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## **BUILDING CRITICAL INFRASTRUCTURE RESILIENCY: GHG INVENTORY AND DECARBONISATION PLAN MODELLING TO MOVE TOWARDS THE FINANCING STAGE**

Building critical infrastructure resiliency requires more resources than usual due to energy, climate change, supply chain turbulence and inflation. By modest estimates Ukraine, for example, needs about 250 billion USD of foreign capital to fast the post-war recovery in five years (2023a). This number is a bit narrow compared with the need to tackle emergencies in the country and obtain sustainability and cyber-physical and digital resiliency for many critical infrastructures sectors: energy, water, food, industry, defence, ICT, transport, and others. It justifies a gigantic request for more scalable funds with a higher speed to invest them into the infrastructure.

The financial institutions can provide financial closes only under the project's cohesion with the European development aid and low-carbon and climate-resilient policies. The essential reference points for investment funds and banks in Eurozone are the Sustainable Finance Disclosure Regulation (SFDR) (2019) and the Guide on Climate-related and environmental risks published by the European Central Bank (ECB)(E. C. Bank, 2020). The Paris Agreement objectives and the Taskforce on Climate-related Financial Disclosures (TCFD) (2017) should align the projects. For most large and listed corporates, the Corporate Sustainability Reporting Directive (CSRD)(2022) and EU Taxonomy (2022) give a framework relating to climate mitigation and adaptation. A specific cohesion stage (E. I. Bank, 2023) precedes measures to assess projects as bankable because of their technical and economic feasibility. When the initial assessment fits the policy and requirements, the beneficiary can get the green light for the next steps, hoping to reach the financial close.

The beneficiaries developing critical infrastructure belong to sovereigns and sub-sovereigns, corporates, and special purpose vehicles (SPVs). The sub-sovereigns and sovereigns (governments) are direct signatories of the Paris Agreement and primarily perform as policymakers. The typical beneficiary of scientific and consulting services for the preceding stage can be a parent corporation that controls an entity, the SPVs, and often represents a group of companies and holdings. Their activity for increasing critical infrastructure resiliency has to follow the Science Based Target Initiative (SBTi)(WRI, 2023). The SBTi prescribes publicly disclosing mid-term (5 to 10 years ) and long-term goals (up to 30 years). The plans cover the quantitative emission reduction targets, offsets' role, and the impact on stakeholders. The beneficiary used to be contractually obliged to work out the greenhouse gas (GHG) inventory and the decarbonisation plan with a commitment to a subsequent implementation of an environmental management system (ESM) according to ISO 14001(2023b).

GHG inventory of Scope 1, Scope 2, and Scope 3 collects all the data necessary under the GHG Protocol Corporate Standard developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). It provides a framework for measuring and managing GHG emissions (2023d). The current GHG emissions inventory implies using secondary and tertiary data for benchmarking analysis with selected sources. A part of the primary data comes from its own supply chain and procurement disclosure upon request. Most corporates do not have relevant online systems for GHG data gathering representing a bottleneck and opportunity for innovation. Therefore, what is essential is that there is a space for implementing science and engineering. For instance, the R&D can obtain new-generation internet technologies, IoT, AI, ML, robotics, 5G/6G connectivity, blockchain, and data processing. Such technology prospects find a place in the content of the decarbonisation plans.

The decarbonisation plan (DP) justifies the ambition of quantitative emission targets for many years broken down into milestones. It explains long-term decarbonisation options, offsets' role, and stakeholder impact. Global leaders and responsible enterprises direct their plans to the public (eBooks.com, 2018). The regulators usually do not prescribe any specific format or structure for the document. Modelling the DP is a focal point where innovation, creativity, science, engineering, and regulation can have a decisive impact on strategic plans. The DP development is more down to models, including digital twins, methods, and prognosis concerning technology switch, energy efficiency, offsetting, cybersecurity, and standards. The resilience and sustainability of the entire supply chain, risks and impacts on the planet, people, profit, and non-financial externalities the ESG-like are objective. Academia, universities, and experts can help beneficiaries to identify and translate options into action plans. The author argues that multi-model methodologies can give the best results for target setting and its cost. The Science Based Targets Initiative (SBTi) is a good service tool in a raw.

The G.E. Pukhov Institute for Modelling in Energy Engineering of the National Academy of Science of Ukraine launched research in studying, assessing and ensuring the resilience of critical infrastructures in the electricity and other sectors(2023c). For example, Ukraine joined the European energy system ENTSO-E on 16 March 2022, which led to new necessities. Resiliency requires an effective policy where the GHG inventory and strategic and middle-term net-zero plans should be scientifically proven. Selecting a priority between energy, climate, supply chain (Prazian, 2023), and security is not always easy for stakeholders. Thus, academia, universities, professional associations, and experts will have a decent scope of work. The beneficiaries and intermediaries seek scientific advisory for capacity building and technical assistance. Before moving closer to the financial stage, where the bankable projects are ready for use, the beneficiaries must arrange their own scientifically based targets and documents as it becomes mandatory(Bui, 2023) in the EU in 2024.

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