Resilience

A more holistic approach at the EBRD

PRODUCED BY
THE EBRD IMPACT DEPARTMENT

European Bank
for Reconstruction and Development

Impact Horizon

Knowledge update

An increasingly turbulent and uncertain world threatens to reverse the impact that development finance institutions have made on their countries of operation and slows progress towards the United Nations’ Sustainable Development Goals (SDGs). This fragile environment requires investors to adapt their strategies in order to generate lasting impact.

Many proposed solutions refer to the concept of resilience. While important in theory, the concept often remains elusive in practice, and investors regularly fail to go beyond the overall ambition for an improved capacity to alleviate such a crisis environment.

This *Impact Horizon* note reflects on institutional shortcomings and discusses gaps between the EBRD’s current approach to enhancing resilience and the latest academic thinking. It also highlights that formal definitions of resilience are not limited to certain economic sectors and argues in favour of adopting a risk-based definition of resilience. Further, it presents how science conceptualises resilience holistically by appreciating its analytical dimensions, the need for adequate resilience metrics and the value of concepts such as biosphere stewardship – that is, a new business logic with the purpose of shepherding and safeguarding the resilience of the biosphere for human well-being.

Background

Development finance institutions and other impact investors seek to make the largest possible impact over time. To do this they need to consider how they will reach their impact targets and prevent previously achieved impact from being lost. Many impact measurement systems capture the latter notion of preventing impact reversals through the concept of resilience.

Originating from its Latin roots meaning "to spring back" or "to rebound", resilience describes the capacity to live and develop within the context of change and uncertainty.[1]

Resilience as an explicit goal for economic policy has gained significant prominence in light of the financial crisis of 2008. And greater awareness of the climate challenge over past decades has similarly brought resilience into mainstream environmental debates in terms of the dynamics of social-ecological systems. Lastly, recent major crises, such as the Covid-19 pandemic and the war on Ukraine, have placed resilience at the top of the international development agenda.

These events have led to institutions each adapting their own strategies for generating and protecting impact in times of crisis but often resulted in siloed solutions on resilience without a common language.

Internally, international financial institutions (IFIs) tend to limit their formal approaches to resilience under the umbrella of sustainability. While the EBRD has embedded financial stability and energy sector resilience into its "resilient" transition quality,[2] climate resilience remains within the "green" transition quality, and tailored resilience approaches to the Covid-19 pandemic or war on Ukraine are found through dedicated frameworks and so lack a proper conceptual grounding in a theory of change on resilience altogether.

Other IFIs similarly limit their formal approaches to resilience within the context of sustainability, while using the rhetoric of resilience more broadly across sectors (for example climate-smart and resilient agriculture) but a coherent approach on how to foster resilience through private sector development is missing across all IFIs.

Given this fragmented landscape, there are considerable benefits of streamlining different areas of resilience-thinking into a coherent approach that is in line with the latest academic literature. As well as reversing this piecemeal approach to resilience, the push towards resilience-thinking is increasingly important for generating impact in a poly-crisis environment. Significant human impact on the Earth's geology and ecosystems in the Anthropocene is a major driver of change. Megatrends, such as rapid technological innovation, new demographic and urbanisation patterns, or the changing geopolitical order act as accelerators. Impact strategies focusing too much on static efficiency perform less well in such a turbulent and uncertain world. Therefore, IFIs must adapt their approaches to generating impact accordingly and put more emphasis on resilience-enhancing activities.

The complex, dynamic and cross-cutting nature of resilience has, however, proven difficult for development practitioners to implement through institutional frameworks. For instance, in times of abrupt change during war or a major health crisis, IFIs often struggle to shift from growing markets to sustaining them and understanding the differential impact of their activities. While resilience is a prominent topic in the grey literature and in publications on natural disasters and climate change, a consolidated academic literature on the economics of resilience is still emerging.[3] In turn, international organisations, such as the United Nations Office for Disaster Risk Reduction (UNDRR) or the Global Facility for Disaster Reduction and Recovery (GFDRR) at the World Bank, are leading voices on resilience. The Global Resilience Partnership and the Stockholm Resilience Centre are key actors in the global science-policy area.

1 See J. Rockström et al.
2 See Annex 1 for more details on the current EBRD approach to resilience.
3 For emerging thinking, see C.Z. Li et al. or V.Galaz Rodriguez et al.

Various sources, ranging from basic research to more practical discussions, agree that taking resilience into account is crucial for creating a lasting impact, rather than just being a theoretical concept. Increasingly the literature can quantify how much it pays to invest in reducing the risks posed by disasters and fragility. The UNDRR estimates that every US$ 1 spent doing this can save US$ 15 in post-disaster recovery costs, while every US$ 1 invested in making infrastructure disaster-resilient saves US$ 4 that would otherwise have to be spent rebuilding. With respect to cost-effectiveness of enhancing resilience in individual corporates, evidence for firm-level resilience tactics suggests that, on average, firms avoided US$ 4.57 in business interruptions for every US$ 1 spent on resilience.[4]

The EBRD Impact department appreciates the need to better leverage resilience-thinking to create lasting impact. Accordingly, this Impact Horizon note describes two areas where the EBRD's current understanding and approach to resilience differs from that of the academic literature:

- **Narrow:** Current EBRD impact guidance considers only financial and energy sector resilience and does not use a broad definition of resilience across sectors. Other IFIs also have this limitation and often cannot conceptually integrate their various activities towards economic resilience with activities towards ecological resilience. Further, measuring resilience impact based on oversimplified project-level proxy indicators currently fails to capture the actual systemic effects of fostering resilience and may lead to wrong incentives. Assessing complex social-ecological interactions cannot exclusively rely on ex-ante impact assessments and light-touch monitoring.
- **Reactionary:** Many EBRD activities only refer to resilience when reacting to crises and equate resilience with good recovery. This often results in ad hoc responses, a backward-looking approach to resilience and a focus on well-known or already materialised negative events. Systematic guidance on how to prepare for crises and navigate through an ongoing crisis is missing.

[4] See N.C. Dormady et al.

1. Understanding resilience as a cross-cutting theme

The Bank's current approach to resilience only narrowly considers financial system and energy sector resilience. These are undoubtedly dimensions of the economy where resilience is important and empirically justified. However, the explicit focus on finance and energy has reduced institutional flexibility to adopt resilience-thinking more broadly. In fact, the concept of resilience is not restricted to certain subsets of the economy or the development process at large. Instead, the literature suggests that resilience can be desirable in all kinds of social-ecological systems, which are not necessarily confined by traditional sector boundaries.

As with other high-level analytical concepts, such as efficiency or social equity, resilience derives from a basic definition that requires complementary definitions of its various dimensions to then be applied in practice. While abstract in nature, a basic definition of resilience is a necessary starting point for a coherent institutional approach. Without first agreeing on what resilience means, it is impossible to work together towards achieving it as an impact goal. At the same time, banking departments need concrete guidance on how to apply the theoretical insights to their respective geographic and sectoral areas of expertise. This requires comprehensive theories of change (TOCs) for the Bank's "resilience" transition quality.

Resilience is a contested concept;[5] **the academic literature does not agree on a single unified definition of resilience but features many different ones.**[6] One question to ask would be how the literature relates resilience to the notion of risk, as both concepts arguably look at system performance during uncertainty. While parts of the literature try to delineate these concepts in terms of analysing performance before or after an event, this seems unnecessarily complicated and potentially leads to inconsistencies.[7]

Instead, work by Logan et al[8] **offers a simple but flexible solution to the challenge of defining resilience.** The authors propose integrating efforts to analyse resilience with the existing methodology and terminology of modern risk science.[9] Instead of defining resilience as an ability or set of abilities, this approach defines it directly as the risk to the system:

"The [un] resilience of a system is the risk of [not] achieving desired functionality, during a specific time, following an event.

This definition also has the corollary that:

"A system is judged resilient if the risk of not achieving the desired functionality is sufficiently low."

