Climate risks for Dutch tour operators

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Preface

Business risks due to a changing climate are the elephant in the room. Everyone sees it but no one talks about it. Fortunately, that is starting to change. And that's high time.

There have been warnings that these risks will become widespread and seriously threaten our prosperity for decades. A recent study estimated 143 billion dollars in damage per year worldwide due to global warming. Then we are talking about serious money. But it is also about human lives. The record heat of 2022 in the EU led to between 60,000 and 70,000 excess deaths.

Most sectors have no idea yet what the risks are for them. This not only concerns sudden physical risks due to a storm, heavy rainfall, or extreme heat waves, but also creeping risks. Think of less and less snow in popular ski areas, but also less and less wine culture because vineyards in holiday destinations such as France, Spain and Italy are disappearing due to drought. As a sector, tour operators are no exception to this rule. They too will start to feel the risks. By 2024, more than 30% of Dutch people will consider taking their holidays in regions or periods with fewer climate risks such as flooding and heat.

Tour operators face climate risks both for and due to their activities. The growing supply of air travel in particular increases the climate risks for themselves but also for other sectors. The sector is putting its business model under pressure. Fortunately, tour operators can do something about the causes of climate risks for everyone as well as the consequences for their sector.

This report gives them insight into their climate risks; a first step towards managing those risks. And that is in the interest of everyone who wants to enjoy a nice holiday in the future.

Piet Sprengers
Manager Sustainability Strategy and Policy ASN Bank

Summary

Reason
Tourism is vulnerable to climate change. Climate change is affecting tourism flows already and climate change will limit tourism in many destinations in the future. In addition, the tourism industry is struggling to meet its stated climate targets, particularly due to current volume-driven growth models. It is therefore likely that tourism companies, such as tour operators, will be increasingly exposed to climate risks.

Purpose and research questions
This study aims to identify climate risks for Dutch outbound tour operators. Climate risks are risks of accelerated loss of value and increases in stranded assets due to the effects of climate change. In this study, these climate risks are applied to the business portfolio of 199 Dutch tour operators. The report focuses on six research questions:

1. How do parties within the financial sector evaluate climate risks?
2. What are the climate risks of the product portfolio of Dutch tour operators according to financial sector experts?
3. What is the current business portfolio of Dutch tour operators?
4. To what extent do Dutch outbound tour operators depend on aviation for their current product offerings and sales?
5. What are the climate risks of the business portfolio of Dutch outbound tour operators?
6. What are implications of these climate risks from the perspective of tour operators and policymakers?

Approach
To find out what financial sector experts believe are the climate risks for tour operators, we used a combination of document analysis and semi-structured interviews. These financial experts identified 18 different climate risks categorised into 4 physical risks, 11 transit risks and 3 liability risks.

By **physical risks**, the researchers mean risks related to the direct (physical) impact of climate change on assets. These include risks such as loss of value due to damage and lost sales, damage to the health and well-being of customers and employees, destinations becoming unsuitable for (certain forms of) tourism in the future, and damage to and restrictions on the transport sector.

Transitional risks are risks associated with the transition to a more climate- and environmentally friendly economy. These include rising insurance premiums, repatriation costs and damages, increasing uninsurability of physical assets, higher solvency requirements, the carbon lock-in effect of (investments in) physical assets that depend on fossil fuels, dependence on fossil fuels to deliver the product, and the cost of CO_2 emissions. There are also consumer risks as destinations and product forms become less appealing to consumers. On the political side, there are risks from more stringent climate and environmental policies and the direct and indirect price effects of these. There are also risks posed by restrictions on fossil fuel advertising, loss of political support and reliance on a specific destination.

Liability risks are the risks of losses arising (in)directly from climate- or environment-related legal claims by or against an organisation, and related reputational damage when stakeholders and/or the public

associate the organisation with negative environmental impact. These include climate litigation to prevent loss of asset value and asset stranding, climate litigation challenging alleged greenwashing and inadequate climate action by companies, and reputational risks and loss of brand value as a result of climate litigation and reputational risks to industry peers.

Next, using a qualitative content analysis, the business portfolio of Dutch tour operators was analysed and scored on three climate risk levels (low, significant and high) based on five resilience factors, namely: revenue, revenue model, destination offering, preferred mode of transport and core proposition. Finally, to understand how the identified climate risks are viewed by the travel industry and policy makers, two group interviews were organised. In the report, the researchers developed a first version of a tool, the KLIM-ARISKSCAN. Using this tool, tour operators can estimate the climate risks of their own operations.

Conclusions

Dutch tour operators face significant climate risks. In particular, tour operators with destinations in their portfolio which are vulnerable to the effects of climate risks according to the *Climate Change Vulnerability Index for Tourism (CVIT)* and tour operators which show a high aviation dependence are at risk of value loss and stranded assets.

Most tour operators (165) are at significant risk (category ORANGE), 33 are at lower climate risk (category YELLOW) and 1 company is at higher risk (category RED).

Tour operators in the YELLOW risk category are typically in the low revenue category; have an asset-light revenue model; primarily offer destinations with a low CVIT score; do not use fossil-dependent modes of transportation; and have a core thematic proposition.

Tour operators in the ORANGE risk category typically use fossil-dependent transport modes only and/or offer destinations with medium/high CVIT scores based on a core geographic proposition. The tour operator in the RED risk category is vulnerable to liability risks; has an asset-heavy revenue model; has an average CVIT score; exclusively uses fossil-dependent transportation modes; and has a core proposition that combines theme and geography.

Tour operators can mitigate climate risks through operational or strategic interventions such as reducing airline dependence and marketing other lower-risk destination regions. However, this is not easy because tour operators consider such adjustments to come with a major commercial risk as long as consumer behaviour remains unchanged. Tour operators indicate that such a transition will only happen due to outside pressure.

To this end, national policymakers must get to work on facilitating tour operators to make outbound tourism less aviation-dependent through, for example, a distance-based aviation tax, a legally defined CO_2 cap for Dutch airports and a ban on fossil advertising. Possible international policy interventions include an international tax on kerosene and tightening the European emissions trading system. Only then will it become easier for tour operators to invest in a sustainable transition.

Follow-up

KLIMARISKSCAN_v1 is a useful tool which allows businesses and policy makers to understand climate risks for tour operators and tourism in general through a quick scan. KLIMARISKSCAN can help companies and policy makers to make climate action an integral part of strategy and policy-making, thus improving the future resilience of tourism.

KLIMARISKSCAN_v1 is well suited for further refinement and development into a more complete tool that allows policy makers and businesses to identify climate risks for different types of tourism activities. The tool can thus be developed into a fully-fledged climate risk model for tourism.


