



Climate-related Risk Radar for Georgian economic sectors and its possible application for the financial sector

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Table of contents

List of Acronyms	4
List of Figures and Tables	4
1. Climate Change and its Consequences for the Financial Sphere	5
2. Methodology of the Risk Radar for Climate-related Risks	8
3. Results from the Risk Radar for Georgian Economic Sectors	15
4. Application of Risk Radar - Heat Map for Georgian Financial Sector	18
References	19
Annex I: Overview of the Risk Radar for Georgian Economic Sectors	20
Annex II: Detailed Sector Assessments for the High-Risk Sectors	21
A Agriculture	21
A 1.2 Growing of perennial Crops	23
A 1.4 Animal Production	25
A 2 Forestry and Logging	27
C Manufacturing	29
D Electricity	31
E Water Supply, Sewerage, Waste Management and Remediation Activities	33
F Construction	35
H Transportation and Storage	37
L Real Estate Activities	39

List of Acronyms

EBA	European Banking Authority
ESG	Environmental, Social and Governance factors/risks
IPCC	The Intergovernmental Panel on Climate Change
NACE	Nomenclature statistique des activités économiques, the Statistical classification of economic activities in the European Community
SRI	Socially Responsible Investment
TI	Transitional Indicators

List of Figures and Tables

Figure 1: Context and Forms of Green Finance

Figure 2: An Overview over climate risks as part of ESG risks

Figure 3: Climate risks as Cross-Risks influencing other Risk-Categories

Figure 4: Proceeding of the assessment process with the Risk Radar

Figure 5: Modelling Transitional Intensity based on the concept of Socio-Economic Rationality

Figure 6: The Scoring System of the Risk Radar

Figure 7: The Risk Radar applied to the sector of Agriculture

Figure 8: Example of a Sector Profile

Figure 9: Sector Assessment with the Risk Radar (Part 1)

Figure 10: Sector Assessment with the Risk Radar (Part 2)

Figure 11: An Example of the Heat Map

1. Climate Change and its Consequences for the Financial Sphere

One of the most pressing problems the modern world faces today is climate change (World Economic Forum 2021). In most countries, the average annual temperature is rising in a massive and unprecedented manner (IPCC 2022). The serious consequences create risks that can be differentiated into acute (e.g., frequent and severe extreme weather events) and chronic (e.g., water scarceness, heat waves) physical climate risks, which cause major damage in various forms also for the country of Georgia (National Inventory Report 2021, World Bank Group and Asian Development Bank 2021).

It is clear from the outset, that due to the scope of the problems some lasting destruction is inevitable. Hence climate change adaptation is as important as mitigation. In both respects, due to its pivotal role within the society and its role in the origination of the problem, economy is the main focus. As a consequence, especially those sectors most affected by and most contributing to climate change need to be transformed in a consequent and timely manner. But for this transformation to succeed, financing is needed and hence financial institutions are essential.

However, from the perspective of financial institutions, the transformation also has a downside: With changing markets and framing conditions, new challenges and risks are arising, labelled as transition (climate) risks. Because in every transformation, there are those that profit and those that suffer. If individual entrepreneurs or companies face economic problems because they find themselves on the losing side of transformation, this could harm their abilities to pay back loans and hence will affect banks and MFI's as well. Therefore, both physical and transition risks will also affect the banks/ MFI 's. This requires Central banks to act in order to preserve financial stability, addressing both the requirement and the practical steps to implement the consideration of especially climate risk management in banks and financial institutions.

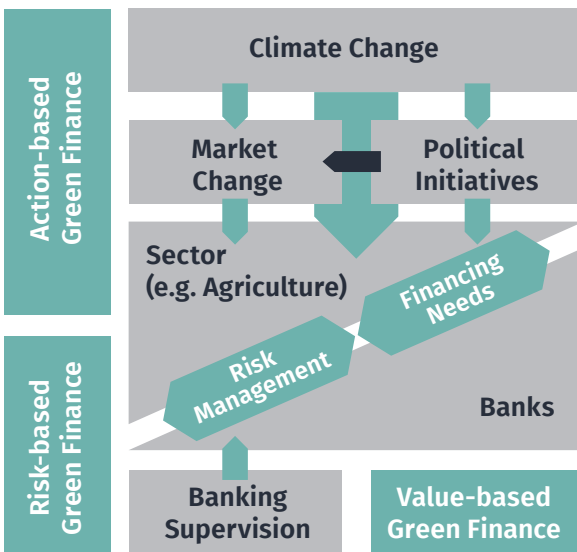


Figure 1: Context and Forms of Green Finance

The link between environmental aspects and financial decisions and instruments is usually labelled as “Green Finance” in a general way. However, as can be seen from the short introduction above, instead of a homogeneous concept there are in fact several distinctive and quite different forms of Green Finance which should be differentiated accordingly:

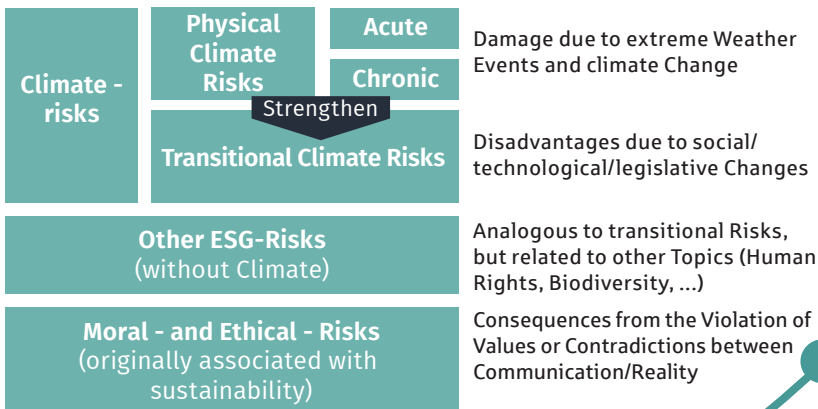
- The enabling and support of transformation via provision of the necessary funds with adequate measures and instruments can be summarized as action-based Green Finance.
- The protection of the stability of the economic and financial systems from the impact of climate risks can be labeled risk-based Green Finance.
- The concept of fairness, moral and ethics in business and the according consideration in the investment process (also often referred to as Socially Responsible Investment SRI) can be called value-based Green Finance.

While all three aspects are important, the third pillar currently has the least momentum – despite being the origin of the concept of Green Finance (Sparkes 2006). This is very different for the two others: As climate change is high on the political agenda (e.g., Ministry of Environmental Protection and Agriculture of Georgia 2021a and 2021b), it is often expected that the financial systems play their part in supporting the transformation process by channeling the funds and fostering the transformation towards a more sustainable economy. And the central banks place a strong focus on the management of ESG and especially climate risks as they know that banks and MFI ‘s are especially vulnerable to those as they are also affected by their client ‘s risks in addition to their own.

The acronym ESG is short for Environmental, Social and Governance aspects. These are developments and effects linked to the corresponding sphere and can have positive (ESG-opportunities) or negative (ESG risks) effects on the economy and the companies within (EBA 2021a, p. 22).

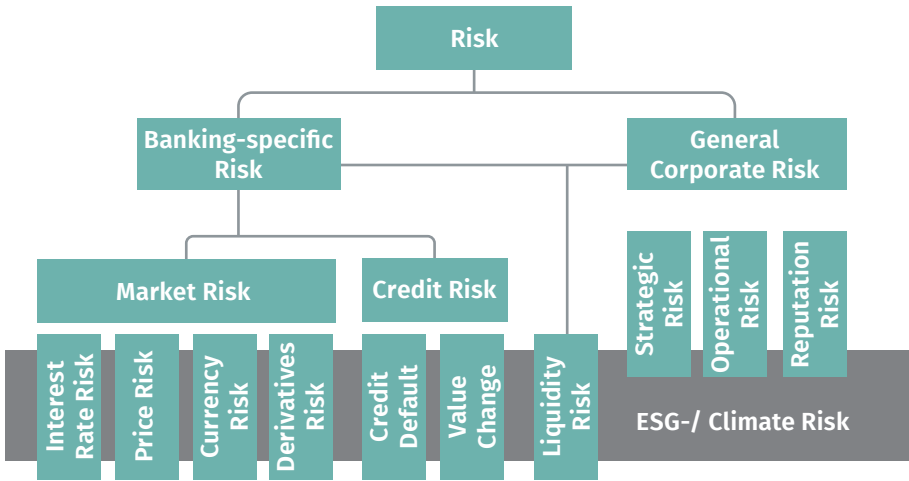
For the scope of this document, the emphasis is especially placed on climate risks, which form an important part of ESG-risks as can be seen in figure 2 below.

Figure 2: An Overview over climate risks as part of ESG risks



Within the System of Risk Management, climate risks do not constitute a new Risk-Category but rather function as Cross-Risks/ Lump Risks, strengthening other Risk Categories instead:

Figure 3: Climate risks as Cross-Risks influencing other Risk-Categories



From the outside-in perspective of the society, the message towards the financial institutions is clearly to embrace the transformation towards a sustainable economy and contribute in a responsible way. As so often, from an inside-out perspective the picture is less clear, as there are many economic considerations causing a conflict of interest both concerning the costs and efforts of implementation as well as the consequences of renouncing unsustainable but possibly profitable business opportunities.