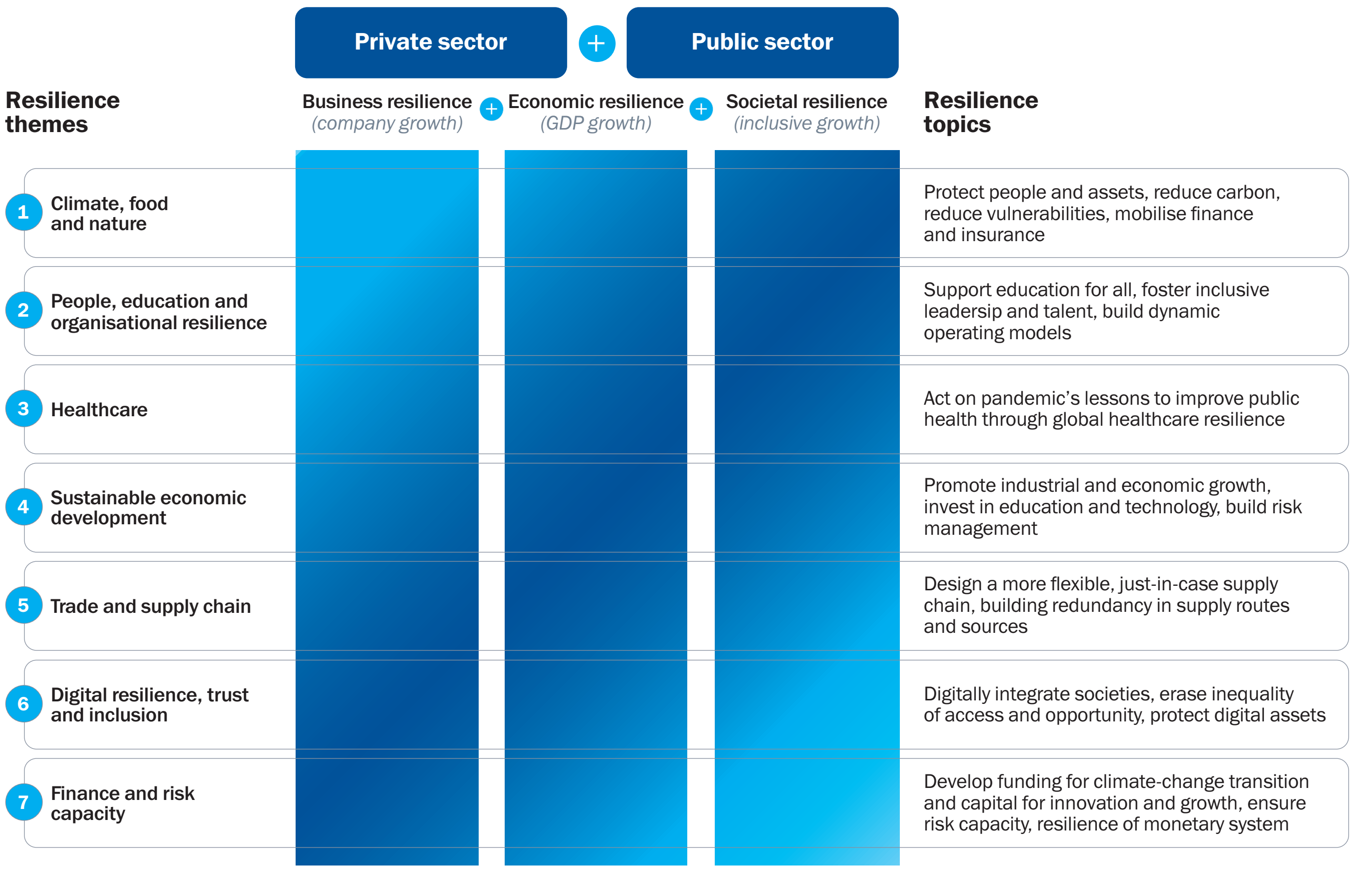
This corollary is consistent with the approach in safety science that defines a system as safe when the risk is acceptable. This way, resilience can be described (either qualitatively or quantitatively) in terms of our belief – for example, expressed in terms of a subjective/knowledge-based probability, combined with a judgement of the strength of the knowledge supporting its assessment – about whether the system will maintain or achieve desired functionality in the face of shocks and stresses. It is important to consider in this context that a measure for a concept is not necessarily its definition. For example, as science and computational ability evolve so too does our ability to measure complexity.

5 See W.B. Gallie
6 See Annex 2 for an overview.
7 See T. Aven (2022).
8 See T.M. Logan et al.
9 Risk science has advanced substantially since the 1920s when Knight described risk as "measurable uncertainty" and even more so from the 1700s when it was first defined as expected loss. If such views are adopted, risk would be unsuitable for contexts including the Covid-19 pandemic, terrorism or climate change where uncertainty is inherent. However, the contemporary view of risk is more holistic and embraces uncertainty as a necessary consideration. Logan et al. adopt the most general definition of risk to integrate it with the concept of resilience.

While having an agreed basic definition of resilience is crucial for aligning institutional strategy and assessment, there is also a need to translate it into sector-specific TOCs that help to apply it in practice. Recent work by the Resilience Consortium,[10] under the leadership of the World Economic Forum, illustrates how broadly resilience applies across the global development agenda and provides a valuable reference point for thinking about resilience on the global agenda. Its main contributions have been two white papers, which identify the key global resilience themes,[11] establish a comprehensive resilience framework[12] for the private and public sectors, and illustrate how the resilience nexus connects many different themes (see Figure 1 and Annex 4 and 5).

Similarly, the UN Global Assessment Report on Disaster Risk Reduction measuring resilience for the SDGs highlights the need for a nexus approach to resilience, as relevant metrics may link to several SDGs.[13] Forthcoming work on developing resilience TOCs for the Bank should establish coherence between the basic definition of resilience, various resilience themes and the associated resilience actions with respective indicators.

Figure 1: The cross-cutting nature of resilience



Source: Resilience Consortium (2022).

[10] The Resilience Consortium launched at the WEF Annual Meeting in 2022. It is a catalyst for coordinating public and private sector efforts to build and strengthen resilience. Leading organisations have joined the consortium steering committee, which receives support from the World Economic Forum and McKinsey & Company.
[11] World Economic Forum, 2022.
[12] World Economic Forum, 2023.
[13] United Nations Office for Disaster Risk Reduction, 2023.

2. Adopting a holistic resilience approach to go beyond quick recovery

In addition to broadly applying resilience across different development themes, the academic literature also characterises the concept of resilience more holistically than the EBRD currently does. This in turn enables a much more nuanced analysis of the different dimensions and dynamics involved in establishing resilience. Ultimately, such an improved conceptual understanding of resilience would translate into better design and performance of EBRD activities with respect to enhancing resilience. The following sub-sections discuss how an appreciation of the analytical dimensions of resilience, better resilience metrics and resilience-thinking for general resilience and biosphere stewardship can contribute to this objective.

2.1. Analytical dimensions of resilient systems

Defining resilience in terms of the risk of systemic failure provides the appropriate flexibility to apply it across different sectors, but in practice often requires complementary concepts to make resilience operationally relevant. Grafton et al.[14] provide a helpful heuristic on how to apply resilience in decision-making. Their framework breaks down the concept of resilience into the three components of robustness, resistance and recovery time. A system is more resilient to the extent that adverse events affect its performance to a lesser degree and for a shorter period. They define these "three Rs" in the following way:

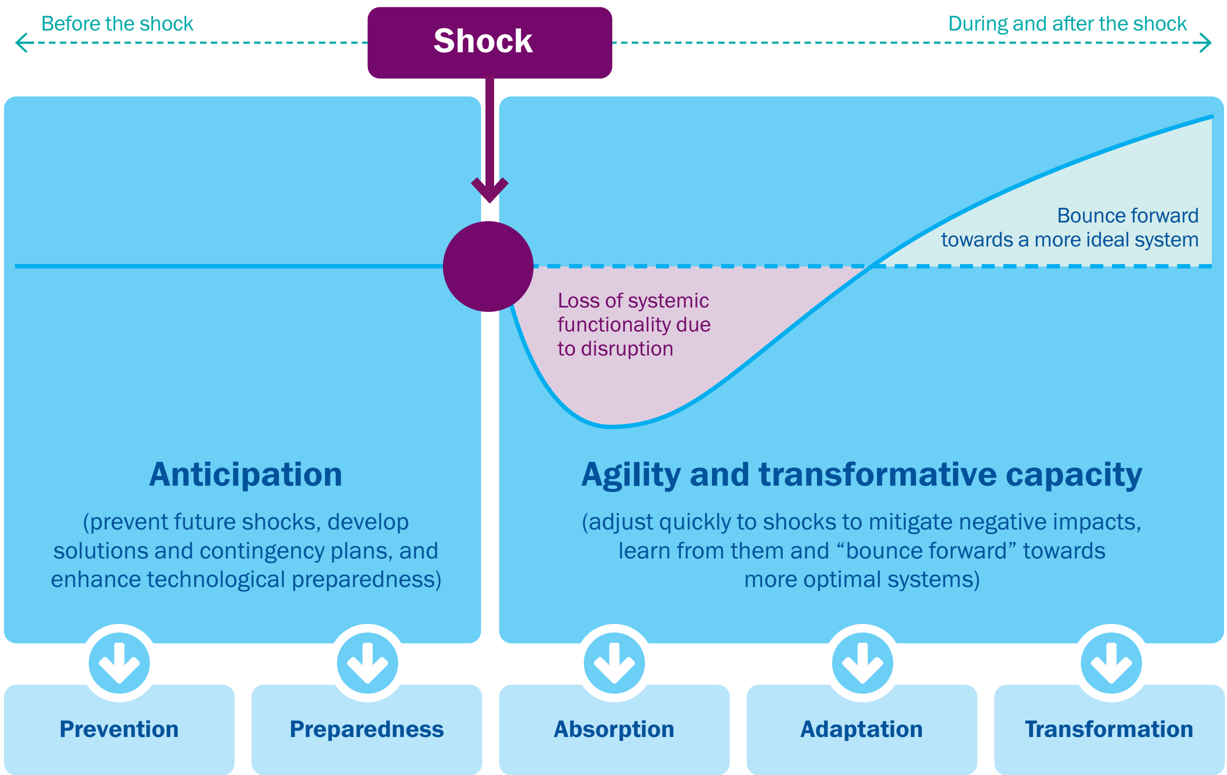
- **Resistance:** in general, a system's ability to actively change while retaining its identity or to passively maintain system performance following one or more adverse events.
- **Recovery time:** the time it takes a system's performance to recover to a desired functionality or viability following one or more adverse events. The relative loss in performance, which IFIs may think of as an impact reversal, is a function of "resistance" and "recovery time".
- **Robustness**: the probability of a system to maintain its identity and not cross an undesirable (possibly irreversible) threshold following one or more adverse events. Robustness refers to the probabilistic view of crossing an undesirable performance threshold. In addition to the relative loss in performance due to impact reversals, crossing an absolute performance threshold entails a disproportionate loss of impact. Such a tipping point has an outsized effect on the system and reinstating the original system identity is costly.

A common way to further break down the three Rs is through different chronological stages of resilience in terms of planning, absorbing, recovering and adapting. These stages closely map the three resilience capacities popularised in Béné (2012)[15] of:
(i) absorptive coping capacity to increase resistance
(ii) adaptive capacity for incremental adjustments
(iii) transformative capacity for transformational responses.

These capacities fall on a spectrum in terms of the required intensity of change in the system. In turn, more stable or more flexible solutions are likely to be associated with different transaction costs. Again, a schematic representation can illustrate the different conceptual stages of resilience. Figure 2, adapted from Paunov and Planes-Satorra (2021),[16] relates these stages to the aim of minimising the loss in relative performance as described earlier.

[14] R.Q. Grafton et al (2019).
[15] C. Béné et al (2012).
[16] C. Paunov and S. Planes-Satorra (2021).

Figure 2: Stylised stages of resilience over time



Source: Paunov and Planes-Satorra (2021)

Figure 2 illustrates the objective function for achieving a resilient system. The dual goal of resilience-enhancing activities is to minimise the loss of system functionality due to disruption while also maximising the bounce forward towards a more ideal system. The resistance and recovery time determine the expected loss of system performance shown in the red area. In turn, the dual goals can be linked to different priorities for investment or policy and the associated outcomes of prevention, preparedness, absorption, adaption and transformation.

Recent responses to major shocks, such as the EBRD's Covid Response Package, show how the stylised stages apply in practice. As with most institutions, the Bank did not anticipate a pandemic and, therefore, had few measures in place. While EBRD liquidity support absorbed the immediate negative effect for many clients, some of the required adaptation measures, such as the need for personal protective equipment, were beyond the Bank's reach. Opportunities for transformation, for example, towards more resilient supply chains, have not been fully explored. This oversimplified summary of the Covid-19 experience shows how the resilience framework helps to prioritise actions in different stages of a crisis.

2.2. Deriving better resilience metrics at the project level

The analytical dimensions of resilience are both dynamic and complex and so require an adequate approach to monitoring, evaluation and learning to maximise the impact of EBRD activities. Several conceptual and methodological hurdles are limiting efforts to improve the measurement of resilience.[17] Inadequate indicators risk doing more harm than good by setting wrong incentives for investment teams.[18] Some integrated frameworks in the literature include guidelines for resilience systems analysis by the Organisation for Economic Co-operation and Development (OECD),[19] a framework for measuring

[17] L.A. Jones et al (2021).
[18] S. Hallegatte and N.L. Engle (2019).
[19] OECD (2014).

market systems resilience by the US Agency for International Development (USAID),[20] or the resilience rating system methodology of the World Bank.[21] At the same time, organisations like the Global Resilience Partnership push for advancing the measurement of resilience.[22]

Attributing resilience-enhancing effects to EBRD projects requires a particularly strong grounding in evidence because of the inherent hypothetical counterfactual challenge. Finding or constructing a convincing counterfactual is a demanding exercise when assessing any Bank activity because doing so, ultimately, always rests on arguments of plausibility. There is no formal test to identify the correct counterfactual. For resilience-enhancing projects this challenge is even more pronounced, as the "factual scenario" within a five-year project horizon may not include the anticipated shock or systemic pressure. Faced with this hypothetical counterfactual challenge, resilience assessments rely on comparing a hypothetical response to an adverse event with the counterfactual response to such an event in the absence of the project. In these circumstances, theory-based assessments of resilience impact gain particular importance. A promising avenue for dealing with abstraction and data constraints in resilience assessments are comparative analyses.[23]

When measuring resilience, the first step for IFIs is to assess how their support in implementing resilience tactics affects their clients' business performance. This micro assessment of firm-level metrics is relatively tractable because they use feedback from a system as a proxy rather than assessing effects on system performance per se. Annex 3 provides an overview of corporate resilience tactics, such as excess capacity or import substitution, that underpin a corporate resilience strategy. Investing in these tactics could be an important way for IFIs to strengthen business resilience.

Three theoretical concepts are necessary to define operational resilience metrics.[24] The first concept involves the degree to which the implementation of a resilience tactic prevents or avoids business interruption losses. In other words, in the absence of a tactic's use, a firm's losses, as measured by output or sales revenue, would have been higher than that observed. This difference is known as *avoided losses*.

The second concept involves the degree of losses the firm would have observed in the absence of any tactics or explicit actions to improve resilience. This concept is known as *maximum potential losses*. Implicitly, maximum potential losses include the sum of both actual losses and losses avoided using one or more tactics – two salient constructs that can be readily instrumented into a survey.

The third concept involves the cost associated with implementing a tactic or suite of tactics. This is referred to simply as implementation cost or *tactic* cost, and note that some resilience tactics can be implemented at a cost saving.

From these three theoretical concepts, it is possible to build two operational resilience metrics for empirically measuring the effectiveness and cost-effectiveness of resilience tactics. The first metric is the benefit-cost ratio (BCR) for a given tactic, and is a function of the avoided losses and implementation cost, as given by:

$$BCR = \frac{AvoidedLosses}{TacticCosts}$$

It reads similarly to a marginal benefit where, for example, a BCR value of 3.1 would indicate that a firm avoided US$ 3.10 for every dollar spent on the resilience tactic. The second metric is an effectiveness, or impact metric, introduced by Rose (2007)[27] as the Resilience Metric (RM). It is given by:

$$RM = \frac{AvoidedLosses}{MaxPotentialLosses}$$

It reads on a percentage basis where, for example, an RM value of .075 would indicate that a firm avoided 7.5 per cent of its maximum potential losses using the resilience tactic.