INSIDE

Key findings

- Climate risks are risks of accelerated loss of value and stranding of assets due to the effects of climate change. Little is known yet about climate risks for Dutch tour operators (and for tourism businesses in general).
- Therefore, this report develops KLIMARISKSCAN, a tool that maps the extent to which companies are exposed to climate risks.
- KLIMARISKSCAN uses three risk categories here – which is common practice when rating risk scores -: a lower risk category (YELLOW); a significant risk category (ORANGE); and a high-risk category (RED).
- We applied the first version of this tool - KLIMARISKSCAN_v1 - to a sample of 199 Dutch tour operators affiliated with the Algemene Nederlandse Vereniging voor Reisorganisaties, abbreviated as ANVR, the Dutch Association of Travel Organisations. All these companies operate in the leisure industry.
- To develop KLIMARISKSCAN and apply it to the above sample, we answer the following research questions:
  a. How do parties within the financial sector evaluate climate risks? (chapter 3);
  b. What are climate risks for the business portfolio of Dutch tour operators according to financial sector experts (chapter 4);
  c. What is the current business portfolio of Dutch tour operators? (chapter 5)
  d. To what extent are Dutch tour operators dependent on aviation (chapter 5)?
  e. What are the climate risks for the business portfolio of Dutch tour operators? (chapter 5)
  f. What are the implications of these risks from the perspective of tour operators and policy makers (chapter 6).

a. Climate risk assessment in the financial sector (chapter 3)

- European and Dutch financial sector policies seek integrated climate risk management based on *Environmental Social Governance (ESG)* policy frameworks.
- The financial sector is increasingly aware of climate risks within its portfolio but still insufficiently able to apply integrated climate risk management within their operations.
- Methodological and governance constraints and the central banks' mandate inhibit integrated climate management in the financial sector.
- Central banks' primary objective is to ensure price stability in the current economy. This limits the willingness of money makers to provide incentives to financial institutions that drive systemic transitions and mitigate climate risks to the future economy.
- Dutch financial institutions will increasingly use ESG criteria when assessing funding requests to comply with national and European policy frameworks.
- It is valuable for tour operators to have their own understanding of the climate risks applicable to their business, as one has to report on these risks to any financiers in a transparent manner.

b. Climate risks applicable to business portfolio tour operators (chapter 4)

- Financial sector experts identify 18 different climate risks applicable to tour operators, which KLIMARISKSCAN categorises into 4 physical risks (A); 11 transit risks (B) and 3 liability risks (C).

- **Physical risks** (A) are risks related to the direct (physical) effects of climate change on assets. They include: loss of value through damage and loss of sales (A1); damage to the health and well-being of customers and employees (A2); destinations becoming unsuitable for (certain forms of) tourism in the future (A3); and damage and restrictions to the transport sector (A4).
- **Transition risks** (B) are risks related to the financial losses a company or institution may incur in the transition process to a climate and more environmentally friendly economy. These include: rising insurance costs & increasing uninsurability of tangible assets (B1); higher repatriation & indemnification costs and stricter solvency requirements (B2); carbon lock-in effect of (investments in) tangible assets dependent on fossil fuel (B3); dependence on fossil fuel to deliver the product (B4); CO_2 emissions (B5); destinations becoming less attractive to consumers due to the effects of climate change (B6); product types losing appeal among consumers (B7); stricter climate & environmental policies and related direct and indirect price effects (B8); curbs on fossil advertising (B9); loss of political support (B10); and destination lock-in (B11).
- **Liability risks** (C) are risks related to losses arising (in)directly from climate or environment-related legal claims by or against an organisation and related reputational damage when stakeholders and/or the public associate the organisation with negative environmental impacts. This includes: climate lawsuits to prevent loss of asset value and asset stranding (C1); climate lawsuits challenging alleged greenwashing and inadequate climate action by companies (C2); and reputational risk and loss of brand equity as a result of climate lawsuits and risks to negatively impact peers (C3).
- Physical risks and especially transition risks may lead to liability risks.

c. Business portfolio of Dutch tour operators (chapter 5)

- To score the extent to which tour operators are exposed to the 18 climate risks, KLIMARISK_v1 takes five characteristics of the business portfolio of Dutch tour operators that characterise a company's resilience as a starting point: revenue; revenue model type; destination offerings; preferred mode of transport; and core proposition. These five resilience factors are based on the widely used canvas business model.
- **Revenue**. KLIMARISKSCAN_v1 divides the 199 tour operators in the sample into 3 revenue categories: low (€250,000 - €6.5 million); medium (€6.6 million - €75 million); and high (€76 million - €1.4 billion). Based on this distribution, 85% of the companies are in the low revenue category; 13% in the medium category; and 2% in the high category.
- **Type of revenue model**. KLIMARISKSCAN_v1 distinguishes between *asset-light; asset-medium; and asset-heavy revenue models*. Companies with asset-light revenue models operate tangible assets such as aircraft, hotels, and cruise ships indirectly, for example through *allotment contracts*; companies with asset-heavy revenue models operate such capital-intensive assets with typically long depreciation periods directly. Asset-medium companies combine asset-heavy and asset-light in their revenue models, but without having the aforementioned capital-intensive assets on their balance sheets. Based on this distinction, 83% of the sample companies have an *asset-light revenue model*; 8% *asset-medium*; and 7% *asset-heavy*.
- **Destination regions**. KLIMARISKSCAN_v1 rates climate risks for destination regions using the *Climate Change Vulnerability Index for Tourism (CVIT)*. Percentages represent the number of companies in the sample offering these destination regions. Destination regions with a low risk level are Northern Europe (54%); Central & Eastern Europe (48%); and Western Europe (69%). Destination regions with a medium risk level are Mediterranean (53%); Southern Europe (68%); Southeast Europe (68%); North America (44%); South America (43%); Oceania (31%); Central Asia (26%); North & Northeast Asia (37%); Southeast Asia (49%). Destination regions with high and very high risk levels are the Caribbean (38%); Central America (34%); North Africa (41%); Central Africa (27%); South Africa (50%); Middle East (42%) and the Indian Ocean (35%). The polar regions are excluded from the CVIT. Destinations

within Europe are generally less vulnerable to the effects of climate change than destinations outside Europe.

- **Preferred mode of transport**. KLIMARISKSCAN_v1 uses distance as a proxy for transport mode choice. Further journeys generally require the use of aviation as a means of transport. On the other hand, aviation makes it possible to offer more distant regions as a destination. 19% of the sample companies exclusively offer destinations closer to the home market (<2000 km); 26% exclusively further away (>2000 km); and 55% have offerings in both categories.
- **Core proposition**. KLIMARISKSCAN_v1 takes a company's core proposition - the translation of its product offerings to a specific target group and the associated market positioning - as a proxy for the extent to which a tour operator is tied to particular destination regions. 48% of the sample firms have a geographically bound core proposition; 14% a thematic core proposition; 39% a combination of both.

d. Aviation dependence of Dutch tour operators (chapter 5)

- About 46% of tour operators in the sample currently exclusively use aviation for transport, regardless of distance. 36% use aviation and other means of transport; 10% do not use aviation.

e. Climate risks in the business portfolio of Dutch tour operators (chapter 5)