While it is obvious that to ignore Green Finance would be irresponsible from many perspectives including – given the possible severe consequences of climate risks – the economic perspective, it is also not sensible to “dive into the implementation head over heels”. Hence, it is of paramount importance to implement the aspects of risk-based Green Finance, as it is both an economic necessity (protecting the financial institutes against the adverse effects of transformation) and a prerequisite for continuing financial stability.

2. Methodology of the Risk Radar for Climate-related Risks

In its practical application, for most banks the influence of climate risks on the credit risk is most relevant. In contrast, the availability of practitioners' instruments and especially the availability of data is very limited for the time being.

Concerning methodologies, in its discussion paper the EBA gives a short overview over the practical approaches to ESG risk management including climate risk management (EBA 2020, p. 68). While the Alignment Method and Risk Framework Method are both interesting and full of potential, they require data that is not yet widely available. Hence, the Exposure Method comes into focus. Here the EBA states: "The third approach is a tool that banks can apply directly to the assessment of individual clients and individual exposures [...] This can then be used to complement the standard assessment of financial risk categories. [...] This method can be described as the possibly most practical method and the most straight-forward to implement amongst the three approaches."

The Exposure Method is a scoring methodology that is applied to assess the relevant influence of risk relevant factors on the counterparty and to give an indication of the potentially harmful consequences on the banks (e.g., via credit defaults). It is in this context that the Risk Radar is presented as a proven tool that can be used as a pragmatic assessment of ESG risks. The tool has been implemented with very positive feedback in over 100 German savings banks and cooperative banks and is currently implemented with several international partners of German Sparkassenstiftung as well.

All scoring methodologies use one of two different approaches: A bottom-up approach would mean to collect relevant data from the client – as is common practice in credit risk management to assess the credit worthiness. However, as already stated above, in the context of ESG and climate risk assessment this would require information on part of the client which often is not available for the time being.

Hence, the Risk Radar is a scoring methodology that chooses the top-down approach: Using available data to assess the potential climate risk of a sector, the data problem at the loan-level is largely solved. After identifying and assessing the sector risk, only a few simple questions are needed to conclude from the industry level to the client/counterparty level.

At its core, managing risks means to identify and assess potential threats in order to understand them and consider them in an informed decision making. "But risk management is not, and will never be, a magic formula that will always give you the right answer. It is a way of thinking that will give you better answers to better questions and by doing so helps you to shift the odds in your favour" (Borge 2001).

In many risk categories, this is achieved by the analysis of past data. Being both future-oriented and unprecedented, for climate risks the necessary data for the use of complex mathematical models is yet missing. As a pragmatic compromise, the qualitative analysis combined with a structured, thorough consideration of all relevant aspects is an important first step on the learning journey of risk management. As a consequence, the Risk Radar has been deliberately kept pragmatic, comprehensible and explainable. By fully disclosing the mechanics, there is no "black box": The risk assessment via the sector scoring scheme is transparently available to the users and can be adapted if need be. As a result, it is designed as an understanding-based and yet lean risk management tool, that is adaptable to the individual context and needs of the bank.

Please note: In its methodology, the risk radar covers both acute and chronic physical climate risks as well as transition risks. Other ESG risks are only considered in a more high-level perspective. **So, both the scope of the instrument and of this publication is the assessment of climate related physical and transition risks.** With respect to ESG risks in general, the National Bank of Georgia is starting to develop ESG Risk Management Guidelines that will provide guidance to the banks on how to perform ESG risk management in the future.

To implement a thorough and systematic assessment of climate risks, all relevant aspects (as highlighted in figure 4) need to be considered. For each individual sector, the assessment process starts with physical climate risks where both acute and chronic forms are considered.

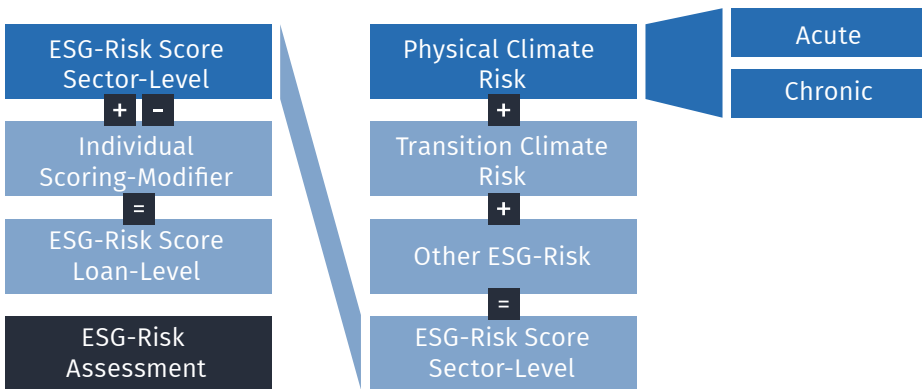


Figure 4: Proceeding of the assessment process with the Risk Radar

For both, many sources are available both on an international and national level giving an informed view over scientific findings and practitioners estimations concerning the extent and the way that climate change will affect the economic system (e.g., National Inventory Report 2021, World Bank Group and Asian Development Bank 2021, Eckstein et al. 2021).

The crucial aspect of this analysis is to analyse and model in which way different sectors are affected. While some companies in some sectors are close to nature and directly affected even by relatively moderate weather events or -changes (e.g., fruit farmers in the sector of Agriculture), others are less vulnerable to, e.g., storms but still affected by temperature (e.g., power plants with their need for cool water within the cooling progress of reactors) or the availability of natural resources like water (e.g., the paper industry).

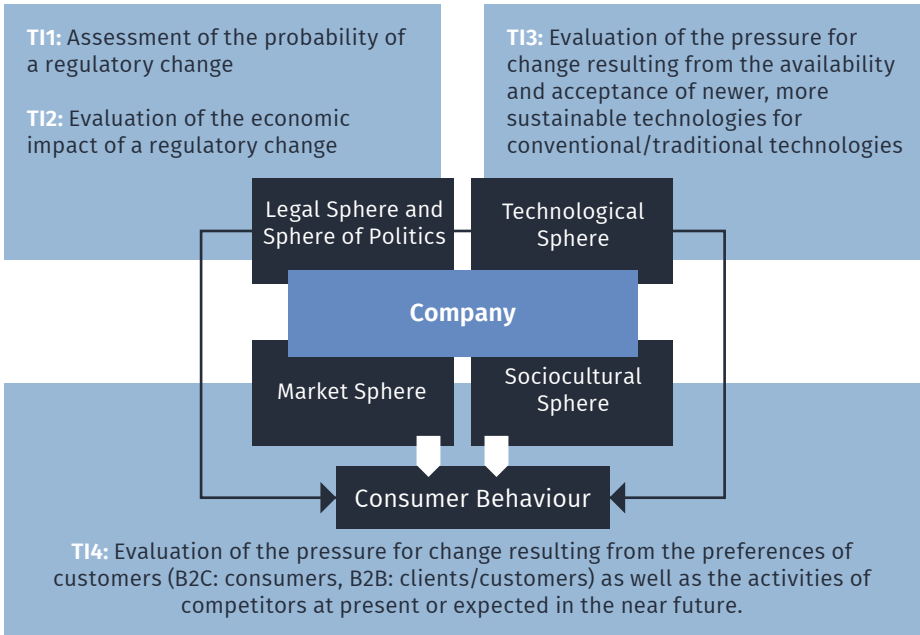
The next important aspect is to model transition risks. Transition risk breaks down into the question of how fast and vehement the transformation is happening for a given sector – and, as a consequence, how likely it is for a given company to not be able to keep up with it and suffer economic damage accordingly.

Here, two aspects are of equal importance: The GHG contribution and the Transitional Intensity of each sector. The first is the consideration of an industry's contribution to global emissions. This is important, as for highly emitting industries, there is increasing regulatory pressure (e.g., Ministry of Environmental Protection and Agriculture of Georgia 2021b). The second is the currently perceptible pressure that manifests as regulatory developments, the availability of new and alternative technologies as well as the perception of the public in general and especially the relevant customers/consumers.

To model the transitional intensity, the stakeholder-model of Socio-Economic Rationality (Schaltegger et al. 2003, p. 36 following) is used: This describes the company's framing conditions as a set of spheres in which different kinds of relevant stakeholders are active, contributing to a company's success or failure as a consequence the company's actions.

Here, the legal sphere does comprise all aspects of compliance towards all kind of legal or regulatory requirements. The technological sphere represents the availability and acceptance of new technologies, enabling or hindering the pace of transformation. The market sphere with all stakeholders associated to belonging to the processes of service creation service provision. Lastly, the sociocultural sphere as a home to the general public as a stakeholder group of major importance influences (together with both spheres described above) the behaviour of consumers/customers and hence the change of demand in the markets. Accordingly, four Transitional Indicators (TI) can be identified as highlighted in figure 5.

Figure 5: Modeling Transitional Intensity based on the concept of Socio-Economic Rationality



Finally, after considering physical climate risks and transition risks, other ESG risks need to be included as well, namely contributions to the loss of biodiversity, other environmental risks, human rights issues and other social risks. As already stated above, within the scope of the risk radar these are not considered in the same detail as the climate risks.