[20] USAID (2019).
[21] World Bank Group (2021).
[22] Global Resilience Partnership (2022).
[23] See for example J. Rocha et al. (2022).
[24] N.C. Dormady et al. (2022).
[25] A. Rose (2007).

Where above standalone measures for the (cost-) effectiveness of the resilience intervention per se are impossible to quantify, it is advisable to use benchmarking indicators instead. These may include faster recovery times from a future or past adverse event with respect to a relevant firm performance metric. Likewise, less frequent failure or relatively less frequent subdued performance of the investee company can be useful indicators. As with any benchmarking exercise, an appropriate set of comparator firms is key for constructing a meaningful indicator.

Box 1: Examples of resilience benchmarking indicators

Targeted adverse event materialises before or during project

- **Better robustness:** less frequent performance "failure" of the investee company relative to relevant comparators.
- **Better resistance/absorption:** less frequent or less severe "subdued" performance of the investee company relative to relevant comparators.
- **Faster recovery:** faster recovery time to performance levels before the adverse event of the investee company relative to relevant comparators.
- **Enabled adaptation:** qualitative shift in operational model of the targeted system or investee company that leads to better performance and can be attributed to the project.

Targeted adverse event materialises (potentially) after project close

- **Theory-aligned actions:** Quantifiable implementation of resilience tactics in line with the best available evidence from the academic and grey literature, published case studies, or internal documentation of operational knowledge.

Due to the inherent complexity, individual indicators and linear targets can only be proxies for assessing the progress of resilience-enhancing projects. Reducing complexity to a manageable or tractable degree is an important tool for aligning projects with impact goals. Due to the resource-intensive nature of collecting data on complex systems, it would be desirable for IFIs to collaborate more extensively on resilience indicators.

2.3. Resilience-thinking for general resilience and biosphere stewardship

Fostering resilience by preparing for predictable negative events is important but preparing for the unknown is equally relevant. To define resilience in terms of how a system performs in response to a shock implies the need for careful analysis of which adverse events are likely to occur and understanding how a certain scenario will unfold. The use of foresight methods, as the EBRD Impact department is currently developing, can help to inform this type of *specified* resilience (see Annex 6). However, the nature and timing of many shocks and systemic pressures are unpredictable, which in turn calls for *general* resilience. Here, the focus shifts from potential adverse events to critical features of the social-ecological system itself and how to achieve optionality that allows adaptation, transformation and performance irrespective of the type of shock.

Resilience-thinking relies on a set of distinct principles to maintain system performance when gradual changes interact with abrupt changes. These include: fostering an understanding of social-ecological systems as complex adaptive systems; managing connectivity, slow variables and feedbacks; and encouraging learning and experimentation, broad participation and a polycentric governance system.[26] The literature also suggests that practitioners must consider associated trade-offs. For instance, these can arise between maintaining redundancies as buffers and aiming for efficient solutions to maximise business-as-usual performance.

To adopt resilience-thinking in practice, institutions need to bring firms together to co-develop resilience across sectors. Without such an intervention by IFIs, incentives to prioritise efficiency or a lack of awareness may prevent resilient systems emerging. The idea of biosphere stewardship is an example of how to translate the principles of resilience-thinking into practice.[27] This approach seeks to engage the private sector in environmental stewardship of critical planetary boundaries (please see Annex 7 for an overview). While not a new idea, novel approaches in terms of global companies in certain industries engaging in collaborative discussions to develop solutions before they become competitors has shown promising results. Beyond directly facilitating such collaboration, this approach can also inform the Bank's policy dialogue with governments.

[26] R. Biggs et al. (2012).
[27] H. Österblom et al. (2022).

A successful example of biosphere stewardship and collaboration between science and business is the Seafood Business for Ocean Stewardship (SeaBOS) initiative. The health of the ocean is under serious threat owing to human activity and so, to address the resulting lack of resilience, the SeaBOS initiative took three key steps:

- **First**, it identified "keystone actors" in marine ecosystems, namely, global corporations engaged in fisheries and aquaculture, that could influence change and take on a leadership role in ocean stewardship.
- **Second**, it engaged with these actors and collaboratively developed solutions to the challenge of ocean sustainability.
- **Third**, it led a coproduction process to establish a unique global ocean initiative, where science and business collaborate to meet the Sustainable Development Goals.[28]

The nine member companies represent over 19 per cent of the world's seafood production and, through more than 465 subsidiaries, have a significant effect on global fisheries.

The success of the SeaBOS initiative could act as a model for the EBRD, which could use its influence to bring clients and partners together to promote biosphere stewardship. In a first step, this could mean learning from the experience of the Stockholm Resilience Centre in facilitating SeaBOS and collaboratively identifying keystone actors in critical industries. In the medium term, IFIs can try to facilitate a regional initiative on resilience with, for instance, existing energy or financial institution clients following the SeaBOS model. This approach for promoting, facilitating and coordinating resilience action across clients would then expand into other sectors over time.

[28] H. Österblom et al. (2017).

3. Fostering systemic resilience

To adopt a more comprehensive and integrated approach to resilience, the Bank needs to develop in-depth knowledge products, develop promising opportunities in the pipeline and update its impact methodology. Respective guidance on how to systematically think about resilience impact in a social-ecological system must inform this evolution towards a new paradigm. Grafton et al.[29] provide a helpful heuristic on how to bring resilience into decision-making. As discussed earlier, their framework breaks down the concept of resilience into the three components of robustness, resistance and recovery time. The following seven steps in relation to a social-ecological system (and its boundaries) provide a useful starting point for assessing resilience-enhancing projects:

1. Resilience of what **objects** (system, system component or interaction) does the project intend to improve?
2. For which **stakeholders** does the project improve resilience?
3. What are the relevant **metrics** of system performance for the identified stakeholders?
4. What are the viability (or safety) **goals** of the stakeholders (and associated metrics) for key system variables that allow a system to retain its identity?
5. What **adverse events or causes** in relation to resilience does the project design consider?
6. How does the project's **M&E approach** measure resistance, recovery and robustness in relation to system performance and in response to adverse events?
7. What are the expected **net benefits,** currently and over time and space, of the anticipated improvement in resilience?

Beyond using individual projects as anchors for assessments, the EBRD also tracks resilience data through its assessments of transition qualities (ATQs) at the country level. While currently restricted to the financial and energy sectors, these macro indicators play an important role in complementing project-level data. The Resilience Index of the Islamic Development Bank[30] is a robust benchmark for developing a more holistic country-level framework. The Index includes the concepts of environmental pressures and natural disasters, health crises and pandemics, economic challenges and livelihood disruptions, human security challenges and forced displacement. At the same time, its nexus approach to resilience and fragility highlights the need for clear definitions of these concepts to delineate or integrate institutional impact strategies accordingly.

The resilience literature also considers increasingly more non-traditional data sources to measure resilience in relevant complex systems that do not align with geographical boundaries. For example, geospatial information holds promise for assessing ecosystems or biodiversity effects at scale and should be explored with respective data providers. While ex ante and real-time assessments of a project's impact on resilience is essential for institutional decision-making, complexity and resource constraints limit the level of understanding feasible during the project cycle. Therefore, thematic assessments of relevant project clusters are essential for generating knowledge on resilience and closing the learning loop at the Bank.

[29] R.Q. Grafton et al. (2019).

Annex 1
Current "resilient" transition quality

At the EBRD, the aim of fostering resilience is formally implemented through the respective transition quality. The Bank's independent Evaluation Department summarises the current approach as follows:

"The Transition Concept Review (BDS16-181) broadly defines resilience as '… a resilient market economy is about the ability of markets and market-supporting institutions to resist shocks, about policy predictability and about balance and sustainability in financial and economic structures. Resilience objectives would be most commonly associated with the nature, conduct and structure of financial systems, but also with economic diversification as well as with food and energy security considerations.'

This broad conceptual definition has been translated into two very specific operational components: financial stability (resilience in the financial sector relates to the health and stability of the banking systems); and energy sector resilience (resilience in the energy sector relates to the availability of the requisite market structures and institutions to provide reliable and transparent energy price signals).