- Based on the five resilience factors, KLIMARISKSCAN_v1 scores the sample tour operators on the 18 identified climate risks as follows (scores are averages): 33 companies (17%) in the YELLOW risk category (lower climate risk); 165 companies (83%) in the ORANGE risk category (significant climate risk); 1 company in the RED risk category (higher climate risk).
- Tour operators in the YELLOW risk category tend to be in the low revenue category; have an *asset-light revenue model*; mainly offer destinations with a low CVIT score; do not use fossil-dependent modes of transport (cruise ships; aircraft); and have a thematic core proposition.
- Tour operators in the ORANGE risk category typically exclusively use fossil-dependent transport modes and/or offer destinations with a medium/high CVIT score based on a core geographical proposition.
- The tour operator in the RED risk category is vulnerable to liability risks; has an asset-heavy revenue model; has an average CVIT score; uses fossil-dependent transport modes only; and has a core proposition that combines theme and geography.
- A limited number of tour operators are currently vulnerable to liability risk (excluding reputational risk).
- A higher level of exposure to physical and transit risks is mainly due to:
    1. The use of fossil-dependent transport modes;
    2. Providing destinations vulnerable to the physical impacts of climate change;
    3. Adopting a geographically bound core proposition.
- Using fossil-dependent transport modes and offering destinations vulnerable to the physical effects of climate change perpetuate each other and create aviation dependence (a type of carbon lock-in). Destinations with higher CVIT risk scores can usually only be operated (cost-effectively) using aviation due to the greater distance from the home market.

f. Implications of climate risks according to tour operators and policy makers (chapter 6)

- For the time being, the identified climate risks will not lead to changes in the revenue model of tour operators which are largely dependent on aviation.
- Tour operators know that they need to drastically reduce their CO_2 emissions and that flying less is therefore inevitable. However, they see such an adjustment of their product portfolio as a commercial risk: as long as consumer behaviour does not change and people continue to demand using flights for their holidays, and as long as offering air holidays generates more than the cost of climate-related damage, they will continue to fly travellers from The Netherlands to destinations that are vulnerable to the effects of climate change. They suggest that more external pressure is needed to trigger this change.

- Politicians expect that more pressure from the government will not automatically break the wait-and-see attitude of market players and it will not encourage companies to make the necessary change. In their view, this will certainly not happen if there is a 'policy lock-in' - as in the case of The Netherlands regarding the growth of Schiphol Airport - where the government for a long time facilitates something that it knows to be a constraint. As market participants invest heavily in the facilitated policy, the inevitable intervention automatically becomes disruptive and problematic. If the government facilitates less and checks more regularly whether emerging developments are in the public interest, the thinking goes, it will be easier for companies to plan investments (for the transition).

Content

Tables and figures

1. Introduction

This study focuses on climate risks faced by Dutch tour operators. Climate risks are the risks that climate change poses to the functioning of the economy (European Central Bank, 2023). Climate change has an impact on (the value) of the monetisable assets of companies and thus on the portfolios of financial institutions. Climate change can cause these assets to become stranded if they lose their value before the end of the expected payback period due to changes in laws and regulations, market conditions, social norms or natural disasters (Generation Foundation, 2013).

Tourism is vulnerable to climate change (UNEP, 2023). *The Tourism Panel on Climate Change (TPCC*) notes in its 2023 *stocktake* that climate change is already having an impact on tourism flows, within Europe for example (see Matei et al., 2023), and that climate change will limit tourism development in many destinations in the future. In addition, the panel concludes that tourism, aviation and the cruise industry will not meet the net-zero targets that have been set (TPCC, 2023). Current volume-driven growth models and intertwined political, technological, social, and corporate conventions make the required transformation extremely unlikely (see, for example, Gössling et al., 2024; Kalbekken & Victor, 2022; Lenzen et al., 2018;). It is therefore plausible that tourism businesses, such as tour operators, are increasingly exposed to climate risks.

Research on climate risks for tourism businesses is growing, but is still quite limited. Since the *Generation Foundation* introduced the concept in 2013, there has been growing attention to climate risks and stranded assets in sustainability transition literature (see e.g. Bos & Gupta, 2019; Caldecott et al., 2021; Daumas, 2023) and in grey literature focused on the financial sector (see e.g. Clapp et al., 2017; EBA, 2019; ECB, 2020). In tourism literature, such research is still in its infancy (see Steiger et al., 2023). Most research adopts a geographical focus and is limited to the implications of climate risks for specific destination regions from a planning perspective (see e.g. Fang et al., 2022; Navarro-Drazich et al., 2023; Rutty et al., 2022). To our knowledge, climate risks for tour operators have not yet been studied.

Tour operators are companies that put together and sell package holidays (EU, 2024). This distinguishes tour operators from travel agencies, which act solely as (re)sellers. However, industry blurring has made this distinction less obvious. Tour operators can play an important role in redirecting tourism flows and encouraging consumers to make more sustainable holiday choices (Buijtendijk et al., 2018). Tour operators can therefore make tourism more or less vulnerable to climate risks. At the same time, if tour operators expose themselves to climate risks, they may find it more difficult to obtain financing in the future. This, in turn, affects their ability to maintain or change their current business portfolio (the current product offerings and underlying business models).

This study therefore aims to identify the climate risks for Dutch outbound tour operators. The Netherlands is of interest because tour operators here can draw on a comparatively large market with a high holiday intention (16.3 billion euro revenue in 2019; holiday intention 85% by 2024) and because the Algemene Nederlandse Vereniging voor Reisorganisaties (ANVR), as an industry association, has a global ambition to be a pioneer in putting more sustainable tourism on the agenda (NBTC, 2024; NRIT, NBTC & CELTH, 2022; ANVR, 2024). We identify climate risks for Dutch tour operators by developing a checklist to map tour operators' exposure to climate risks: KLIMARISKSCAN. We then apply KLIMARISKSCAN to the business portfolio of Dutch tour operators. To this end, we answer the following research questions:

OV1 How do parties within the financial sector evaluate climate risks?
OV2 What are the climate risks of Dutch tour operators' product portfolio according to financial sector experts?
OV3 What is the current business portfolio of Dutch tour operators?
OV4 To what extent are Dutch outbound tour operators dependent on aviation for their current product offerings and sales?
OV5 What are the climate risks of the business portfolio of Dutch outbound tour operators?
OV6 What are implications of these climate risks from the perspective of tour operators and policy makers?

KLIMARISKSCAN can help the travel industry in The Netherlands and abroad to understand and mitigate climate risks in business operations. In addition, KLIMARISKSCAN offers policy makers insights into the long-term perspective and resilience of this economic sector when it comes to the green transition of the European tourism ecosystem as part of EU industrial policy (see European Commission, 2022). This report is structured as follows. After the methodological justification (chapter 2), we look at how climate risks are assessed within the financial sector as a starting point for the development of KLIMARISKSCAN (OV1) in chapter 3. Chapter 4 identifies relevant climate risks for tour operators (OV2). Using this input in chapter 5, we develop KLIMARISKSCAN, apply a first version of the checklist to Dutch tour operators and present the climate risks in the business portfolio of these companies (OV3-5). Chapter 6 includes a sector and policy perspective on these climate risks (OV6). In chapter 7, we wrap up with the conclusion and make some recommendations for follow-up research.

2. Method

Little is still known about climate risks for tour operators. There is no developed academic literature to draw on. In addition, identifying climate risks for tour operators requires input and expertise from different fields, such as finance; economics and environmental science; tourism; and policy.

We therefore chose an exploratory, *mixed-methods*, research design for this study (see also Molina-Azorín & Font, 2016) and used a combination of quantitative and qualitative data collection tools: document analysis and semi-structured interviews; quantitative content analysis; and group interviews (workshop). We used the document analysis and semi-structured interviews and the quantitative content analysis to develop a climate risk checklist for tour operators (KLIMARISKSCAN) and apply it to a sample of Dutch tour operators (OV1-5). We used the group interviews (workshop) to understand the policy implications from a travel sector and policy perspective (OV6). These methodological steps are explained in further detail below.