To assess the extent and severity of climate related risks, the Risk Radar uses a scoring scheme of a total of 5 levels ranging between 0 and 4:

0. a development/risk is theoretical and will only in very isolated cases cause damage
1. a development/risk is already perceptible and will cause some damage in individual cases (which, as a mean, can be considered to be minor)
2. a development/risk is obvious and must be considered to be harmful to business
3. a development/risk is significant, causing serious and extensive damage
4. a development/risk is existential, the potential damage is very high and can be fatal for many companies within the sector

For both physical climate risks and transition risks this 5-level scoring is applied, rating the individual relevance to the given sector and resulting in a 0-4 score calculated as a mean of the different components. With other ESG risks, a more global approach is chosen with a yes/no system in which for each category an additional +0.5 is added to the score up to a maximum of 2. Please refer to figure 6 to an overview over the full scoring scheme.

Figure 6: The Scoring System of the Risk Radar

NACE-Code	Sector		Scoring		Reference		
	Physical Climate Risk	Acute	0-4 Weight 50%		0-4	1	
		Chronic	0-4 Weight 50%			2	
	Transition Climate Risk	GHG-Emission Contribution		0-4 Weight 50%		0-4	3
		Transitional Intensity	Probability of regulatory Change	0-4 Weight 25%	0-4 Weight 50%		4
			Economic Impact of regulatory Change	0-4 Weight 25%			5
			Technology Squeeze-out	0-4 Weight 25%			6
	Customer/ Consumer Behavior		0-4 Weight 25%	7			
	Other ESG Risks	Loss of Biodiversity		+0,5		0-2	8
		Other Environmental Risks		+0,5			9
		Possible Human Rights Issues		+0,5			10
		Other Social Risks		+0,5			11
ESG-Risk Score at Sector-Level					0-10		

As a sample of application, the scoring result of the sector of Agriculture is given below in figure 7.

Figure 7: The Risk Radar applied to the sector of Agriculture

A	Agriculture, Forestry and Fishing		Scoring		Reference		
	Physical Climate Risk	Acute	2,5		2,8	1	
		Chronic	3			2	
	Transition Climate Risk	GHG-Emission Contribution		4		2,9	3
		Transitional Intensity	Probability of regulatory Change	3	1,8		4
			Economic Impact of regulatory Change	2			5
			Technology Squeeze-out	1			6
			Customer/ Consumer Behavior	1			7
	Other ESG Risks	Loss of Biodiversity		+	0,5	1,3	8
		Other Environmental Risks		+	0,5		9
		Possible Human Rights Issues		+	0,0		10
		Other Social Risks		+	0,25		11
ESG-Risk Score at Sector-Level:					7	6,88	

As can be seen from the scoring system above, the results could theoretically range from 0 to 10. As no sector is completely risk free and – for the time being – no sector is at absolute risk, the extremes can be neglected. In practice the results range from 2 to 7. Higher scores, however, remain a possibility for the future especially due to the potential increase of physical and transition risks.

To guide the investment decision, this spectre of outcomes is separated into the following clusters:

- 0-3 neglectable
- 4-5 vulnerable
- 6-7 high risk
- 8-10 critical

For those sectors that have been identified as high risk (risk sector scores of 7 and 6), more detailed sector profiles are provided using the reference on the right of the scoring scheme to give more detailed explanations and sources for the assessment (for an example see figure 8 below.)

Figure 8: Example of a Sector Profile

Ref.	Explanation of the Assessment	Score
1	The Global Climate Risk Index (Eckstein et al. 2021, 36) lists Georgia at rank 108 of the countries most affected by extreme weather events. This translates into an obvious danger (score 2). In contrast, EU4Climate (2021, 2) ranks Georgia "highly vulnerable to the effects of climate change", naming acute physical climate risks that include increased frequency and severity of flooding and landslides. This translates into an estimation of significant economic damage (score 3). As a compromise, the mean between both scores is used (score 2.5). Agriculture is the sector most exposed to extreme weather events, hence there is no further mitigation of the score for this sector.	2,5
2	The Climate Risk Country Profile compiled by World Bank Group and Asian Development Bank (2021, 2) expects an above-average temperature rise for Georgia as well as severe droughts and water shortages. In addition, due to glacier-shrinkage, the water supplies via rivers is threatened. This translates into significant economic consequences (score 3).	3
3	According to the National Greenhouse Gas Inventory Report of Georgia 1990-2017 (2021, 36 (2-20)), the sector accounts for the second highest GHG-emissions of all sectors (approx. 20%). As a comparison: Also the EU-Taxonomy (EU Technical Expert Group 2020, 12) lists this sectors GHG-emissions among the highest. GHG-Emission Contribution is thus considered to be existential (score 4).	4
4	One aspect of Georgia's 2030 Climate Change Strategy and 2021-2023 Action Plan (CSAP 2020) is to support development of low carbon approaches in agriculture sector. In contrast to other sectors, this objective is less concrete. However, there is a significant probability of regulation for the sector (score 3).	3
5	As the CSAP (2020) is less concrete with its objectives, it is plausible that the impact of the legislation will be obvious but not yet significant (score 2).	2
6	There is evidence of organic farming (Nadiradze, without date) being adopted as an alternative model to conventional farming with positive aspects concerning climate change mitigation and adaption. While it is said to be promoted by the government, currently the implementation seems perceptible but not yet a competition to conventional farming methodology (score 1).	1
7	As a consequence of the assessment under 6, the customer demand of organic food is estimated to be to date only perceptible (score 1).	1
8	It can be shown that monocultures, the use of pesticides and fertilizers as well as the practices of burning crop residues are reducing the rich biodiversity of Georgia (Mütting 2017).	0,5
9	There is a significant problem of soil erosion due to strong winds in combination with extensive tillage using heavy machinery. This leads to a significant loss of the humus layer on top and thus to a loss of nutrients (Mütting 2017).	0,5
10	No indication for human rights issues has been found for this sector.	0
11	There is indication that other social risks are caused especially concerning the use/misuse of pesticides.	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

CSAP (2020): Georgia's 2030 Climate Change Strategy and 2021-2023 Action Plan. Tbilisi: Ministry of Environmental Protection and Agriculture of Georgia
 Citation and summary at: <https://www.iewa.org/policies/13023-climate-change-strategy-2030-and-action-plan-for-2021-2023>

Eckstein, D.; Künzel, V., Schäfer, V. (2021): Global Climate Risk Index 2021. Berlin: Germanwatch.
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https://s13.cgpublisher.com/proposals/63/index_html

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<https://unfccc.int/sites/default/files/resource/NIR%20%20Eng%2030.03.pdf>

World Bank Group and Asian Development Bank (2021): Climate Risk Country Profile Georgia. Washington & Mandaluyong City: World Bank Group and Asian Development Bank.
<https://reliefweb.int/sites/reliefweb.int/files/resources/climate-risk-country-profile-georgia.pdf>

3. Results from the Risk Radar for Georgian Economic Sectors

This scoring systematic of the risk radar has been applied for all sectors in Georgia classified as main sectors according to the NACE sector codes (Eurostat 2008). For the sectors A Agriculture and C Manufacturing the subsectors have been assessed as well (see Appendix I). This assessment has been conducted in a two-step process with an initial desk research followed by a discussion- and review workshop with local experts. The overview over the results are given below in Figure 9. The detailed tables for sectors with high risk scores are given in the Appendix II. As stated above, for the time being the highest score is 7, so there are no critical sectors yet. However some (namely scores 7 and 6) need to be considered as potentially high risk and others (scores 4 and 5) render the portfolio vulnerable to climate risks.

From the assessment, the sectors with the highest risk profile (score 7) are:

- A Agriculture, Forestry and Fishing (chapter)
- A 1.1 Growing of non-perennial Crops
- A 2 Forestry and Logging
- C 10 Manufacture of Food Products
- C 20 Manufacture of Chemicals and chemical Products
- D Electricity, Gas, Steam and Air Conditioning Supply
- E Water Supply, Sewerage, Waste Management and Remediation Activities

The sector with a very high risk score (score 6) are:

- A 1.2 Growing of perennial Crops
- A 1.4 Animal Production
- A3 Fishing and Aquaculture
- C Manufacturing (chapter)
- C12 Manufacture of Tobacco Products
- C19 Manufacture of Coke and refined Petroleum Products
- C29 Manufacture of Motor Vehicles, Trailers and semi-Trailers
- F Construction (chapter)
- H Transportation and Storage (chapter)

Those sectors are most affected by either physical climate risks or transition climate risks or both and, in turn, also have a high contribution towards climate change and thus contribute to the severity of those risks within their sectors as well. Evidence of that (which in turns also confirm the methodology of the Risk Radar) can be found in the fact that it is those sectors that are featured both within the relevant national documents considering climate change mitigation and adaptation like the Fourth National Communication of Georgia under the United Nations Framework Convention on Climate Change and Georgia's Long-Term Low Emission Development Strategy (Ministry of Environmental Protection and Agriculture of Georgia (2021a and b) as well as in the European Taxonomy (European Union Technical Expert Group on Sustainable Finance 2020). Many of them are also addressed in the results of the EBA's mapping of climate risk (EBA 2021b, p. 17 following).