There is no documentation available explaining how the concept of resilience as defined was translated (by EPG [the Bank's Economics, Policy and Governance department]) into these two components. Nor is there any documentation showing how these two components were further translated (by CSRM [Country Strategy Coordination and Results Management]) into the specific transition objectives shown. Intended to be useful at the country level they are not well aligned with either the conceptual definition or the sub-set of operational definitions. Yet, the question on how the country-level objectives, standardised transition objectives drawn from the Compendium, contribute to improving the components of Resilience remains to be answered; there is no logical link between country-level objectives and the components of transition qualities."

How the EBRD defines its "resilient" transition quality

The EBRD's definition has two prongs. The first concerns financial stability:

"A resilient market economy is one that develops an efficient financial sector and system of infrastructure that support growth while avoiding excessive volatility, supply disruptions and lasting economic reversals."

The second concerns the energy sector:

"Resilience in the energy sector relates to the availability of the requisite market structures and institutions to provide reliable and transparent energy price signals to which private investors can respond by building the right type of infrastructure at the right time and in the right place."

Annex 2

A sample of resilience definitions from the literature

Table A2.1 A sample of resilience definitions from the literature

Author (year)	**Definition**
Holling (1973)	A measure of the persistence of systems and of their ability to absorb change and disturbance and still maintain the same relationships between populations or state variables.
Pimm (1984)	How fast a variable that has been displaced from equilibrium returns to it. Population resilience is the rate at which populations recover their former densities.
Mileti (1999)	A disaster-resilient community can withstand an extreme natural event with a tolerable level of losses and take mitigation actions consistent with achieving that level of protection.
Adger (2000)	Social resilience is the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change.
Bruneau et al. (2003)	The ability of social units to mitigate hazards, contain the effects of disasters when they occur and carry out recovery activities in ways that minimize social disruption and mitigate the effects of future earthquakes. Specifically, a resilient system should demonstrate three characteristics: reduced failure probabilities, reduced consequences from failure and reduced time to recovery.
Turner et al. (2003)	The system's capacities to cope or respond.
Walker et al. (2004)	The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks.
Manyena (2006)	The intrinsic capacity of a system, community or society predisposed to a shock or stress to adapt and survive by changing its non-essential attributes and rebuilding itself.
Berkes (2007)	The capacity of a system to absorb recurrent disturbances, such as natural disasters, so as to retain essential structures, processes and feedbacks.
Cutter et al. (2008)	Resilience is the ability of a social system to respond and recover from disasters and includes the conditions that allow the system to absorb impacts, cope and adapt.
Lamond and Proverbs (2009)	Urban resilience encompasses the idea that towns and cities should be able to recover quickly from major and minor disasters.
Cimellaro et al. (2010)	Resilience is defined as a function indicating the capability to sustain a level of functionality or performance for a given building, bridge, lifeline networks or community over a period defined as the control time that is usually decided by the owners, or society.
Turner et al. (2010)	Resilience is the amount of disturbance a system can absorb and still remain within the same state or domain of attraction.
Béné et al. (2012)	Resilience emerges as the result not of one but all of these three capacities: absorptive, adaptive and transformative capacities, each of them leading to different outcomes: persistence, incremental adjustment, or transformational responses.
National Research Council (2012)	The ability to anticipate, prepare for and adapt to changing conditions and withstand, respond to and recover rapidly from disruptions.
IPCC (2012)	The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner.
Barrett and Constas (2014)	Development resilience is the capacity over time of a person, household or other aggregate unit to avoid poverty in the face of various stressors and in the wake of myriad shocks. If, and only if, that capacity is and remains high over time, then the unit is resilient.
Saunders and Becker (2015)	Resilience is the ability to adapt to the demands, challenges and changes encountered during and after a disaster.
Tendall et al. (2015)	The capacity over time of a food system and its units at multiple levels to provide sufficient, appropriate and accessible food to all in the face of various and even unforeseen disturbances.

Annex 2

A sample of resilience definitions from the literature

Table A2.1 A sample of resilience definitions from the literature

Author (year)	**Definition**
Folke (2016)	Resilience as persistence, adaptability and transformability of complex adaptive social-ecological systems is the focus, clarifying the dynamic and forward-looking nature of the concept.
Meerow et al. (2016)	Urban resilience refers to the ability of an urban system … to maintain or rapidly return to desired functions in the face of a disturbance, to adapt to change and to quickly transform systems that limit current or future adaptive capacity.
Platt et al. (2016)	Resilience is the speed of recovery.
Cutter (2016)	Creating resilience is about enhancing the ability of a system to anticipate, absorb or recover from a shock and to adapt successfully to such conditions so as to make the system better and more secure in the future.
Nan and Sansavini (2017)	The ability of a system to resist the effects of a disruptive force and to reduce performance deviation.
IPCC (2018)	The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation.
Linkov et al. (2018, 2019, 2020)	The ability to recover from and adapt to unexpected threats.
Walker (2020)	The ability to cope with shocks and to keep functioning in much the same kind of way…. the ability to adapt and change.

Source: Logan et al. (2022)

Annex 3

Different firm-level resilience tactics

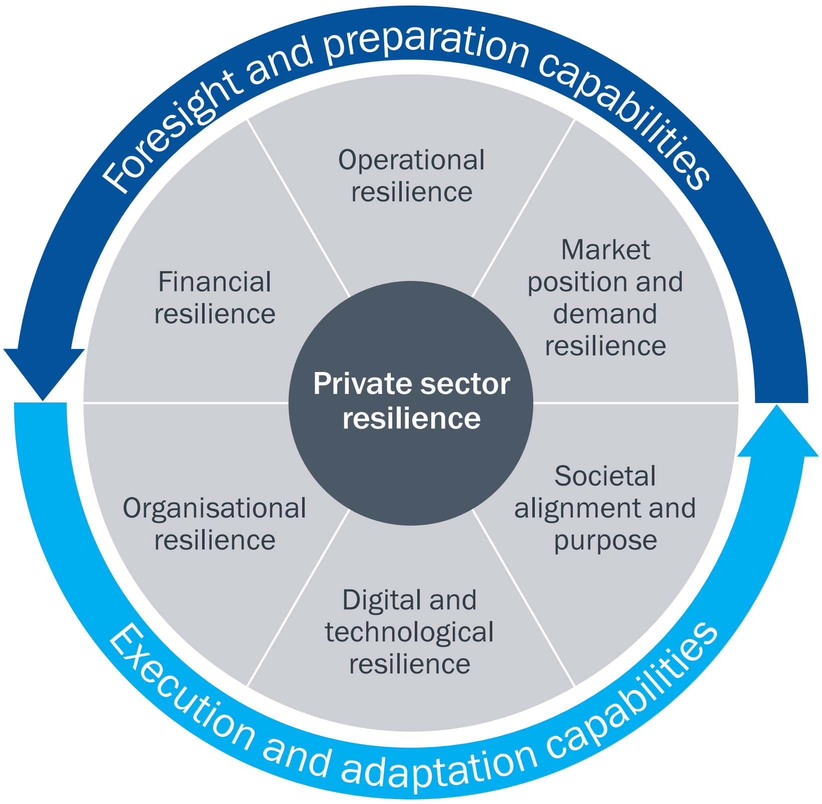
Table A3.1: Resilience tactics/actions and general definitions