2.1. Document analysis and semi-structured interviews

To find out how climate risks are evaluated within the financial sector (OV1) and what financial sector experts believe are climate risks for tour operators (OV2), we used a combination of document analysis and semi-structured interviews. For the document analysis, we drew on a combination of academic and grey literature on climate risks and stranded assets in relation to the financial sector. Input from this literature guided the *interview guide* that served as the basis for the semi-structured interviews (see Appendix I).

Semi-structured interviews are an appropriate means of exploring a complex topic from the specific expertise of respondents, as it provides structure to the conversation but also allows for flexibility within which the interviewer and the respondent can examine a complex topic from multiple angles based on the expertise of the latter (see also Beard et al., 2016). Interview respondents were purposively approached, based on their expertise in relation to the research topic, as part of a select sample (Creswell & Poth, 2018). We intended to conduct 5-7 interviews with different types of financiers who held positions with Dutch tour operators or who were employed in the industry in the recent past (including representatives of private equity (PE) funds; banks and private investors). As we were unable to find representatives of PE funds and private investors willing to collaborate, we expanded the sample to include financial sector experts (academics and journalists) with knowledge in the field of climate risks for assets within tourism (see table 1).

Respondent #	Description	Interviewer	Date
R1	Financial sector	A	19-6-2023
R2	Financial sector	B	27-6-2023
R3	Climate journalist	A	28-6-2023
R4	Tourism sector	A	1-9-2023
R5	Scientist	A	13-9-2023
R6	Tourism sector	B	6-10-2023

Table 1 Respondents interviews

The second and third authors of this report conducted the interviews. The aforementioned *interview guide* consisted of four topics: (1) perceived, different types of climate risks for assets in general; (2) criteria, current and future legal requirements and tools to determine and evaluate climate risks for assets; (3) perceived climate risks for specific tour operator assets; and (4) current and proposed ways to determine and evaluate climate risks of tour operator assets. The interview guide was not shared with respondents in advance. Interviews were conducted online via *Microsoft Teams*, in Dutch. Interviews lasted 19-63 minutes (with 39 minutes as the average). During the interviews, respondents had flexibility to deviate from the questions based on their own expertise, in line with the principle of semi-structured interviews. All interviews were recorded, with respondents' consents, using *Microsoft Teams*. Interviews were fully transcribed using the transcription software *TRINT* and *Amberscript*. The transcripts were then manually coded (open coding) to identify themes and segment the data. After identifying the themes, the data was triangulated with the findings of the literature review and compiled into a list of **identified climate risks for Dutch tour operators** (see Appendix II).

2.2. Quantitative content analysis

To understand the current business portfolio of Dutch tour operators (OV3); the aviation dependence of this portfolio (OV4); and the climate risks applicable to this portfolio (OV5), we used a quantitative content analysis (KCA). A KCA is a systematic content analysis of documents and text, based on predefined criteria (Bryman, 2016). For the KCA, we used a list of 277 travel organisations (tour operators and non-tour operators) from the Algemene Nederlandse Vereniging van Reisorganisaties (ANVR). This list was manually vetted based on a website check. Criteria for exclusion were: a non-working website or unclear product offerings; travel organisation for business and/or school trips; bankruptcy/administrative reasons (duplicate entries on list/inactive trade names). This resulted in a sample of 199 ANVR member tour operators active in the leisure segment (N=199).

We then set up a coding scheme to collect company-specific data on the tour operators in the sample. Such a coding scheme is an essential part of KCA (Bryman, 2016). The coding scheme was prepared in Excel (see Appendix III). Data was collected online, manually from the websites of tour operators within the sample and imported into Microsoft Excel. Frequency tables by code were created for analysis. Given the exploratory nature of the study, the data was analysed using descriptive statistics in Microsoft Excel, categorised and assigned one of three climate risk levels (YELLOW/lower; ORANGE/significant; RED/higher) based on **five resilience factors**, as described in detail in chapter 5.

2.3. Group interviews (workshop)

Finally, to get a picture of how the identified climate risks are viewed by the travel sector and by policy makers (OV6), we organised two group interviews (sessions I & II). The participants in these group interviews consisted of employees, managers and directors/owners of travel organisations (session I) and national policy makers in the field of tourism and international mobility (session II).

2.3.1. Session I

This group interview had the character of a workshop and took place on 6 November 2023 in Utrecht. The aim of this workshop was to engage with tour operators to find out what impact the identified climate risks have on their business portfolio through a conversation about the potential impact of these risks on their business model. Workshop participants were pre-selected by ANVR to ensure a diverse a range of tour operator types. Four tour operators were represented, in addition to an airline ticket specialist and two advocates (see table 2).

Participant number	Description	Number of persons
DLN-1	Tour operator	1
DLN-2	Tour operator	1
DLN-3	Tour operator	1
DLN-4	Tour operator	1
DLN-5	B2B airline ticket specialist	1
DLN-6	Interest representative	2
DLN-6	Interest representative	1

Table 2 Participants session I

At the start, participants were first given an explanation of the research project, including the identified climate risks for tour operators that had emerged from the quantitative content analysis and interviews. Then, using the online platform *Wooclap*, participants were asked to answer some questions regarding the nature of their organisation, their product portfolio and the extent to which their organisation is aviation-dependent. Finally, over two hours were spent mapping the impact of physical risks, transit risks and liability risks. Here, using *Wooclap*, the participants were asked 12 questions. The first four questions probed what actions tour operators should take to address a specific risk. The next eight questions asked participants to describe how those actions would impact the business model of the tour operator they represented.

With permission from the participants, an audio recorder was used to record the workshop. For qualitative analysis, the answers and comments of the workshop participants were coded in *MAXQDA24*. These included answers and comments formulated by participants on their mobile phones or tablets in *Wooclap*, as well as notes from two note-takers present. Central to the *MAXQDA24* coding was the *Canvas Business Model* (Osterwalder & Pigneur, 2010). By linking the answers and comments to the different segments of the Canvas Business Model, it becomes clear how, according to the workshop participants, the impact of climate risks is distributed across relevant segments: *key partners, key activities, key resources, value propositions, customer relationships, channels, customer segments, cost structure* and *revenue streams*. The findings of this analysis are described in chapter 6.

2.3.2. Session II

This group interview was similar to a discussion and took place on 14 November 2023 in The Hague. The aim of this discussion was to find out how national policy makers view the identified climate risks for tour operators and what they think are the policy implications of these risks. Participants in this session were selected in advance in consultation with the Ministry of Infrastructure and Water Management and the Ministry of Economic Affairs (see table 3). With permission from the participants, the session was recorded with an audio recorder.

Participant	Area of expertise
Participant 1	Financing Sustainable mobility
Participant 2	Sustainable mobility
Participant 3	Aviation Economics

Table 3 Participants session II

At the start, participants in this session were also provided with an explanation of the study beforehand, including a presentation of the identified climate risks for tour operators. They were also given some insights into tour operators' responses to these identified risks from the first session. They were then asked for their reaction and asked about current policy instruments in relation to outbound tourism and possible policy instruments for the future. Based on this input, a comprehensive summary of the discussion was made using the audio recordings. This was submitted by email to all participants noting that they could freely make changes or add comments to the document. Using this input, a final report was prepared, as described in Chapter 6.