Figure 9: Sector Assessment with the Risk Radar

NAE-Codes	Sectors	ESG-Risk Sector-Score															
		Physical Climate Risk			GHG-Emissions Contribution	Transition Climate Risk				Σ	Other ESG-Risks					Σ	Σ
		Acute	Chronic	Σ		Transitional Intensity					Loss of Biodiversity	Other Environmental Risks	Possible Violation of Human Rights	Other Social Risks			
					Probability of regulatory Change	Economic Impact of regulatory Change	Techno-logy Squeeze-out	Customer/ Consumer Behavior									
A	Agriculture, Forestry and Fishing	2.5	3.0	2.75	4.0	3.0	2.0	1.0	1.0	2.88	0.5	0.5	0.0	0.25	1.3	7	
B	Mining and Quarrying	1.5	0.0	0.75	4.0	1.0	1.0	0.0	0.0	2.25	0.5	0.5	0.5	0.5	2.0	5	
C	Manufacturing	1.5	1.5	1.50	3.5	3.0	1.5	1.0	0.5	2.50	0.5	0.5	0.0	0.5	1.5	6	
D	Electricity, Gas, Steam and Air Conditioning Supply	1.5	2.5	2.00	4.0	4.0	2.5	2.5	1.5	3.31	0.5	0.5	0.0	0.5	1.5	7	
E	Water Supply, Sewerage, Waste Management and Remediation Activities	2.0	2.5	2.25	4.0	3.0	2.0	1.0	0.0	2.75	0.5	0.5	0.0	0.5	1.5	7	
F	Construction	1.5	1.5	1.50	3.0	3.0	2.5	1.0	1.0	2.44	0.5	0.5	0.5	0.5	2.0	6	
G	Wholesale and Retail Trade	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.5	0.5	2	
H	Transportation and Storage	2.0	1.0	1.50	3.5	3.0	2.0	1.0	0.0	2.50	0.5	0.5	0.5	0.5	2.0	6	
I	Accommodation and Food Service Activities	1.5	2.0	1.75	1.0	0.0	0.0	1.0	1.0	0.75	0.5	0.5	0.0	0.5	1.5	4	
J	Information and Communication	1.5	0.0	0.75	2.0	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0	0.0	2	
K	Financial and Insurance Activities	2.5	2.5	2.50	1.0	2.0	2.0	0.0	0.0	1.00	0.0	0.5	0.0	0.5	1.0	5	
L	Real Estate Activities	2.0	2.0	2.00	3.0	3.0	2.0	1.0	1.0	2.38	0.5	0.0	0.0	0.25	0.8	5	
M	Professional, Scientific and Technical Activities	1.5	0.0	0.75	2.0	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0	0.0	2	
N	Administrative and Support Service Activities	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0	1	
O	Public Administration and Defence, Compulsory Social Security	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0	1	
P	Education	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0	1	
Q	Human Health and Social Work Activities	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0	1	
R	Arts, Entertainment and Recreation	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.5	0.0	0.5	1.0	2	
S	Other Service Activities	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0	1	
T	Activities of Households as Employers	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0	1	
U	Activities of Extraterritorial Organisations and Bodies	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0	0.0	1	

To help to understand the scoring results, a few specific aspects of the assessment should be noted:

1) *Bottom Line of Climate Risks*

Naturally, the exposure of the different sectors towards physical and transition risks is very different. With acute physical risks especially, the closer a sector is connected to nature, the more immediate and potentially devastating are the consequences from extreme weather events: Even a minor weather event such as a hailstorm can destroy a farmer's entire harvest, where for manufacturing companies only a small damage to the roof of a production hall or to vehicles in the fleet would have to be expected. Still, larger events will cause damage to near any sector, which is why there is no risk-free sectors and an assessment of 1 is used the minimum for acute physical climate risks for all sectors.

2) *Inheritance in Physical Risks*

Many sectors are interconnected, which leads to the fact that the risks affecting one sector will also affect affiliated ones. Such close connection exists, for example, in the food sector (C10) where there is a strong dependency on the agricultural sector (which has an especially high-risk profile). That is why food manufacturing is not only considered with the physical climate risk of manufacturing but also “inherits” a risk premium from agriculture due to the exposure affecting its supply chain.

3) *Inheritance in Emissions*

The same principle of inheritance is considered in the estimation of the level of emissions. Here, the sectors emissions receive an upgrade if there are especially high emissions in the supply chain. Again on the example of the food sector (C10), the manufacturing of meat products have to be considered especially harmful due to its connection with animal production (A1.4) – which in turn accounts for its high emission estimate. As a comparison, beverages (C11) have a strong connection with the growing of perennial crops (A1.2, especially wine and other fruit-based beverages) which has a considerably lower emission profile, resulting in a lower emission assessment for the sector C11.

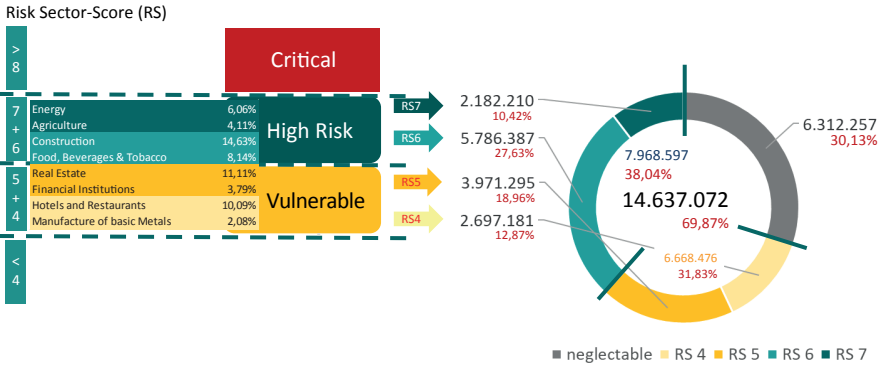
4) *Scope 3 in Emissions*

Following the systematic of the internationally accepted Greenhouse gas Protocol, emissions are clustered into 3 scopes (GHG Protocol 2011): Scope 1 includes only the direct emissions of the company itself, scope 2 also considers upstream emissions from the value chain and scope 3 considers emissions from the products across their life cycles. In most publications, emissions are assessed as scope 2, whereas the Risk Radar focusses on scope 3. Hence, where a sector has especially high emissions resulting from their products (e.g. automotive C29), the emission assessment is upgraded.

4. Application of Risk Radar - Heat Map for Georgian Financial Sector

With the availability of this sector data, it is now possible to perform an analysis for individual banks as well as the financial sector in total concerning the impact of physical climate risks as well as transition risks on the loan portfolios. The assessment – labelled as Heat Map – can be done using the sector-shares of loan portfolios. Figure 10 offers an example of such a “Heat Map” assessment.

Figure 10: An Example of the Heat Map



This Heat Map was created on the basis of the stock of corporate loans in Georgia per 12-2021. All figures are given in K Georgian Lari.

Please note that only corporate loans have been included in this analysis. If consumer loans would be included as well, the share of the vulnerable and high-risk area of the loan portfolio would be considerably smaller because consumer loans are considerably less affected by climate risks than corporate loans.

The Heat Map is independent of portfolio size and can be applied for very small banks as well as very large institutes using the risk sector scores given in figure 9. It gives an initial overview over the extent to which a bank is affected by climate related risks.

For a more detailed risk assessment on counterparty level, the individual scoring modifiers for each sector have to be defined in order to use a short checklist to analyze to which extent a specific company shares the same risk as its sector and in which aspects a mitigation of this risk score (for reasons of caution often considered as a “worst case” within the sector) is adequate. On this basis, finally, both limits on counterparty level, pricing consequences and collateral requirements can be formulated, further enhancing the completeness of the ESG risk management process.

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Annex I: Overview of the Risk Radar for Georgian Economic Sectors