Resilience Tactic	Definition (Activities Involved)	Related Terminology in Supply-Chain Literature
Conservation	Maintaining intended production or service levels using lower amounts of an input or inputs (e.g., achieving the same level of production using less water, electricity or workers, without substituting other inputs for them).	*Green Supply Chain* (Govindan et al., 2014); *Recoverable Manufacturing Systems* (Guide et al., 2000)
Resource Isolation	Modifying a portion of business operations to run without a critical input (e.g., following a disaster an office building could still be operational without water). This can include isolation before the event or extra effort to isolate it postevent.	*Flexible Production Processes* (Bode et al., 2011; Graves & Tomlin, 2003; Stecke & Kumar, 2009); *Segmentation* (Chopra & Sodhi, 2004)
Input Substitution	Replacing a production input in short supply with another (e.g., replacing electricity by natural gas, piped water with bottled or trucked water, whole milk with powdered milk, employees for tasks previously performed by machinery).	*Input Redundancy or Production Flexibility* (Martha & Vratimos, 2002; Chowdhury & Quaddus, 2017; Pettit et al., 2013; Sheffi, 2005; Tang, 2006)
Inventories	Continuing business operations even when a critical input is in short supply by using emergency stockpiles and ordinary working supplies of production inputs (e.g., water tanks, canned goods, stock-piled materials in general).	*Inventories or Strategic Stock* (Bode et al., 2011; Sheffi & Rice, 2005; Tang, 2006); Inventory Buffers (Kleindorfer & Saad, 2009; Lee, 2004; Liu et al., 2016)
Excess Capacity	Using plant or equipment that was idle before a disaster in place of a damaged plant and equipment (e.g., bringing online physical assets not previously in use; such assets might include computers, equipment, vehicles, and vacant buildings).	*Excess Capacity* (Chowdhury & Quaddus, 2015; 2017; Kleindorfer & Saad, 2009; Lee, 2004); *Flexible Supply Base* (Tang, 2006); *Organizational Slack* (Bourgeois, 1981); *Volume Flexibility* (Tomlin, 2006)
Relocation	Moving some or all of the business activity to a new location (either temporary or permanent), including shifting data from onsite to "cloud" storage.	*Relocation and Off-site Storage* (Knemeyer et al., 2009); *Production Rerouting* (Rose & Dormady, 2018; Tomlin, 2006)
Management Effectiveness	Improving business efficiency in the aftermath of a disaster (e.g., allowing for flexibility in business operations/procedures to minimize red tape during recovery, offering flexible working hours, minimizing reporting requirements or monitoring to facilitate more efficient or responsive operations).	*Efficient HR Management* (Coutu, 2002; Stecke & Kumar, 2009); *Increased Responsiveness* (Chopra & Sodhi, 2004); Revenue Management (Tang, 2006); *Operational Flexibility* (Melnyk et al., 2014); *Skill & Efficiency Development* (Chowdhury & Quaddus, 2015)
Import Substitution	Importing needed production inputs when not available from the usual local or regional suppliers, including new contractual arrangements (e.g., buying materials or supplies from other regions or countries).	*Multiple/Redundant Suppliers* (Kleindorfer & Saad, 2009; Knemeyer et al., 2009; Lee, 2004)
Technological Change	Improvising all or part of the production process without requiring a major investment expenditure (e.g., replacing two food preparation kitchens with one, replacing a paper accounting system with an automated one).	*Alternate Technology* (Gunasekaran et al., 2011; Pettit et al., 2013)
Production Recapture	Making up for lost production (not just selling inventories) by working overtime or extra shifts (e.g., adding an additional shift for employees or having them work additional overtime hours).	*Overtime or Double Shifts* (Sheffi & Rice, 2005); *Postponement* (Manuj & Mentzer, 2008; Tang, 2006)
Resource Pooling/ Sharing	Hastening recovery through mechanisms such as bargaining (e.g., renegotiating supply contracts), selective exchange of resources (short-term agreements for a defined period of time with other organizations, e.g., utilization of facilities in exchange for provision of any service or any other resource), creating new partnerships (e.g., building relationships with other businesses to share information and/or expertise) and joint ventures (e.g., to bid for public contracts).	*Buffering* (Bode et al., 2011; Meznar & Nigh, 1995); *New Alternative Sourcing Arrangements* (Lee & Wolfe, 2003; Tomlin, 2006); *Collaborative Information Exchange* (Chowdhury & Quaddus, 2017; Pettit et al., 2013); *Cooperation/Co-opetition Agreements/ Contracts* (Bakshi & Kleindorfer, 2009)

Source: Dormady et al. (2022).

Annex 4

Private sector resilience framework



Resilience capabilities

Foresight
- Information gathering and dashboard
- Scenario-planning
- Stress-testing

Preparation
- Risk-reduction conversation at the executive level
- Resilience agenda-setting based on scenario-planning

Disruption and crisis response
- Crisis response task force and mechanisms
- Long-term change programmes
- Communication capabilities
- Scalability of response

Strategic reorientation
- Ability to self-examine
- Mechanisms to implement learnings
- Dynamic strategy embedding
- Strategic adaptation capability

Resilience action areas

Financial resilience
- Access to capital
- Debt-to-liquidity
- Projected revenue

Operational resilience
- Ratio of offshore/ onshore in supply chain
- Time supply chain can function on domestic resources
- Ratio of domestic/ international workforce

Market position and demand resilience
- Alignment with consumer price sensitivity and preferences
- Time to market
- R&D/Capability spend yield
- Business model adaptability

Organisational resilience
- Agility of business units
- Access to talent
- Workforce churn rate
- Clarity of roles and responsibilities

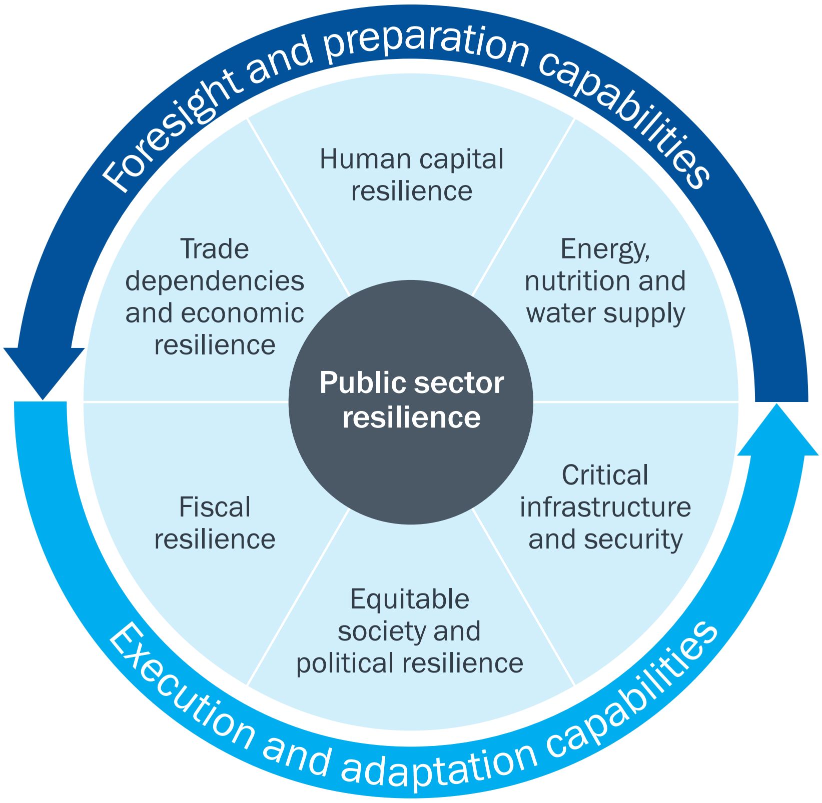
Digital and technological resilience
- Cybersecurity
- System coverage rate
- Fitness for purpose
- Malware scanning and security conformance
- Frequency and severity of outages
- Mean time to resolution

Societal alignment and purpose
- Stakeholder representation in governance
- ESG accreditation
- Employer inclusivity accreditation
- Workplace safety accreditation
- Living wage
- Brand perception

Source: McKinsey & Co.

Annex 5

Public sector resilience framework



Resilience capabilities

Foresight
- Information gathering and dashboard
- Scenario-planning
- Stress-testing

Preparation
- Cross-ministerial execution teams by resilience topic
- Policy agenda-setting based on scenario-planning

Disruption and crisis response
- Crisis response task force and mechanisms
- Long-term change programmes
- Communication capabilities
- Scalability of response

Strategic reorientation
- Ability to self-examine
- Mechanisms to implement learnings
- Dynamic strategy embedding
- Strategic adaptation capability

Resilience action areas

Trade dependencies and economic resilience

Macroeconomic stability
GDP and GDP growth
Inflation
Inequality index
Ease of doing business

Innovation
R&D spend yield
Patent rate

Human capital resilience

Education
Access to education
Completion rate of primary/ secondary education
Access to skilled domestic labour

Healthcare
Access to healthcare
Healthcare quality index
Healthcare affordability

Energy nutrition and water supply

Energy
Domestic energy production share
Diversified energy sources
Share of renewables
Transportation and infrastructure
Rail, road and airport connectivity
Mitigation for temperature and sea level change

Nutrition and water supply
Internal production of staple foods
Water security
Climate and environment
Carbon footprint
Resource availability
Performance against climate and nature commitments

Fiscal resilience
Fiscal
Debt-to-GDP ratio
Access to capital

Equitable society and political resilience

Societal inclusiveness
Quality of social support system, and social, gender and racial-ethnic inequalities

Geopolitical resilience
Human rights
Rule of law
Internal security
External defence

Public trust
Governmental transparency
Judiciary independence
Anti-corruption measure

Political stability
Uninterrupted availability of essential services
Quality of policy formulation

Critical infrastructure and security

Transportation infrastructure
Rail, road and airport connectivity

Infrastructure
Mitigation for temperature and sea level change

Source: McKinsey & Co.