3. Climate risk management in the financial sector

In this chapter - based on literature and insights gained from interviews with financial sector experts - we look at how parties within the financial sector evaluate climate risks. In doing so, we address research question 1.

Overall, the experts interviewed see loss of value and asset stranding due to climate change and linked climate policies and legislation as the main climate risk for the financial sector (R1; R2; R5).

> *"The biggest concern of banks worldwide is actually that they will end up with 'stranded assets'. So yes, let's say the credits that are actually becoming much less valuable because of climate change and the environmental legislation to counter that." (R1)*

The financial sector is therefore coming under increasing pressure to identify their vulnerability to climate risks and to contribute to the transition to a low-carbon economy through sustainable finance. The financial sector is also increasingly required to report publicly on these efforts (Campiglio et al., 2018). This may therefore have implications for the portfolio composition of financial institutions and therefore the finance-ability of specific economic (sub-)sectors in countries, such as Dutch tour operators. However, financial institutions often have little insight into the extent to which their portfolio is exposed to climate risks and cannot properly assess these risks (ibid.).

Below, we first explain how the European Union (EU) and The Netherlands deal with climate risks in the financial sector in policy terms (2.1). We then discuss some of the challenges for managing climate risks in the financial sector (2.2) and wrap up with a brief conclusion addressing the implications for tour operators (2.3).

3.1. European and Dutch climate risk policies for financial institutions

To get climate risk management on the financial sector's agenda, the *Network of Central Banks and Supervisors for Greening the Financial System* (NGFS), was established in 2017: a global network of central banks and supervisors who voluntarily exchange best practices on climate risk management and seek to mobilise financial flows for the transition to a low-carbon economy (NGFS, 2023).

Against this background, there is a policy emphasis within the EU on integrating climate risk management into the overall operations of the financial sector (Janssen & Linger, 2021). For instance, the European Central Bank (ECB) (2020) considers climate risks as part of its own broader *Environmental Social Governance* (ESG) and *sustainable finance policy framework*. ESG criteria should enable financial institutions to determine the sustainability of investments (DNB, 2023). This policy framework should therefore do better justice to sustainability goals than traditional benchmarks and methodologies (see European Commission, 2018). The ECB recognises that the direct effects of climate change can harm the real economy and the financial system (physical risks) and, alongside this, expects the financial sector to accompany the transition to a low-carbon and circular economy with opportunities and risks (transition risks) (ECB, 2020).

> *"The primary overarching problem is that climate change may lead to us not being allowed to do certain things anymore. So that we are going to decide, politically, that certain things are no longer allowed, that they are going to become so expensive, because we are going to price them so that nobody wants them anymore, or that they become physically inaccessible or impossible because of climate change." (R5)*

The ECB aims to manage climate risks by including climate risks in the risk assessment of monetary policy operations; by conducting climate stress tests; and by improving the models it uses to identify the impact of climate change on the economy (ECB, 2023). In addition, within the above ESG framework, the ECB wants to ensure that banks manage climate risks (ibid). For instance, the European Banking Authority (EBA) expects banks to factor climate risks into their strategy and risk management and to report on climate risks and, to this end, regularly apply a climate stress test for banks which is to be developed by the EBA (EBA, 2019).

Such a stress test is a widely used method to assess the vulnerability of financial institutions to climate risks (Caldecott et al., 2021). In 2022, the ECB applied the aforementioned climate stress test to European banks. Banks had to report on their own capacity to stress test; their reliance on fossil-dependent sectors; and their presentations under different (climate) scenarios over different timeframes. Managing and reducing fossil fuel emissions is an important criterion here, for which more and more banks also set specific targets (R1; R2). The results of the stress tests show that although banks report more extensively on climate risks, they do not yet have a solid framework to perform stress tests for climate risks and also lack relevant data for this purpose (ECB, 2022).

> *"We do not have an infinite supply of fossil fuels, so we will have to do something about that. On the other hand, we also see that fossil fuels have an emissions problem so we think that should be reduced. So, we have also inititated activities on scope 1, scope 2 and scope 3 to reduce that." (R2)*

In The Netherlands, De Nederlandsche Bank (DNB, the Dutch central bank) commissioned research on climate risks to the Dutch financial sector. (See Regelink et al., 2017; Schotten et al., 2016). Both studies show that climate change is already having an impact on the functioning of the Dutch economy. According to a recently published climate risk management guideline, the Dutch financial sector is aware of climate risks in their portfolio, but financial institutions need to do more to manage climate risks in an integrated way (as part of their regular business operations) (see DNB, 2023). Integrated climate risk management

requires more attention from financial institutions to business models and strategies; governance structures; risk management organisation; and disclosure (reporting). In the guidance document, DNB provides examples of good practice for each focus area and notes that its own guidance needs to be further defined in order to better support institutions on their journey (ibid).

3.2. Challenges for climate risk management in the financial sector

The proposed solution of integrated climate risk management is not without its challenges. For instance, it is important that a climate risk analysis is more than a snapshot and also provides a picture of an institution's ability to adapt to future climate risks (Clapp et al., 2017). Such an approach requires, among other things, that financial institutions make adjustments in their risk management process (risk identification; risk assessment; risk mitigation; risk monitoring) and collect relevant climate risk data (Janssen & Linger, 2021). This is complex, as we see, for example, when conducting so-called climate stress tests - methods that map the extent to which a finance portfolio is exposed to climate risks (Campiglio et al., 2018). Climate stress tests are currently insufficiently integrated within financial institutions, partly due to the lack of reliable methods and the necessary data to properly conduct such tests (European Central Bank, 2022).

In addition, there are methodological and managerial limitations to integrated climate risk management. Many climate scenario models used by the financial sector underestimate climate risks: remaining carbon budgets may be smaller and physical climate risks may develop faster (Trust et al., 2023).

> *"The world has not behaved according to the benchmark for 10 years, so there is a kind of strange situation where, also from a regulatory point of view, investors are doing a kind of risk diversification and working with a kind of risk models that are actually outdated or very much based on the past. And there are no good ways yet to incorporate these climate risks into the models. So they are basically just continuing with business as usual, but they are also perpetuating a system that is in part causing climate change." (R5)*

Climate scenario models are often interpreted too literally and out of context, and can lead to groupthink (e.g. when financial institutions hide behind the conservative compromises of the NGFS), placing too much emphasis on optimistic modelling results without critically examining the underlying assumptions (Trust et al., 2023).

3.3. Implications for tour operators

So, what does this mean for economic sectors and companies such as tour operators? At first glance, not much at all. The financial sector is increasingly aware of climate risks within its portfolio but financial institutions are still insufficiently capable of applying integrated climate risk management based on ESG frameworks in their business operations and reporting on this publicly. Besides methodological and managerial challenges, the mandate of central banks can hamper the implementation of effective ESG. Central banks' primary objective is to ensure price stability (DNB, 2024). They are bound by this mandate and its interpre-

tation and shaping by politicians, policy makers and the financial sector itself. The mandate to ensure price stability in the present may cause friction with the willingness of these money-makers to provide incentives for financial institutions to drive systemic transitions and mitigate climate risks to the future economy, for example by integrating effective climate risk management into the financial sector (Campiglio et al., 2018).