NACE-Code	Sector	ESG-Risk Sector-Score															Σ	Σ
		Physical Climate Risk			Transition Climate Risk						Other ESG-Risks							
		Acute	Chronic	Σ	Transition Intensity				Σ	Loss of Biodiversity	Other Environmental	Other Social	Other Governance	Σ	Σ			
					Other Climate-Related Risks (COP)	Probability of Regulatory Change	Economic Impact of Regulatory Change	Technology Change								Customer/Consumer Behaviour		
A	Agriculture, Forestry and Fishing	2.5	3.0	2.75	4.0	3.0	2.0	1.0	1.0	2.88	0.5	0.5	0.0	0.25	1.3	7		
A.1.1	Growing of non-perennial Crops	2.5	3.0	2.75	4.0	3.0	2.0	1.0	1.0	2.88	0.5	0.5	0.0	0.25	1.3	7		
A.1.2	Growing of perennial Crops	3.5	3.5	3.90	2.0	1.0	1.0	1.0	1.0	1.50	0.5	0.5	0.0	0.25	1.3	6		
A.1.4	Animal Production	1.5	2.5	2.00	4.0	4.0	2.0	1.0	1.0	3.00	0.5	0.5	0.0	0.0	1.0	6		
A.2	Forestry and Logging	3.0	3.0	3.00	3.0	3.0	2.5	1.0	1.0	2.44	0.5	0.5	0.0	0.00	1.5	7		
A.3	Fishing and Aquaculture	2.5	3.0	2.75	2.0	1.5	1.5	1.0	1.0	1.63	0.5	0.5	0.0	0.50	1.5	6		
B	Mining and Quarrying	1.5	0.0	0.75	4.0	1.0	1.0	0.0	0.0	2.33	0.5	0.5	0.5	0.5	3.0	5		
C	Manufacturing	1.5	1.5	1.50	3.5	3.0	1.5	1.0	0.5	2.95	0.5	0.5	0.0	0.5	1.5	6		
C.10	Manufacture of Food Products	1.5	2.0	1.75	4.0	3.0	2.0	1.0	1.0	2.88	0.5	0.5	0.5	0.5	2.0	7		
C.11	Manufacture of Beverages	1.0	2.0	1.90	2.0	2.0	1.0	0.0	0.0	1.38	0.5	0.5	0.0	0.5	1.5	4		
C.12	Manufacture of Tobacco Products	1.0	2.0	1.50	3.5	2.0	1.0	1.0	1.0	2.38	0.5	0.5	0.5	0.5	2.0	6		
C.13	Manufacture of Textiles	1.0	1.5	1.25	3.0	2.0	1.0	0.5	0.5	2.00	0.5	0.5	0.5	0.5	2.0	5		
C.14	Manufacture of wearing Apparel	1.0	1.5	1.25	3.0	1.0	1.0	0.0	0.0	1.75	0.0	0.5	0.5	0.5	1.5	5		
C.15	Manufacture of Leather and related Products	1.0	1.5	1.25	3.0	2.0	1.0	0.5	0.5	2.00	0.5	0.5	0.5	0.5	2.0	5		
C.16	Manufacture of Wood and of Products of Wood and Cork, except Furniture; Manufacture of Articles of Straw and Plaiting Material	1.0	1.0	1.00	2.0	1.0	1.0	0.0	0.0	1.25	0.0	0.5	0.0	0.5	1.0	3		
C.17	Manufacture of Paper and Paper Products	1.0	2.0	1.90	3.0	3.0	2.0	1.5	1.0	2.44	0.5	0.5	0.0	0.5	1.5	5		
C.18	Printing and Reproduction of Recorded Media	1.0	1.0	1.00	2.0	1.0	1.0	1.5	1.5	1.83	0.0	0.0	0.0	0.0	0.0	3		
C.19	Manufacture of Coke and refined Petroleum Products	1.5	1.5	1.50	4.0	3.0	2.5	1.0	1.0	2.94	0.5	0.5	0.5	0.5	2.0	6		
C.20	Manufacture of Chemicals and chemical Products	2.0	2.0	2.00	4.0	3.0	2.5	0.0	0.0	2.69	0.5	0.5	0.5	0.5	2.0	7		
C.21	Manufacture of basic pharmaceutical Products and pharmaceutical Preparations	2.0	2.5	2.25	3.0	2.0	1.0	0.0	0.0	1.88	0.0	0.5	0.0	0.5	1.5	5		
C.22	Manufacture of Rubber and plastic Products	1.0	1.0	1.00	3.0	3.0	1.0	0.5	0.5	2.13	0.0	0.5	0.0	0.0	0.5	4		
C.23	Manufacture of other non-metallic mineral Products	1.5	1.5	1.50	3.0	3.0	2.0	0.5	0.5	2.20	0.0	0.5	0.0	0.5	1.0	5		
C.24	Manufacture of basic Metals	1.0	1.0	1.00	4.0	2.0	1.5	0.0	0.0	2.44	0.0	0.5	0.0	0.5	1.0	4		
C.25	Manufacture of fabricated metal Products, except Machinery and Equipment	1.0	1.0	1.00	4.0	2.0	1.5	1.0	0.0	2.56	0.0	0.5	0.0	0.0	0.5	4		
C.26	Manufacture of Computer, electronic and optical Products	1.0	1.0	1.00	2.5	1.0	1.0	0.0	0.0	1.90	0.0	0.5	0.0	0.0	0.5	3		
C.27	Manufacture of electrical Equipment	1.0	1.0	1.00	2.5	1.0	1.0	0.0	0.0	1.90	0.0	0.5	0.0	0.0	0.5	3		
C.28	Manufacture of Machinery and Equipment	1.0	1.0	1.00	3.0	2.0	1.0	0.0	0.0	1.88	0.0	0.5	0.0	0.5	1.0	4		
C.29	Manufacture of Motor Vehicles, Trailers and semi-Trailers	1.0	1.0	1.00	4.0	3.0	3.0	2.0	1.5	3.19	0.5	0.5	0.0	0.5	1.5	6		
C.30	Manufacture of other Transport Equipment	1.0	1.0	1.00	4.0	2.0	1.0	0.0	0.0	2.38	0.5	0.5	0.5	0.5	2.0	5		
C.31	Manufacture of Furniture	1.0	1.0	1.00	2.0	1.0	1.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0	0.0	2		
C.32	Other manufacturing	1.0	1.0	1.00	2.5	2.0	1.0	0.0	0.0	1.63	0.0	0.5	0.0	0.0	0.5	3		
C.33	Repair and installation of Machinery and Equipment	1.0	1.0	1.00	2.0	1.0	1.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0	0.0	2		
D	Electricity, Gas, Steam and Air Conditioning Supply	1.5	2.5	3.00	4.0	4.0	2.5	2.5	1.5	3.31	0.5	0.5	0.0	0.5	2.0	7		
E	Water Supply, Sewerage, Waste Management and Remediation Activities	2.0	2.5	2.25	4.0	3.0	2.0	1.0	0.0	2.75	0.5	0.5	0.0	0.5	1.5	7		
F	Construction	1.5	1.5	1.50	3.0	3.0	2.5	1.0	1.0	2.44	0.5	0.5	0.5	0.5	2.0	6		
G	Wholesale and Retail Trade	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.5	0.5	2		
H	Transportation and Storage	2.0	1.0	1.90	3.5	3.0	2.0	1.0	0.0	2.50	0.5	0.5	0.5	0.5	2.0	6		
I	Accommodation and Food Service Activities	1.5	2.0	1.75	1.0	0.0	0.0	1.0	1.0	2.75	0.5	0.5	0.0	0.5	1.5	4		
J	Information and Communication	1.5	0.0	0.75	2.0	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0	0.0	2		
K	Financial and Insurance Activities	2.5	2.5	2.50	1.0	2.0	2.0	0.0	0.0	1.90	0.0	0.5	0.0	0.5	2.0	5		
L	Real Estate Activities	2.0	2.0	2.00	3.0	3.0	2.0	1.0	1.0	2.38	0.5	0.0	0.0	0.25	0.5	5		
M	Professional, Scientific and Technical Activities	1.5	0.0	0.75	2.0	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0	0.0	2		
N	Administrative and Support Service Activities	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.0	0.0	1		
O	Public Administration and Defence, Compulsory Social Security	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.0	0.0	1		
P	Education	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.0	0.0	1		
Q	Human Health and Social Work Activities	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.0	0.0	1		
R	Arts, Entertainment and Recreation	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.5	0.0	0.5	2.0	2		
S	Other Service Activities	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.0	0.0	1		
T	Activities of Households as Employers	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.0	0.0	1		
U	Activities of Extraterritorial Organizations and Bodies	1.5	0.0	0.75	1.0	0.0	0.0	0.0	0.0	0.90	0.0	0.0	0.0	0.0	0.0	1		

Annex II: Detailed Sector Assessments for the High-Risk Sectors

A Agriculture

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector

A	Agriculture, Forestry and Fishing		Scoring		Reference	
Physical Climate Risk	Acute		2,5		2,8	1
	Chronic		3			2
Transition Climate Risk	GHG-Emission Contribution		4		2,9	3
	Transitional Intensity	Probability of regulatory Change	3	1,8		4
		Economic Impact of regulatory Change	2			5
		Technology Squeeze-out	1			6
		Customer/ Consumer Behavior	1			7
Other ESG Risks	Loss of Biodiversity		+	0,5	1,3	8
	Other Environmental Risks		+	0,5		9
	Possible Human Rights Issues		+	0,0		10
	Other Social Risks		+	0,25		11
ESG-Risk Score at Sector-Level:					7	6,88

Ref.	Explanation of the Assessment	Score
1	The Global Climate Risk Index (Eckstein et al. 2021, 36) lists Georgia at rank 108 of the countries most affected by extreme weather events. This translates into an obvious danger (score 2). In contrast, EU4Climate (2021, 2) ranks Georgia "highly vulnerable to the effects of climate change", naming acute physical climate risks that include increased frequency and severity of flooding and landslides. This translates into an estimation of significant economic damage (score 3). As a compromise, the mean between both scores is used (score 2.5). Agriculture is the sector most exposed to extreme weather events, hence there is no further mitigation of the score for this sector.	2,5
2	The Climate Risk Country Profile compiled by World Bank Group and Asian Development Bank (2021, 2) expects an above-average temperature rise for Georgia as well as severe droughts and water shortages. In addition, due to glacier-shrinkage, the water supplies via rivers is threatened. This translates into significant economic consequences (score 3).	3
3	According to the National Greenhouse Gas Inventory Report of Georgia 1990-2017 (2021, 36 (2-20)), the sector accounts for the second highest GHG-emissions of all sectors (approx. 20%). As a comparison: Also the EU-Taxonomy (EU Technical Expert Group 2020, 12) lists this sectors GHG-emissions among the highest. GHG-Emission Contribution is thus considered to be existential (score 4).	4
4	One aspect of Georgia's 2030 Climate Change Strategy and 2021-2023 Action Plan (CSAP 2020) is to support development of low carbon approaches in agriculture sector. In contrast to other sectors, this objective is less concrete. However, there is a significant probability of regulation for the sector (score 3).	3
5	As the CSAP (2020) is less concrete with its objectives, it is plausible that the impact of the legislation will be obvious but not yet significant (score 2).	2
6	There is evidence of organic farming (Nadiradze, without date) being adopted as an alternative model to conventional farming with positive aspects concerning climate change mitigation and adaption. While it is said to be promoted by the government, currently the implementation seems perceptible but not yet a competition to conventional farming methodology (score 1).	1
7	As a consequence of the assessment under 6, the customer demand of organic food is estimated to be to date only perceptible (score 1).	1
8	It can be shown that monocultures, the use of pesticides and fertilizers as well as the practices of burning crop residues are reducing the rich biodiversity of Georgia (Müting 2017).	0,5
9	There is a significant problem of soil erosion due to strong winds in combination with extensive tillage using heavy machinery. This leads to a significant loss of the humus layer on top and thus to a loss of nutrients (Müting 2017).	0,5
10	No indication for human rights issues has been found for this sector.	0
11	There is indication that other social risks are caused especially concerning the use/misuse of pesticides.	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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A 1.2 Growing of perennial Crops

Please Note: This sector is a subsector of A Agriculture, Forestry and Fishing. As such, it has many aspects of the assessment in common with its main sector. Therefore, in the following explanation, only those aspects are explained that deviate from the assessment of the main sector.

