeholders as a result.

Recipients will benefit in terms of access to concessional finance as well as ability to attract private investments and will be enabled and motivated to track socioeconomic benefits and efficiencies. Financiers will benefit from substantially reduced risk (including but not limited to reputational risk), optimization of concessionality and additional assurance on impact effectiveness. Public recipients will also remain free to decide which T&D interventions to pursue/prioritize to reach planning targets, and whether and how to transfer their program risks downstream (e.g. to operators, contractors, dedicated govt agencies, etc).

[31] This could be, for example, limited to at least the projects that comply with the Climate Finance Principles or can be qualified as a low hanging fruit, without prejudice to further restrictions based on individual lenders' requirements.
[32] The hybrid and progressive approach also accounts for the fact that decarbonization results and socioeconomic benefits of grid investments are often visible only in the medium-long term
[33] For example, a political instability clause should be included, blocking payments when political deterioration threatens to creates a risk of funds misuse.
[34] For example, there is a stronger case for renegotiation due to exogenous factors such as natural disasters beyond the control of the recipient. On the other side, persistent renegotiation undermines the transfer of accountability and ownership to the recipient and should be avoided unless necessary. Finally,

FINANCING MODELS AND SECURITIZATION

There is an increasing need for climate finance, and particularly climate-aligned financing for electricity grids, as a key enabler for renewable roll-out and electrification of demand.

Grid financing in most countries has historically occurred on the balance sheet of the incumbent monopoly grid owner (often a State Owned Entity, SOE), but the ability to raise finance depends on the performance, track record and creditworthiness of the utility, including consideration of all associated risks, as described above. In particular where vertically integrated companies are involved, the fungibility of this finance presents risks from a financing perspective if the incumbent monopoly owns fossil fuelled assets. This can be somewhat mitigated with the use of proceeds finance (for example green loans or project finance). However, tenors of this type of financing are also often not aligned to the long-term nature of CAPEX heavy grid infrastructure.

One of the most effective ways to finance long-term infrastructure projects is via non-recourse or limited-recourse financial structures, for example project finance. This provides good leverage and the cash flows from the project are used to repay the debt and equity components of the package; it allows sponsors to fund major projects off-balance sheet. However, this can be challenging with certain regulatory models, as they often do not allow third-party ownership; the SOE needs to own and operate all grids. Regulatory change is required to permit this, and there are often lighter touch regulatory changes that can allow third-party financial ownership but allow the SOE/incumbent to still operate the grid for safety and stability purposes.

Debt capital markets (bond issuance) can provide efficient long-term funding. They provide increased liquidity (as well as secondary trading markets) and access to a large number of institutional investors such as funds, banks or insurance companies. They also allow the issuer to own the assets that it is funding (i.e. its on-balance sheet), which means that the need for regulatory changes is minimized. However, it should be noted that the issuance and funding is limited to balance sheet headroom and gearing ratios of the issuing company. Use of proceeds bonds can be issued to ensure the finance is going to grid assets installation and expansion Costs, risks and the general ability to finance electricity grids can be improved in various ways: Using robust, measurable and easy to understand green KPIs, to ensure use of proceeds goes to grid expansion, which if met, can reduce the cost of financing for the relevant issuer – this is a key part of the Principles.

- Guarantees and credit enhancement; various products such as guarantees and insurance that can guarantee debt repayment in the case of lost revenue streams or default, and ultimately increase the credit rating. This can come from a range of different bodies including Government bodies and MDBs (blended finance), Export Credit Agencies (ECAs) where an international import/export angle is involved, and potentially private insurance companies, etc.
- Various forms of blended finance, either from Governments or MDBs
- Securitization; Pooling of finance (from multiple grid projects or grid related financing products) across a wide range of private and public investors. For pooled finance, the issued securities are ultimately 'secured' by the underlying revenue stream(s) of the grid infrastructure, which in turn come from bill payers (users of electricity). This pooling/aggregation can be particularly important when trying to do a lot of grid investment across a large region, with large CAPEX volumes involved. Securitization is commonly used in advanced markets but less so in EMDEs, especially in the grid space.