Nevertheless, action is required. Indeed, despite the situation outlined above, Dutch financial institutions will increasingly use ESG criteria when assessing financing requests to comply with national and European policy frameworks. It is therefore valuable for tour operators to have their own understanding of the climate risks applicable to their business, so that they can report on this to possible financiers and apply climate risk management themselves within their operations.

> *"Basically, you just want to be able to present a very clearly defined ESG policy to your bank, to your employees, to your owners. And if you have it then it yields interest rate discounts, it yields lower wage demands from employees, it yields low staff revenue, it yields more support from NGOs and from governments. And if you don't have it, it is exactly the opposite. So, it [in the ESG policy] has to have sustainability ambitions in it and that means, in broad terms, more train travel and less air travel and the air travel you do make, yes, it has to be in the most economical aircraft possible and in the most economical accommodations possible.... You just have to have an ESG policy. It has to show ambition, it has to be thought through and it has to be measurable, the progress has to be measurable, you just have to have that" (R1).*

In the next chapter, we will therefore look more closely at the climate risks for Dutch tour operators.

4. Climate risks for tour operators

In this chapter, based on literature and insights gained from interviews with financial sector experts, we identify 18 climate risks for tour operators included in the KLIMARISKSCAN, as summarised in Appendix II. These climate risks are divided into three categories: physical risks ('things that can no longer be done due to climate change') (A1-A4); transition risks ('things that cannot be done due to climate change or that people no longer want') (B1-B11): and liability risks (C1-C3). The climate risks are set out below with references (in bold) to them. In doing so, we answer research question 2.

How and to what extent tour operators are exposed to climate risks is partly determined by their chosen business model. Climate risks for so-called asset-heavy tour operators (tour operators with many tangible assets on the balance sheet) are considered higher and different in nature from climate risks for asset-light tour operators (tour operators with few tangible assets on the balance sheet) (R1; R2; R3).

> *"The moment you own aircraft that are no longer allowed to land at certain airports while you do have to pick up or take your travellers there, you have a problem. Then such an aircraft is actually worth nothing to your tour operation and then you are dealing with a stranded asset" (R1)*

The observation that asset-heavy tour operators face greater and different climate risks than asset-light tour operators is also found in literature, for example when it comes to the financial risks surrounding the COVID-19 pandemic (see Poretti & Yoonjoung Heo, 2021). This chapter is structured as follows. In paragraphs 4.1 and 4.2, we elaborate on physical and transit tourism risks as they apply to tour operators. In 4.3, we address the resulting liability risks.

4.1. Physical climate risks

Physical risks are risks related to the direct physical impacts of climate change on assets (Caldecott et al., 2021). The financial sector, particularly due to its dependence on infrastructure and transport, sees tourism as vulnerable to the effects of climate change and exposed to significant physical risks (European Central Bank, 2020). Deutsche Bank wrote a report on this back in 2008 (see Ehmer et al., 2008). Physical risks are incidental or chronic in nature. Incidental physical risks apply when assets are at risk of being exposed to, for example, natural disasters (forest fires), floods or extreme weather (storms, precipitation).

Chronic physical risks revolve around structural effects of climate change, e.g. sea level rise, drought, or soil erosion. (Campiglio et al., 2022; European Central Bank, 2020). Assets can become stranded if the effects of climate change lead to direct, irreparable damage or make it difficult to continue operating these assets, for example, when climate change impacts the supply chain, regional infrastructure or labour availability (Caldecott et al., 2021). Exposure to physical risks thus lead to losses for firms and the financial sector (Janssen & Linger, 2021).

Coastal and winter tourist destinations in particular, due to their dependence on weather conditions and environment, are at risk of losing value and stranding assets (Caldecott et al., 2016). Extreme weather conditions in coastal tourist regions, for example, can damage real estate (hotels and resorts), while sea level rise can render these assets useless over time. Resulting repair and (preventive) adaptation costs have the effect of reducing the value of these properties (Arabadzhyan et al., 2021).

> *"If you offer beautiful resort tours and beautiful resorts and they fill up with water, yeah that's just obviously a pretty obvious risk then." (R3)*

> *"Particularly when it comes to hotels that are in areas that, yes, will suffer and are already suffering greatly from global warming." (R4)*

Tour operators that own physical assets in destinations vulnerable to incidental or chronic exposure to the physical impacts of climate change, or that depend on the operation of these assets, are thus at risk of experiencing increasing damage, loss of value of these assets, and loss of revenue (**A1**). These tour operators are also at risk of exposing their customers (and employees) to these impacts, and in the process directly or indirectly harming their health and well-being (**A2**) (see also Amelung & Moreno, 2012; Scott et al., 2019). Ultimately, tour operators will also have to take into account the risk that destinations that are most vulnerable to climate change and where climate adaptation capacity is limited (see Scott et al., 2019) will become unsuitable for (certain forms of) tourism in the future and thus can no longer be offered (**A3**).

Finally, tourism is by definition dependent on infrastructure and transport (Peeters, 2017). The physical effects of climate change impact the use and operation of road and rail networks, waterways, aircraft and airports, among others, for example through fluctuations in maintenance and repair costs (Chen & Wang, 2019; Koetse & Rietveld, 2009; Tillema et al., 2021). Structural adaptation of these facilities to climate change are often complex and expensive (ibid.). The extent to which a destination is able to effectively implement these adaptations varies by country and depends, among other things, on socio-political conditions (Scott et al., 2019). Tour operators offering destinations vulnerable to the effects of climate change are thus at risk of damage and disruption related to the use and operation of road and rail networks, waterways, aircraft and airports (**A4**).

4.2. Transition risks

Transition risks are risks related to the financial losses a company or institution may suffer in the transition process towards a climate and more environmentally friendly economy (European Central Bank, 2020). Cuts in the amount of greenhouse gases that countries and sectors are allowed to emit in order to limit

global warming to the temperature limit agreed upon in the Paris Climate Agreement may lead to fossil fuel resources that can no longer be (optimally) exploited (Caldecott et al., 2021). Transition risks stem from stricter climate policies (e.g. CO_2 taxes), changes in technology (effective climate policies make low-carbon technologies cheaper) and reduced public support among consumers and politicians for fossil-dependent products and services (Semieniuk et al., 2021). Assets associated with the mining, processing, burning, or use of fossil fuels or that are insufficiently energy-efficient are therefore at increased risk of falling sharply in value or becoming stranded (European Central Bank, 2020).

In the case of tour operators, we find transition risks in particular for tour operators that have become (largely) dependent for their sales on (4.2.1) the operation of fossil fueled transport modes without a realistic, scalable decarbonisation pathway (aircraft; cruise ships) and (4.2.2) the delivery of their products to destinations that may be too far from the home market for a realistic low-carbon transport alternative and that may be vulnerable to the physical impacts of climate change. This carbon and destination dependency is often intertwined and can lead to tour operators and the travel industry as a whole losing public support, as external actors increasingly see the sustainability claims of certain companies as implausible (4.2.3).