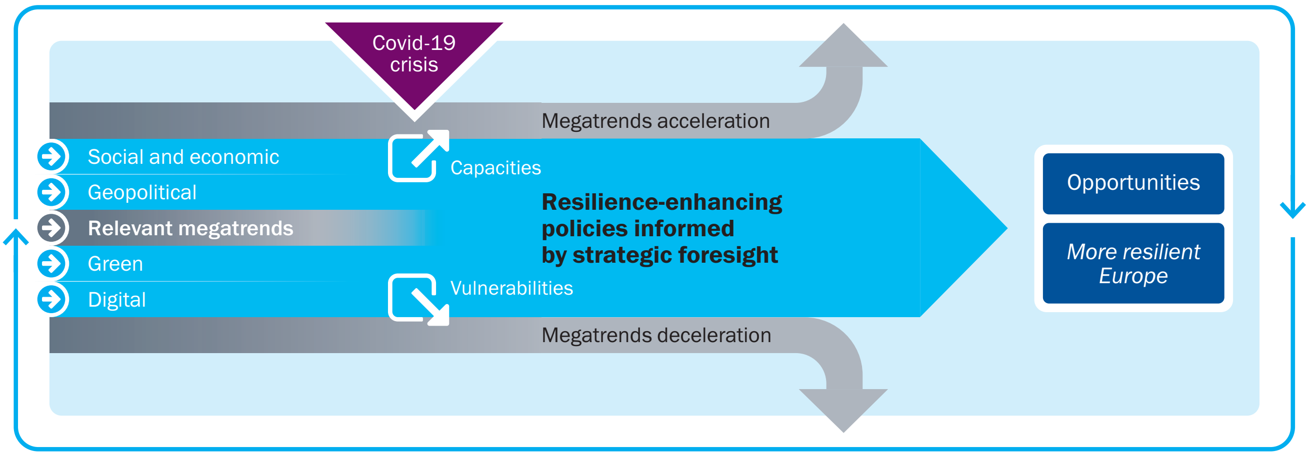
Annex 6
The strategic foresights methodology

For specified resilience, it is important to systemically consider evidence for future developments relevant for key social-ecological systems. This may at times involve a data-driven approach of assessing the changing likelihood of extreme weather events. Moreover, an interdisciplinary understanding of geo-political risks and respective implications for the economies where the Bank operates is key to preparing projects that enhance specified resilience. Likewise, ongoing megatrends and emerging technological innovations carry important information on how to achieve resilience. The literature on strategic foresights presents a comprehensive methodology to systematically think about different future scenarios and detect weaknesses early on.

Foresight is a systematic participatory process, creating collective intelligence about the medium- to long-term future. It aims to inform present-day decisions and mobilise joint action. Building on decades of experience shaping the field, Sardar and Masood defined foresight as "the art of anticipation based on the science of exploration".[31] Foresight helps us to understand the possible consequences of current trends, to detect new signals of change and to determine their potential developments. It facilitates the development of systemic understanding and generates plausible and coherent pictures of the future ranging from alternative scenarios (normative or exploratory) to vision-building. Foresight also helps us to understand both incremental and disruptive changes.

The European Union (EU)'s ambition to embed strategic foresight into its policymaking and combine it with resilience as a new compass for EU policies exemplifies the complementarities between these concepts.[32] The EU approach analyses resilience across the four dimensions of social and economic, geopolitical, green and digital. The approach then adds value by mapping capacities, vulnerabilities and opportunities to each of these megatrends. Strategically analysing the future by methods such as horizon-scanning is not about making detailed predictions but serves as a systematic approach to identifying likely adverse events. Figure A6.1 illustrates the link between strategic foresight and resilience in light of the Covid-19 pandemic and with a regional focus on Europe. A similar approach could be adapted to inform the EBRD's strategic decisions. The *UNDP Foresights Manual* provides further reading on the strategic foresights methodology.[33]

Figure A6.1: Strategic foresights in the EU



Source: European Commission (2020).

[31] Störmer et al. (2020).
[32] European Commission (2020).
[33] UNDP Global Centre for Public Service Excellence (2018).

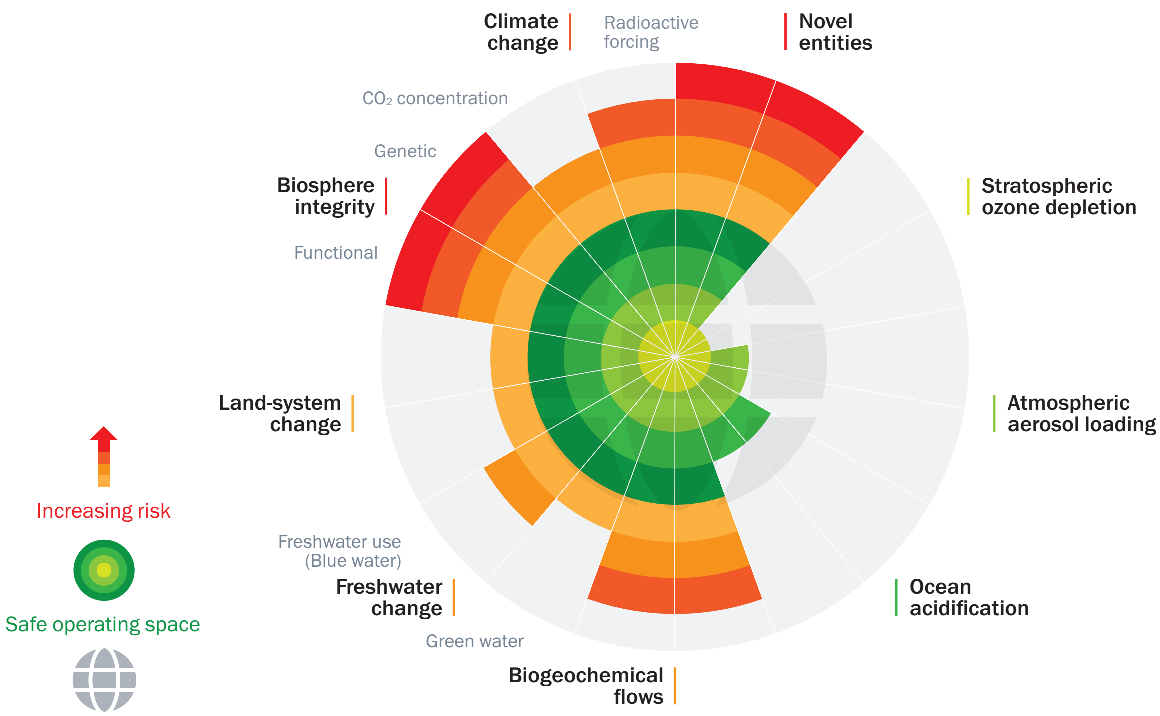
Annex 7

The biosphere subsidy, planetary boundaries and managing aggravation risks

Earth's biosphere – its extraordinary and complex web of species and ecosystems on land and in the oceans – drives the life-sustaining cycles of water and other materials that enable all life on Earth to thrive. The biosphere is also a principal driver of immense negative feedback loops in the Earth's system that stabilise atmospheric CO_2 concentrations and thereby global climate, including carbon sequestration by vegetation, soils and the oceans. Ocean and land ecosystems remove around 50 per cent of anthropogenic CO_2 emissions from the atmosphere each year,[34] an extraordinary biophysical feat, given that these emissions have risen from approximately 4 gigatonnes of carbon per year in 1960 to around 11 gigatonnes per year today. Put another way, half of our "climate debt" is removed, for free, by the biosphere every year – a vast subsidy to the world economy.[35]

Breaching planetary boundaries endangers this enormous ecosystem service.[36] Richardson et al. (2023)[23] find in their planetary boundaries framework (see Figure A7.1) that six of the nine boundaries are transgressed, suggesting that Earth is now well outside of the safe operating space for humanity. This dynamic causes severe aggravation risks across all sectors.[38] These are externalities created by one industry that contribute to large-scale environmental change which then affects the sector itself, and multiple other sectors across short and longer timescales. A key motivation for biosphere stewards is facilitating and coordinating private sector action to reduce such aggravation risks.