Whatever the type of grid financing tool that is used, if they are implemented using the Climate Finance Principles listed here, it will help to ensure that the products are accepted by the market, and can be aggregated/pooled into wider portfolios. By using the Principles, these grid financing products will attract more interest, be more trustworthy and become a standardized and tradeable product for entities interested in grid financing. In turn, this will lead to more liquidity and a wider pool of investors and financiers in the grid financing space for EMDEs. This wider pool is clearly needed given the volume of financing that is required in the grid going forward.

Ensuring a Just Energy Transition

A Just Transition refers to the process of shifting from a carbon intensive, fossil fuel-based economy to a sustainable, low-carbon economy in a way that is socially equitable, inclusive and fair. It aims to address both environmental and social justice concerns simultaneously, ensuring that the benefits and burdens of the transition are distributed equitably. The just transition adds a social-rights-based approach to the green transition and involves attention to aspects such as working conditions, non-discrimination, re-training and re-skilling of workers[35], participation and community buy-in, transparency and accountability.

A just approach to the green transition respects human rights and provides for a fair distribution of benefits and burdens, ensuring that the transition does not disproportionately affect vulnerable groups of people, such as low-income households, minorities, employees in the fossil fuel industry or other groups in carbon intensive economies. Moreover, it adds an inclusive decision-making process involving all stakeholders (women and men) and local communities in planning and implementation processes. It strives to ensure that governments and companies are held responsible for their environmental and social impacts.
Climate Finance Principles advocate for setting up and monitoring coordinated indicators and targets at the sector and project levels. As such, they encourage an approach where just transition indicators can also be integrated and monitored, either quantitatively or qualitatively, in both sector planning and project development. Examples of such aspects also include human rights within the energy asset manufacturing and mining industry, respect of land rights and retainment of high standards within dialogues for land-acquisition. Having just transition targets can also enable technical assistance (TA), portions of lending, or future replicability being tied to just transition performance, encouraging socioeconomic change in parallel with infrastructural development.
Human rights aspects within the mining industry, such as decent working conditions, are a key concern for the Just Green Transition. Climate Finance as well as development-funding can support efforts to ensure that environmental, social and corporate governance (ESG) concerns are addressed, that strong supply chains can be established also in developing countries, providing economic benefits, and that local people to enjoy the benefits from the new power infrastructure; for example by assuring that down transformers, distribution networks and service lines are included in the investment.

Lastly, in order to avoid conflicts and create mutual benefits from power transmission lines, cross-border agreements should strive to ensure equitable risk sharing and profit making among the involved countries.

[35] In the global metal mining sector, energy transition minerals, which used to be a small segment of the market, are moving to centre stage in the mining and metals industry. Existing workers, supply chains and stakeholders in the fossil fuel industry can be re-skilled and pivoted – for example -towards these new sectors that require massive scale up. End-of-life management and recycling of renewable energy products also presents significant challenges and job opportunities.

A Call to Action

There is no transition without transmission. Investment in grids is a necessary precursor to the transition from fossil fuels to clean energy because of grids' role in integrating renewable energy to ensure a safe, secure and reliable electricity system. We need to do all we can to encourage investment into the sector.

Current classification approaches tend to exclude grid investment from climate finance in regions which are currently fossil fuel intensive, even if those countries are moving in the right direction in terms of decarbonization. This creates a barrier for climate investors.

This position paper sets out proposals to address this barrier by helping climate investors to identify contexts where grid projects would be catalytic to the greening of the electricity system, including in fossil fuel intensive regions. We hope that this can help to accelerate the transition in some of the regions which need the investment the most.

Accelerating the energy transition requires collective action. The 10 Climate Finance Principles proposed in this paper will only work if they are broadly adopted by practitioners and accepted as good practice by stakeholders, including civil society. This requires building trust in the environmental safeguards presented, as well ensuring the practicability of the approach set out.

We need your help. For the next 3 months, we will be consulting on these proposals, and we welcome your inputs to improving the approach set out here. Thereafter, we will be piloting the approach with real-world case studies. We already have a group of interested investors willing to trial this approach, and we would welcome more investors and other interested parties to join this group. Over the course of 2025, we will build out these pilots and incorporate the lessons learned with a view to launching a fully fledged set of Principles that could be more formally adopted by relevant institutions.

To provide feedback, and register your interest in being involved in this process, please contact ana@green-grids.com with the subject line "GGI Climate Finance Principles Consultation".