4.2.1. Transport

Transport is seen as a sector that could be impacted by the transition to a low-carbon economy (Daumas, 2023; European Central Bank, 2020) and tourism and transport are intrinsically linked (Peeters, 2017). (Inter)national policies aiming at CO_2 emission reductions may affect the price and thus the consumption of air travel (Caldecott et al., 2016). Stricter climate and environmental policies, such as, for example, the direct or indirect pricing of greenhouse gas emissions from aviation (R3), and related price effects represent a key transition risk for tour operators (**B8**). Here, CO_2 emissions are the most important (**B5**), as the Paris Climate Agreement focuses primarily on CO_2 emissions (R1). This poses a problem for tour operators whose core proposition and/or product offerings are largely dependent on fossil fuels, such as cruise tour operators and long-haul travel specialists (**B4**):

> *"Basically, anything that runs on fossil energy has a problem. So, whether it is aircraft or buses, yes, you can link to that on different deadlines, but you should do something with that" (R5)*

Taxes on carbon-intensive products and subsidies on low-carbon alternatives can affect consumer's choices and lead to reductions in distance travelled and use of alternative means of transport (Peeters & Papp, 2023). Consumer preferences for certain product forms and destinations may change as a result of these price effects and a general shift in standards.

In this context, tour operators that own (or invest in) fossil-dependent tangible assets, such as aircraft and cruise ships, are seen as particularly vulnerable. These assets typically have long depreciation periods. These companies are thus less agile and more dependent on the transition they need to make (R2; R3).

> *" Of course, you do see in a broader sense that it is always the more you have invested in assets with a long-term depreciation period, the harder it is to change. And often it also goes hand in hand with a matching business culture or business processes and a financial logic, which is therefore very much focused on long-term stability and continuity and it is inconcei-*

vable within such a company, that things could come to an end. So, for those kinds of companies, they really need a very fundamental transition of their own." (R5)

Such a situation is illustrative for some asset-heavy tour operators (see Buijtendijk et al., 2021) and encourages so-called carbon lock-ins: the tendency of companies to hold on to these fossil-dependent assets because their business models are based on operating them cost-effectively as long as further investments in increasing efficiency pay off (see Erickson et al., 2015) (**B3**). Carbon lock-ins make firms less agile when it comes to making changes in business operations. This can lead to higher interest rates, higher staff revenue, higher wage demands from employees and reduced support from non-governmental organisations (NGOs) and governments (R1).

4.2.2. Destinations

Experts interviewed expect tour operators (especially those with asset-heavy revenue models), which continue to offer destinations vulnerable to the physical impacts of climate change (see 4.1), to become more financially vulnerable over time (R1; R6) (**B11**). These companies will increasingly face rising insurance costs and increasing uninsurability of local physical assets due to more stringent climate and linked environmental and financial policies by, for example, insurance companies (**B1**).

"Well, in general you see that insurance premiums for areas where the flood risk is high are increasing tremendously or even being excluded (....) I can easily imagine that at least in certain areas it is very difficult to get insurance at all" (....) and if you are doing trips in certain seasons "in a flood-prone area then you will have to take that into account." (R1)

In addition, tour operators have to consider higher costs for compensation and repatriation (R1; R6). If tour operators rely on a limited number of climate change vulnerable destinations, this could have structural consequences over time for the solvency requirements imposed on them by the Stichting Garantiefonds Reisgelden (SGR, Travel Guarantee Fund Foundation) and the requested contribution per booking to the affiliated Calamity Fund (see Calamity Fund, 2023; SGR, 2023) (**B2**). Tour operators also run the risk that destinations, due to (repeated) exposure to incidental or chronic physical effects of climate change, may become less attractive to consumers during a particular season or in general (Matei et al., 2023). Consumers associate these destinations with climate change-related calamities such as forest fires (R1; R2; R4; R5; R6). Winter destinations lose their appeal due to reduced snowfall and a shorter winter season (Steiger et al., 2019). The Mediterranean region will increasingly become less popular during the summer season due to the effects of climate change, while destinations in northern and central Europe will see increased demand during this period (Matei et al., 2023) (**B6**).

(We see) "that potentially does pose a risk to this party [tour operators], because consumers may be put off by big forest fires that have occurred in the south of France or in Spain or in Portugal in recent seasons, so it could just be that consumers may not dare to take that risk in the long run to go to those locations, so we definitely see that as a risk." (R2)

"But that means that eventually between well, say in about five to 10 years or so, those flows, those holiday flows are going to change and those are going to shift and then you will see that people will move a bit more to some northern environments anyway, so a bit closer to home. You will also see that people are a bit more willing to travel in outside peak seasons. So, you just see a change in tourist flows yes" (R4)

Besides destinations, certain climate-damaging product forms may gradually lose their appeal among consumers. For example, customers become more discerning and want to travel more climate-consciously (R1; R3) (**B7**).

"Well, the most practical risk for assets is that their value is reduced or at least comes under pressure, because there may be other flows, so more in other periods and it may become quieter. A study was recently published by the European Commission and they estimated that for the next few years, the southern Mediterranean in particular should take into account 10 per cent less holidaymakers, that has consequences for those assets, there is no other way." (R4)

"Yes, so the travel behaviour of consumers will change, but that will have effects on a travel company's bookings and if it does not adjust its business model then it will also ultimately lead to lower profitability and lower solvency." (R6)

(Tangible) assets in these cases or assets that enable the exploitation of these uses and cannot be easily exploited in any other way may therefore lose their value (**B11**).

4.2.3. Social support

Reduced public support among consumers and politicians for fossil-dependent products and services (Semieniuk et al., 2021) is visible in the changing public opinion regarding flying and cruise holidays (R1; Sistermans, 2023). This is visible, for example, in the growing debate around curbing fossil advertisements (**B9**):

"Fossil advertising for example is really an issue and you see more and more social questions being asked with newspapers full of cheap travel deals (...) and in part governments will start to regulate more and more. So just like tobacco advertising, you cannot sell your travel as easily, so, I don't know if that is your travel package being a stranded asset but the product you are selling is getting harder and harder to sell, because there is more and more discussion about it, making it harder to advertise it, in any way, but also because more and more people are starting to question it." (R5).

The moment you do not have a story about your environmental impact, well that is a show-stopper." (R1)

Through the ANVR, many tour operators have committed to the Glasgow Accord (see UNWTO, 2021). This industry association also recently presented a new sustainability vision for the sector (see Vermeulen, 2024). If the actual sustainability performance of tour operators (see Van der Duim & Keller, 2021) is not in line with these goals, the sector risks losing political and social support among politicians, policy makers, the media and the public. The sustainability claims made and reporting on them may then be seen as implausible, incomplete, or not transparent (**B10**).

4.3. Liability risks

Physical risks and - in particular - transit risks can lead to liability risks (Caldecott et al., 2021; European Central Bank, 2020, 2023). Liability risks are risks of losses arising (in)directly from climate or environment-related legal claims by or against an organisation and related reputational damage when stakeholders and/or the public associate the organisation with negative environmental impact (European Central Bank, 2020). We see these liability risks, for example, in climate lawsuits about the causes or consequences of climate change (see Setzer & Vanhala, 2019). Climate lawsuits are brought against financial institutions or (passive) governments, but also against and by (polluting) companies. These lawsuits aim to accelerate or delay climate action to limit or avoid loss of asset value and - in the former case - are increasingly strategic in nature. Strategic climate lawsuits have the explicit goal of changing the way a system operates (Setzer & Higham, 2022). The number of climate lawsuits has increased significantly in recent years. Setzer and Higham (2022) count 1,200 climate lawsuits between 2015 (the year of the Paris Agreement) and 2022 worldwide. Between 1986 and 2014, there were 800 (Setzer & Vanhala, 2019). Despite this increase, it is still scientifically unclear whether climate lawsuits strengthen or weaken climate policies (ibid).