Figure A7.1: The planetary boundaries framework



Source: Richardson et al. (2023).

[34] P. Friedlingstein et al. (2020).
[35] J. Rockström et al. (2021).
[36] M. Nyström et al. (2019).
[37] K. Richardson et al. (2023).
[38] B. Crona et al. (2021).

References

J. Rockström, A.V. Norström, N. Matthews, R. Biggs, C. Folke, A. Harikishun, S. Huq, N. Krishnan, L. Warszawski and D. Nel (2023), “Shaping a resilient future in response to Covid-19”, *Nature Sustainability*, pp.1-11.

T. Aven (2022), “On some foundational issues concerning the relationship between risk and resilience”, *Risk Analysis*, 42(9), pp.2062-2074.

C. Béné, R.G. Wood, A. Newsham and M. Davies (2012), “Resilience: new utopia or new tyranny? Reflection about the potentials and limits of the concept of resilience in relation to vulnerability reduction programmes”, IDS Working Papers, 2012(405), pp.1-61.

R. Biggs, M. Schlüter, D. Biggs, E.L. Bohensky, S. BurnSilver, G. Cundill, V. Dakos, T.M. Daw, L.S. Evans, K. Kotschy and A.M. Leitch (2012), “Toward principles for enhancing the resilience of ecosystem services”, *Annual review of Environment and Resources*, 37, pp.421-448.

B. Crona, C. Folke and V. Galaz (2021), “The Anthropocene reality of financial risk”, *One Earth*, 4(5), pp.618-628.

N.C. Dormady, A. Rose, A. Roa-Henriquez and C.B. Morin (2022), “The cost-effectiveness of economic resilience”, *International Journal of Production Economics*, 244, p.108371.

European Commission (2020), *Strategic Foresight Report - Charting the course towards a more resilient Europe*. Available at: https://commission.europa.eu/system/files/2021-04/strategic_foresight_report_2020_1_0.pdf (last accessed 20 August 2024).

P. Friedlingstein, M. O'Sullivan, M.W. Jones, R.M. Andrew, J. Hauck, A. Olsen, G.P. Peters, W. Peters, J. Pongratz, S. Sitch and C. Le Quéré (2020), Global Carbon Budget 2020, Earth System Science Data, 12, 3269–3340.

V. Galaz Rodriguez and D. Collste (2022), *Economy and Finance for a Just Future on a Thriving Planet*, Stockholm University. Report. Available at https://doi.org/10.17045/sthlmuni.19792957.v1 (last accessed 20 August 2024).

W.B. Gallie (1964), “Essentially Contested Concepts”, pp. 157–191 in *Philosophy and the Historical Understanding*, Chatto & Windus (London).

Global Resilience Partnership (2022), *Advancing resilience measurement consultation report*. Available at: advancing-resilience-measurement-consultation-report-1-1.pdf (globalresiliencepartnership.org), last accessed 20 August 2024.

R.Q. Grafton, L. Doyen, C. Béné, E. Borgomeo, K. Brooks, L. Chu, G.S. Cumming, J. Dixon, S. Dovers, D. Garrick and A. Helfgott (2019), “Realizing resilience for decision-making”, *Nature Sustainability*, 2(10), pp.907-913.

S. Hallegatte and N.L. Engle (2019), “The search for the perfect indicator: Reflections on monitoring and evaluation of resilience for improved climate risk management”, *Climate Risk Management*, 23, pp.1-6.

Islamic Development Bank (2022), *IsDB Resilience Report: Pandemic Recovery and Preparing for Future Shocks*. Available at: www.isdb.org/sites/default/files/media/documents/2022-06/IsDB%20RESILIENCE%20REPORT.pdf (last accessed 20 August 2024).

L.A. Jones, M. Constas, N. Matthews and S. Verkaart (2021), “Advancing resilience measurement”, *Nature Sustainability*, 4(4), pp.288-289.

C.Z. Li, A.S. Crépin and C. Folke (2018), *The economics of resilience. International Review of Environmental and Resource Economics*, 11(4), pp.309-353.

References

T.M. Logan, T. Aven, S.D. Guikema and R. Flage (2022), "Risk science offers an integrated approach to resilience", *Nature Sustainability*, 5(9), pp.741-748.

M. Nyström, J.B. Jouffray, A.V. Norström, B. Crona, P. Søgaard Jørgensen, S.R. Carpenter, Ö. Bodin, V. Galaz and C. Folke (2019), "Anatomy and resilience of the global production ecosystem", *Nature*, 575(7781), pp.98-108.

Organisation for Economic Co-operation and Development, OECD (2014), *Guidelines for resilience systems analysis*, OECD Publishing.

H. Österblom, J. Bebbington, R. Blasiak, M. Sobkowiak and C. Folke (2022), "Transnational corporations, biosphere stewardship, and sustainable futures", *Annual Review of Environment and Resources*, 47, pp.609-635.

H. Österblom, J.B. Jouffray, C. Folke and J. Rockström (2017), "Emergence of a global science-business initiative for ocean stewardship", *Proceedings of the National Academy of Sciences*, 114(34), pp.9038-9043.

C. Paunov and S. Planes-Satorra (2021), "What future for science, technology and innovation after COVID-19?", OECD Science, Technology and Industry Policy Papers, No. 107, OECD Publishing, Paris.

K. Richardson, W. Steffen, W. Lucht, J. Bendtsen, S.E. Cornell, J.F. Donges, M. Drüke, I. Fetzer, G. Bala, W. von Bloh and G. Feulner (2023), "Earth beyond six of nine planetary boundaries", *Science Advances*, 9(37)

J. Rocha, C. Lanyon and G. Peterson (2022), "Upscaling the resilience assessment through comparative analysis", *Global Environmental Change*, 72.

J. Rockström, T. Beringer, D. Hole, B. Griscom, M.B. Mascia, C. Folke and F. Creutzig (2021), "We need biosphere stewardship that protects carbon sinks and builds resilience", *Proceedings of the National Academy of Sciences*, 118(38).

A. Rose (2007), "Economic resilience to natural and man-made disasters: Multidisciplinary origins and contextual dimensions", *Environmental Hazards*, 7(4), pp.383-398.

E. Störmer, L. Bontoux, M. Krzysztofowicz, E. Florescu, A.K. Bock and F. Scapolo (2020), "Foresight–using science and evidence to anticipate and shape the future", in *Science for Policy Handbook* (pp. 128-142), Elsevier.

United Nations Development Programme Global Centre for Public Service Excellence (2018), *Foresights Manual: Empowered Futures for the 2030 Agenda*.

United Nations Office for Disaster Risk Reduction (2023), GAR Special Report: *Measuring Resilience for the Sustainable Development Goals*, Geneva.

United States Agency for International Development (2019), *Market Systems Resilience: A framework for measurement*.

World Bank Group (2021), *Resilience Rating System: A Methodology for Building and Tracking Resilience to Climate Change*, World Bank, Washington, DC.

World Economic Forum (2022), *Resilience for Sustainable Inclusive Growth*, White Paper in collaboration with McKinsey & Company. Available at: www3.weforum.org/docs/WEF_Resilience%20for_Sustainable_Inclusive_Growth_2022.pdf (last accessed 15 August 2024).

World Economic Forum (2023), *Seizing the Momentum to Build Resilience for a Future of Sustainable Inclusive Growth*, White Paper in collaboration with McKinsey & Company. Available at: www3.weforum.org/docs/WEF_Resilience_Consortium_2023.pdf (last accessed 15 August 2024).

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