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector

A 01.2	Growing of perennial Crops		Scoring		Reference	
	Physical Climate Risk	Acute	3,5		1	
		Chronic	3,5		2	
	Transition Climate Risk	GHG-Emission Contribution		2		3
		Transitional Intensity	Probability of regulatory Change	1	1,0	4
			Economic Impact of regulatory Change	1		5
			Technology Squeeze-out	1		6
			Customer/ Consumer Behavior	1		7
	Other ESG Risks	Loss of Biodiversity		+	0,5	8
		Other Environmental Risks		+	0,5	9
		Possible Human Rights Issues		+	0,0	10
		Other Social Risks		+	0,25	11
ESG-Risk Score at Sector-Level:				6	6,25	

Ref.	Explanation of the Assessment	Score
1	In growing fruit, the short phase of the flowering period is of particular importance. During this phase, there is a highly pronounced susceptibility to extreme weather (storms, hail and heavy rain). Because these extreme weather events can reduce the yield even when they are not severe enough to damage the plants themselves, the risk is rated as significant to existential (score 3.5) (Alae-Carew et al. 2020). This is also in line with the findings described in chapter 4.3 of the Fourth National Communication (Ministry of Environmental Protection and Agriculture of Georgia 2021a).	3,5
2	Perennial Crops are especially vulnerable to changes in temperature and changes in precipitation. Hence, the risk is also rated as significant to existential (score 3.5) (Alae-Carew et al. 2020).	3,5
3	For the main part, GHG-emissions in agriculture are generated by cattle, manure- and fertilizer management as well as soil-emissions (for Georgia see NIR chapter 5, on an international scope also Umweltbundesamt 2021). In this context, the emissions related to the growing of perennial crops are among the lowest in the sector and are hence only rated as obvious (score 2) .	2
4	In Georgia's long term low emission development strategy, next to no reference is made to fruit farming (Ministry of Environmental Protection and Agriculture of Georgia 2021b). The probability of regulatory change is hence rated to date as only perceptible (score 1) .	1
5	In Georgia's long term low emission development strategy, next to no reference is made to fruit farming (Ministry of Environmental Protection and Agriculture of Georgia 2021). The impact of regulatory change is hence rated to date as only perceptible (score 1) .	1
6		1
7		1
8		0,5
9		0,5
10		0
11		0

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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A 1.4 Animal Production

Please Note: This sector is a subsector of A Agriculture, Forestry and Fishing. As such, it has many aspects of the assessment in common with its main sector. Therefore, in the following explanation, only those aspects are explained that deviate from the assessment of the main sector.

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector		Scoring		Reference		
A	01.4	Animal Production				
Physical Climate Risk	Acute		1,5	2,0	1	
	Chronic		2,5		2	
Transition Climate Risk	GHG-Emission Contribution		4	3,0	3	
	Transitional Intensity	Probability of regulatory Change	4		2,0	4
		Economic Impact of regulatory Change	2			5
		Technology Squeeze-out	1			6
		Customer/ Consumer Behavior	1			7
Other ESG Risks	Loss of Biodiversity		+	1,0	8	
	Other Environmental Risks		+		9	
	Possible Human Rights Issues		+		0,0	10
	Other Social Risks		+		0,0	11
ESG-Risk Score at Sector-Level:			6	6,00		

Ref.	Explanation of the Assessment	Score
1	Since livestock operations generally use buildings to protect the animals, only extreme weather events with exceptional destructive power are sufficient to threaten the animals themselves. More susceptible, on the other hand, is the perishable fodder. In combination of both, the exposure to physical risk is rated as perceptible to obvious (score 1.5) . This is also in line with the findings described in chapter 4.3.1 of the Fourth National Communication (Ministry of Environmental Protection and Agriculture of Georgia 2021a).	1,5
2	While water scarcity and heat waves also affect livestock, adaptation measures are easier to implement than in soil-farming. Still, since the productivity of the pastures is highly influenced especially by precipitation, the influence of chronic risk remains obvious to significant (score 2.5) .	2,5
3		4
4	In Georgia's long term low emission development strategy, husbandry plays an important role (Ministry of Environmental Protection and Agriculture of Georgia 2021b). The probability of regulatory change is hence rated as existential (score 4) .	4
5		2
6		1
7		1
8		0,5
9		0,5
10		0
11	The problems encountered with the use of pesticides are not relevant for this subsector.	0

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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A 2 Forestry and Logging

Please Note: This sector is a subsector of A Agriculture, Forestry and Fishing. As such, it has many aspects of the assessment in common with its main sector. Therefore, in the following explanation, only those aspects are explained that deviate from the assessment of the main sector.

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector

A 02 Forestry and Logging		Scoring			Reference	
Physical Climate Risk	Acute	3		3,0	1	
	Chronic	3			2	
Transition Climate Risk	GHG-Emission Contribution		3		3	
	Transitional Intensity	Probability of regulatory Change	3	1,9	4	
		Economic Impact of regulatory Change	2,5		5	
		Technology Squeeze-out	1		6	
		Customer/ Consumer Behavior	1		7	
Other ESG Risks	Loss of Biodiversity		+	0,5	1,5	8
	Other Environmental Risks		+	0,5		9
	Possible Human Rights Issues		+	0,0		10
	Other Social Risks		+	0,5		11
ESG-Risk Score at Sector-Level:				7	6,94	

Ref.	Explanation of the Assessment	Score
1	Forests are especially vulnerable to extreme events (storms, landslides and wildfires, for this and the following see EU Technical Expert Group on Sustainable Finance 2020, page 40 following). In particular, the frequency and the extent of wildfires (fostered by the chronic aspect of drought) has increased sharply in recent years. Acute physical climate risk is thus assessed as being significant (score 3) for this sector. This is also in line with the findings described in chapter 4 of the Fourth National Communication (Ministry of Environmental Protection and Agriculture of Georgia 2021a).	3
2	Forests are also highly vulnerable to chronic aspects of climate change (heat and droughts), depleting the soils of water and giving rise to many sorts of parasites and pests. Chronic physical climate risk is thus assessed as being significant (score 3) for this sector.	3
3	While forests are an important factor to mitigate climate change by providing much needed sinks for greenhouse gases, the sector of forestry is often not focused on conservation but rather on exploitation and change in land-use. Hence the beneficial effect of forests do not apply to this sector, rather the CO2 contribution by forest removal can be considered to be significant (score 3) (NIR 2021).	3
4		3
5	In Georgia's long term low emission development strategy, forestry plays an important role (Ministry of Environmental Protection and Agriculture of Georgia 2021). As more emphasis is placed on conservation, the impact on the conventional forestry sector is assessed to be between obvious and significant (score 2.5) .	2,5
6		1
7		1
8		0,5
9		0,5
10		0
11	In some regions of Georgia unsustainable use of firewood is common due to lack of heating/ energy poverty (Ministry of Environmental Protection and Agriculture of Georgia 2021a pp 28, 130-131).	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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C Manufacturing

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector

C	Manufacturing		Scoring		Reference	
C	Physical Climate Risk	Acute	1,5		1	
		Chronic	1,5		2	
	Transition Climate Risk	GHG-Emission Contribution		3,5		3
		Transitional Intensity	Probability of regulatory Change	3	1,5	4
			Economic Impact of regulatory Change	1,5		5
			Technology Squeeze-out	1		6
			Customer/ Consumer Behavior	0,5		7
	Other ESG Risks	Loss of Biodiversity		+	0,5	8
		Other Environmental Risks		+	0,5	9
		Possible Human Rights Issues		+	0	10
		Other Social Risks		+	0,5	11
				6	5,50	

Ref.	Explanation of the Assessment	Score
1	The Global Climate Risk Index (Eckstein et al. 2021, 36) lists Georgia at rank 108 of the countries most affected by extreme weather events. This translates into an obvious danger (score 2). In contrast, EU4Climate (2021, 2) ranks Georgia "highly vulnerable to the effects of climate change", naming acute physical climate risks that include increased frequency and severity of flooding and landslides. This translates into an estimation of significant economic damage (score 3). As a compromise, the mean between both scores is used (score 2.5) for sectors with a high vulnerability to acute physical climate risks. However, due to mostly indoor-production, this sector is only affected by the most severe events like hydrometeorological events and landslide/gravity and mudflow processes which are to be expected as described in Georgia's 2030 Climate Change Strategy (Government of Georgia 2021, p. 32 following). For the time being, an estimated impact between perceptible and obvious seems to be a plausible assessment for this sector (score 1.5).	1,5
2	The climate risk country profile compiled by World Bank Group and Asian Development Bank (2021, 2) expects an above-average temperature rise for Georgia as well as severe water shortages. Hence, additional energy will be required for cooling, and many manufacturing processes require water. The shortages resulting in a price rise for water and energy translates into already perceptible to obvious economic consequences (score 1.5).	1,5
3	According to the National Greenhouse Gas Inventory Report of Georgia 1990-2017 (2021, 57 (3-40)), especially the sub-sector of heavy manufacturing (including ferroalloy, steel/iron, fertilizers and cement) is highly GHG-intense. As a comparison: Also the EU-Taxonomy (EU Technical Expert Group 2020, 12) lists this sectors GHG-emissions in the second-highest category. GHG-Emission Contribution is thus considered to be between significant and existential (score 3.5).	3,5
4	In Georgia's 2030 Climate Change Strategy (Government of Georgia 2021), especially cement manufacturing is addressed with some measures (pp. 21 and 56). However, especially in the context of energy efficiency (p. 54), the whole sector will be targeted with some measures and requirements. Hence, the probability of regulation is significant (score 3).	3
5	As the strategy is moderate in its objectives (5% GHG-reduction, p. 54), it is plausible that the impact of the legislation will be between perceptible and obvious (score 1.5).	1,5
6	Especially heavy manufacturing forms an important part of Georgia's economy (National Greenhouse Gas Inventory Report of Georgia, p. 57). There are some practices considerably improving energy efficiency (Government of Georgia 2021, p. 54), but overall heavy manufacturing will remain GHG-intense. Alternative technologies are thus rated as being only perceptible (score 1).	1
7	As a consequence of the assessment under section 6, customer demand for alternatives are to date rated between theoretical and perceptible (score 0.5).	0,5
8	As a consequence especially of a lack of waste management and industrial water pollution, there are considerable consequences for biodiversity (Wikipedia 2021).	0,5
9	As mentioned under section 8, especially in the context of pollution numerous environmental problems are related to the sector.	0,5
10	No indication for human rights issues has been found for this sector.	0
11	Human Rights Watch (2021) mention several incidents especially in the context of a lack workplace safety and decent labor conditions in the sector.	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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D Electricity

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector

D	Electricity		Scoring		Reference	
Physical Climate Risk	Acute		1,5		2,0	1
	Chronic		2,5			2
Transition Climate Risk	GHG-Emission Contribution		4		3,3	3
	Transitional Intensity	Probability of regulatory Change	4	2,6		4
		Economic Impact of regulatory Change	2,5			5
		Technology Squeeze-out	2,5			6
		Customer/ Consumer Behavior	1,5			7
Other ESG Risks	Loss of Biodiversity		+	0,5	1,5	8
	Other Environmental Risks		+	0,5		9
	Possible Human Rights Issues		+	0		10
	Other Social Risks		+	0,5		11
					7	6,81

Ref.	Explanation of the Assessment	Score
1	The Global Climate Risk Index (Eckstein et al. 2021, 36) lists Georgia at rank 108 of the countries most affected by extreme weather events. This translates into an obvious danger (score 2). In contrast, EU4Climate (2021, 2) ranks Georgia "highly vulnerable to the effects of climate change", naming acute physical climate risks that include increased frequency and severity of flooding and landslides. This translates into an estimation of significant economic damage (score 3). As a compromise, the mean between both scores is used (score 2.5) for sectors with a high vulnerability to acute physical climate risks. This sector, however, is only affected by the most severe events like hydrometeorological events and landslide/gravity and mudflow processes which are to be expected as described in Georgia's 2030 Climate Change Strategy (Government of Georgia 2021, p. 32 following). For the time being, an estimated impact between perceptible and obvious seems to be a plausible assessment for this sector (score 1.5).	1,5
2	The climate risk country profile compiled by World Bank Group and Asian Development Bank (2021, 2) expects an above-average temperature rise for Georgia as well as severe water shortages. The energy sector heavily relies on water from streams and rivers for the cooling of the power plants. Therefore, both water scarceness and heightened temperatures of the water will severely impede this process, causing the necessity for temporary shutdowns (e.g. Byers et al. 2020). The impact of chronic physical climate risk is thus rated between obvious and significant and will, in the future, have even more severe economic consequences (score 2.5).	2,5
3	Worldwide, the energy-sector is considered to be responsible for the highest GHG-emissions of all sectors (see also National Greenhouse Gas Inventory Report of Georgia 1990-2017, 2021, p. 44 (3-28) & EU Technical Expert Group 2020, 12). GHG-Emission Contribution is considered to be existential (score 4).	4
4	In Georgia's 2030 Climate Change Strategy (Government of Georgia 2021), the energy sector is addressed with several measures (p. 39 following). Hence, the probability of regulation is sure/existential (score 4).	4
5	As this part of the strategy can be considered the most ambitious (15% GHG-reduction until 2030, see Government of Georgia 2021, p. 39), most likely the impact of the legislation will be between obvious and significant (score 2.5).	2,5
6	With energy from renewable sources both widely accepted and supported by the government (Government of Georgia 2021, p. 39) technological alternatives are available and will built up pressure on the conventional sector that can already be rated between obvious and significant (score 2.5).	2,5
7	With growing acceptance supported by the government initiatives, customer demand for alternatives is increasing. For those able to install solar modules on their property, energy-independency and stability can be considered additional benefits. In combination, the pressure from customer behavior is ranked between perceptible and obvious (score 1.5).	1,5
8	Worldwide, energy production is considered to have severe negative effects on bio-diversity (Holland et al. 2019).	0,5
9	The sector is held responsible for pollution of air and water (Wikipedia 2021).	0,5
10	No indication for human rights issues has been found for this sector.	0
11	Social problems occur especially in the context of hydroelectric power plants (e.g. Vardiashvili 2019).	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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Vardiashvili, Manana (2019): Why Georgia's hydropower plants are causing nation-wide protests. In: Jam News. <https://jam-news.net/why-georgias-hydropower-plants-are-causing-nation-wide-protests/>

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E Water Supply, Sewerage, Waste Management and Remediation Activities

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector

E	Water Supply, Sewerage, Waste Management and Remediation Activities		Scoring		Reference
Physical Climate Risk	Acute		2,0		1
	Chronic		2,5		2
Transition Climate Risk	GHG-Emission Contribution		4		3
	Transitional Intensity	Probability of regulatory Change	3	1,5	4
		Economic Impact of regulatory Change	2		5
		Technology Squeeze-out	1		6
		Customer/ Consumer Behavior	0		7
Other ESG Risks	Loss of Biodiversity		+	0,5	8
	Other Environmental Risks		+	0,5	9
	Possible Human Rights Issues		+	0,0	10
	Other Social Risks		+	0,5	11
					7
					6,50

Ref.	Explanation of the Assessment	Score
1	The Global Climate Risk Index (Eckstein et al. 2021, 36) lists Georgia at rank 108 of the countries most affected by extreme weather events. This translates into an obvious danger (score 2). In contrast, EU4Climate (2021, 2) ranks Georgia "highly vulnerable to the effects of climate change", naming acute physical climate risks that include increased frequency and severity of flooding and landslides. This translates into an estimation of significant economic damage (score 3). As a compromise, the mean between both scores is used (score 2.5) for sectors with a high vulnerability to acute physical climate risks. This sector is a mixture of different activities; therefore the ranking is orientated on the most vulnerable aspect. In this case, water supply, sewerage and waste management could all be affected by hydrometeorological events and landslide/gravity and mudflow which are to be expected as described in Georgia's 2030 Climate Change Strategy (Government of Georgia 2021, p. 32 following). For the time being, the impact is therefore ranked obvious (score 2) .	2
2	The climate risk country profile compiled by World Bank Group and Asian Development Bank (2021, 2) expects an above-average temperature rise for Georgia as well as severe water shortages. Water scarceness will impede both water supply and sewerage, higher temperatures may cause severe problems also with sewerage but especially waste management (Bebb & Kersey 2003). The impact of chronic physical climate risk is thus rated between obvious and significant already today with a clear tendency to become even more problematic in the near future. (score 2.5).	2,5
3	World- and countrywide, this sector is considered responsible for among the highest GHG-emissions of all sectors (see also National Greenhouse Gas Inventory Report of Georgia 1990-2017, 2021, p. 192 (6-92) & EU Technical Expert Group 2020, 12). GHG-Emission Contribution is considered to be existential (score 4) .	4
4	In Georgia's 2030 Climate Change Strategy (Government of Georgia 2021), especially waste and wastewater is addressed with several measures (p. 39 following). Hence, the probability of regulation is significant (score 3) .	3
5	The measures described in this part of the strategy can be considered to have an obvious impact (score 2).	2
6	In waste management, recycling can be seen as a new technology putting the conventional practices of landfill under pressure. The pressure is increasing by the inclusion of recycling in Georgia's 2030 Climate Change Strategy (Government of Georgia 2021) and can be considered perceptible (score 1) .	1
7	No indication has been found for a change in consumer behaviour or customer demand building up pressure that can be considered to be more than theoretical (score 0) .	0
8	Worldwide, waste management is considered to have severe negative effects on bio-diversity (BBC 2021).	0,5
9	The sector is held responsible for pollution of air and water (Wikipedia 2021).	0,5
10	No indication for human rights issues has been found for this sector.	0
11	The presence of illegal landfills as described in Georgia's 2030 Climate Change Strategy (Government of Georgia 2021, p. 61) always goes along with social problems and health-hazards for the population living near these sites.	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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F Construction

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2024
Valid Until: Q1 2024

NACE Sector

F	Construction		Scoring		Reference		
	Physical Climate Risk	Acute	1,5		1,5	1	
		Chronic	1,5			2	
	Transition Climate Risk	GHG-Emission Contribution		3,0			3
		Transitional Intensity	Probability of regulatory Change	3	1,9	2,4	4
			Economic Impact of regulatory Change	2,5			5
			Technology Squeeze-out	1			6
			Customer/ Consumer Behavior	1			7
	Other ESG Risks	Loss of Biodiversity		+	0,5	2,0	8
		Other Environmental Risks		+	0,5		9
		Possible Human Rights Issues		+	0,5		10
		Other Social Risks		+	0,5		11
ESG-Risk Score at Sector-Level:					6	5,94	

Ref.	Explanation of the Assessment	Score
1	The exposure of the construction sector to acute physical climate risk manifests itself e.g. in the form of destruction on construction sites through extreme weather events, worker safety, supply chain reliability and project delays (Hurlimann et al. 2019, Müller et al. 2020). For the time being, the effects are between perceptible and obvious (score 1.5) .	1,5
2	High temperatures and lack of water impede construction. Due to the consequences e.g. on forests, material becomes less readily available and more expensive (Hurlimann et al. 2019, Müller et al. 2020). The impact of chronic physical climate risk is also rated between perceptible and obvious (score 1.5) .	1,5
3	The EU-Taxonomy (EU Technical Expert Group 2020, 12) lists this sectors GHG-emissions among the second highest. GHG-Emission Contribution is thus considered to be significant (score 3) .	3
4	In many sources, the construction sector is considered in combination with the building sector. Naturally, there are close ties between the two. However, the questions and the associated requirements from the areas of heat and energy are often less relevant for the construction sector, since these costs - as well as the possibly increased requirements - are to be borne by the subsequent owners and not by the construction companies. Hence, while the sector features in The Fourth National Communication and Georgia's long term low emission development strategy (Ministry of Environmental Protection and Agriculture of Georgia 2021a, 106 and 2021b, 59), the probability of regulation is significant (score 3) but the impact on the construction sector is only between obvious and significant (score 2.5) . That is because most of the measures do affect the existing buildings with heat and energy and less their original construction.	3
5		2,5
6	Alternative technologies in the form of sustainable construction methods are available in parts and will be applied on a larger base in the wake of the regulation, but for the time being they are only rated as perceptible (score 1) .	1
7	No indication was found that customer demand for the use of alternative construction concepts can be considered to be more than theoretical (score 0) at present.	1
8	Biodiversity is severely harmed by the extensive change in land use and surface sealing caused by the construction sector (Umweltbundesamt 2017).	0,5
9	There are many environmental problems connected to the construction sector (Yilmaz & Bakis 2015).	0,5
10	There are known human rights issues for this sector (Andrieu et al. 2016).	0,5
11	Unsustainable space-planning practicess and constrution of inefficient/unsustainable buildings lead social problems in Georgia.	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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H Transportation and Storage

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q1 2022
Valid Until: Q1 2024

NACE Sector

H	Transportation and Storage		Scoring		Reference
Physical Climate Risk	Acute		2	1,5	1
	Chronic		1		2
Transition Climate Risk	GHG-Emission Contribution		3,5		3
	Transitional Intensity	Probability of regulatory Change	3	1,5	4
		Economic Impact of regulatory Change	2		5
		Technology Squeeze-out	1		6
		Customer/ Consumer Behavior	0		7
Other ESG Risks	Loss of Biodiversity		+	2,0	8
	Other Environmental Risks		+		9
	Possible Human Rights Issues		+		10
	Other Social Risks		+		11
ESG-Risk Score at Sector-Level:					6
					6,00

Ref.	Explanation of the Assessment	Score
1	The exposure of the transportation sector to acute physical climate risk is considered to be obvious (score 2) : Storms, floods and landslides affect the reliability and capacity of transportation system, however to date they do not harm the sector in a significant way (EPA 2021, Ministry of Environmental Protection and Agriculture of Georgia 2021a chapter 4.14).	2
2	High temperatures can cause pavement to soften and expand, damaging the infrastructure and impeding traffic. On the other hand, certain areas may experience cost savings and improved mobility from reduced snowfall and less-frequent winter storms (EPA 2021). As a combination, the impact of chronic physical climate risk is rated as perceptible (score 1) .	1
3	According to the National Greenhouse Gas Inventory Report of Georgia 1990-2017 (2021), the sector accounts for very high GHG-emissions. In Georgia's long term low emission development strategy, approx. 25% of the national GHG emissions are attributed to this sector (Ministry of Environmental Protection and Agriculture of Georgia 2021, page 92). Also the EU-Taxonomy (EU Technical Expert Group 2020, 12) lists this sectors GHG-emissions among the second highest. GHG-Emission Contribution is thus considered to be between significant and existential (score 3.5) .	3,5
4	In Georgia's long term low emission development strategy, transportation plays an important role (Ministry of Environmental Protection and Agriculture of Georgia 2021b). The probability of regulatory change is hence rated as significant (score 3) .	3
5	The measures proposed in Georgia's long term low emission development strategy (Ministry of Environmental Protection and Agriculture of Georgia 2021) are rather aimed at public transportation then at the commercial transportation sector. The estimated impact on the sector is thus considered to be obvious (score 2) but not yet significant.	2
6	Alternative technologies in the form of electric or hydrogen propulsion are available but currently limited to passenger transport. To date the implementation seems perceptible but not yet a competition to conventional transportation technology on a larger scale (score 1).	1
7	Customer demand for the use of alternative concepts can be considered to be theoretical (score 0) with regard to the transportation sector.	0
8	Biodiversity is severely harmed both by the infrastructure (roads, railways) and the traffic (Bennett 2017).	0,5
9	There are many environmental problems connected to both infrastructure and traffic (Rodrigue & Comtois 2019).	0,5
10	There are known human rights issues for this sector (BSR 2011).	0,5
11	There are known social issues for this sector (BSR 2011).	0,5

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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Rodrigue, J.-P. & Comtois, C. (2019): The environmental impacts of transportation. In: The Geography of transport system (2019).

L Real Estate Activities

Assessment of ESG-Risk at Sector-Level

Date of Assessment: Q2 2022
Valid Until: Q1 2024

NACE Sector

L	Real Estate Activities		Scoring		Reference
Physical Climate Risk	Acute		2,0		1
	Chronic		2,0		2
Transition Climate Risk	GHG-Emission Contribution		3,0		3
	Transitional Intensity	Probability of regulatory Change	3	1,8	4
		Economic Impact of regulatory Change	2		5
		Technology Squeeze-out	1		6
		Customer/ Consumer Behavior	1		7
				2,4	
Other ESG Risks	Loss of Biodiversity		+	0,5	8
	Other Environmental Risks		+	0,0	9
	Possible Human Rights Issues		+	0,0	10
	Other Social Risks		+	0,25	11
				0,8	
ESG-Risk Score at Sector-Level:					5

Σ

Ref.	Explanation of the Assessment	Score
1	The exposure of the real estate sector to acute physical climate risk manifests itself in the form of damage and destruction of houses through extreme events (especially landslides, wildfires, flooding and storms, see Boland et al. 2022). Considering the status quo and forecasts for Georgia (e.g. EU4Climate (2021, 2), the effects should be considered as already being obvious (score 2) .	2
2	High temperatures will cause heat stress in both residential and office buildings (Hooyberghs et al. 2017 as well as Boland et al. 2022). The impact of chronic physical climate risk is thus also rated as also being obvious (score 2) .	2
3	The EU-Taxonomy (EU Technical Expert Group 2020, 12) lists this sectors GHG-emissions among the second highest. GHG-Emission Contribution is thus considered to be significant (score 3) .	3
4	In many sources, the real estate sector is considered in combination with the construction sector. Naturally, there are close ties between the two. The differentiation is especially, that the real estate sector has to carry the main burden of both energy costs and energy-efficiency requirements. The later are prominently featured in Georgia's 2030 Climate Change Strategy (Government of Georgia 2021, 49). Hence, the probability of regulation on the real estate sector should be considered significant (score 3) .	3
5	Again in accordance to Georgia's 2030 Climate Change Strategy (Government of Georgia 2021, 49), the impact of said regulation should be considered obvious (score 2) .	2
6	Alternative technologies in the form of sustainable heating systems are available, however the Fourth National Communication of Georgia (Ministry of Environmental Protection and Agriculture of Georgia 2021, 381) mentions the necessity of further efforts to implement these measures, so for now they are assessed as perceptible (score 1) .	1
7	No indication was found that customer demand for the use of sustainable housing and efficiency concepts can be considered to be more than also perceptible (score 1) at present.	1
8	Biodiversity is severely harmed by the extensive change in land use and surface sealing caused by the real estate sector. This is also confirmed by Georgia's Fifth National Report to the Convention on Biological Diversity (Ministry of Environment and National Resources Protection of Georgia 2015, 22)	0,5
9	n/o	0,0
10	n/o	0,0
11	Unsustainable space-planning practices and construction of inefficient/unsustainable buildings lead social problems in Georgia.	0,25

References:

Note: At the time of the ESG-risk assessment of this sector, the sources and references listed here contained information that we considered relevant and have used for the assessment and evaluation. However, especially the internet content can be subject to change. We cannot take responsibility for the content or security of the websites concerned.

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