Tourism is increasingly dependent on aviation for transport (see Lenzen et al., 2018): a sector that faces significant liability risks. The aviation sector contributes disproportionately to global warming given the relatively small share of the world's population that travels by air and has no credible, scalable emission reduction solutions at hand between now and 2050 (see e.g.; Gössling & Humpe, 2024; Gössling et al., 2023). On the one hand, the aviation industry faces significant liability risks because the sustainability claims of airlines and their advocates are in stark contrast to this reality (Maclaren, 2023). On the other hand, legal opposition to the inevitable volume restrictions needed to bring aviation within the temperature limit of the Paris Agreement (see, e.g., NLR, 2024b; Peeters & Papp, 2023) suffers additional costs and reputational damage. Two lawsuits are currently pending in The Netherlands illustrating both sides: Fossielvrij vs KLM (see Fossielvrij, 2023) and KLM and others against the Dutch State (see KLM, 2023).

Tour operators may therefore become directly or indirectly involved in climate lawsuits when, as mentioned above, tour operators facing carbon lock-in effects sue the state (see 4.2.1), or when suppliers to tour operators, such as airlines, are sued by civil society organisations (**C1**; **C2**).

"If there is some tour operator in your (sector) that gets sued by NGOs or local residents or whatever, it also puts you at risk. How will you adjust yourself then, that you do not end up in front of the bench yourself?" (...) I think KLM is quite troubled at the moment by the associa-

tion that is being made more and more clearly in terms of climate, causing nuisance and the primary business of the company, that does undermine the brand value" (R3).

"NGOs and dealing with interest groups is a very important one. And this plays across the board. (...) Schiphol and KLM are regularly in the picture of environmental groups. But that is one thing, because that influences public opinion as well, of course." (R1)

Such climate lawsuits can thus have risks beyond the lawsuits themselves, weakening the brand value of industry peers and the reputation of the travel industry as a whole (**C3**).

This billboard was part of an international campaign against airline advertising, sponsorship and greenwashing, organized by Stay Grounded and Badvertising, with actions in 16 Dutch municipalities and in Switzerland, Germany, France, UK, Belgium and Portugal.

5. KLIMARISKSCAN: a climate risk scan for tour operators

In this chapter - based on insights gained from the previous two chapters - we develop the first version of a climate risk scan for tour operators (KLIMARISKSCAN_v1) and apply it to a sample of 199 tour operators affiliated with the Algemene Nederlandse Vereniging voor Reisorganisaties (ANVR, the Dutch Association of Travel Organisations). In doing so, we answer research questions 3 to 5.

KLIMARISKSCAN_v1 (see Figure 1) is a tool that scores the extent to which tour operators are exposed to the 18 identified climate risks (see Annex II). KLIMARISKSCAN_v1 works on an average basis, using three risk categories. The lower risk category (YELLOW) equals 1 point; the significant risk category (ORANGE) equals 2 points; and the higher risk category (RED) equals 3 points. This three-way division is a common method for creating risk scores (see, for example, Clapp et al., 2017). Table 4 shows the risk-scoring margins.

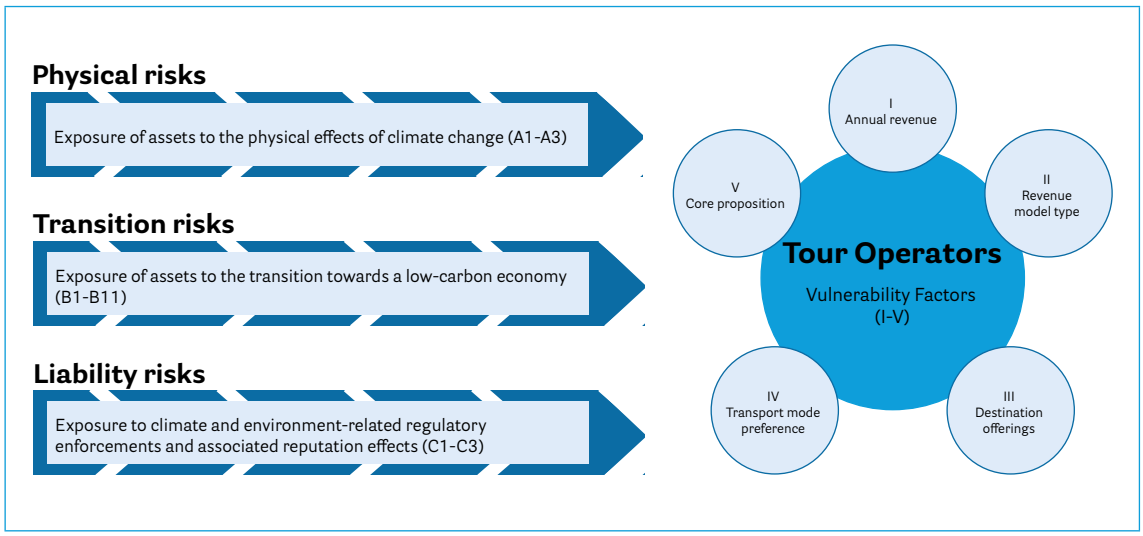

Figure 1 KLIMARISKSCAN_v1

Climate risk	Low	Significantly	High
Score	<1,49	1,5 - 2,49	>2,5

Table 4 Risk-scoring margins KLIMARISKSCAN_v1

To score the extent to which tour operators are exposed to the 18 climate risks, KLIMARISK_v1 takes 5 attributes of the business portfolio of Dutch tour operators that characterise a company's resilience as a starting point: revenue; type of *revenue model*; *destination offerings*; *preferred mode of transport*; and *core proposition*. These attributes - hereafter referred to as resilience factors - differ among tour operators and affect the extent to which a business is vulnerable to the identified climate risks.

The five resilience factors are based on the widely used canvas business model by Osterwalder and Pigneur (2010). According to Teece (2010), a business model consists of three stages: value-creation (how does a company create value); value-conversion (how does a company convert value into revenue); and profitability (how does a company generate profit from this revenue). The canvas business model assumes that profit is generated when nine elements of a revenue model are logically related: market segments; value proposition; sales or distribution channels; customer relationships; revenue streams; key assets; key activities; partnerships; and cost structure. Table 5 shows the relationship between these elements and KLIMARISK_v1's five resilience factors.

Resiliencefactors KLIMARISK_v1	Elements Canvas business model (Osterwalder and Pigneur, 2010)	Businessmodelstages (Teece, 2010)
Revenue	Sales or distribution channels; customer relationships; revenue streams.	Value conversion
Type of revenue model	Key assets	Profitability
Destination	Key activities; partnerships	Value creation; profitability
Preferred mode of transport	Key assets; key activities; joint ventures.	
Core proposition	market segments; value proposition;	Value creation

Table 5 Relationship resilience factors KLIMARISK_v1 <> business model canvas

In paragraph 5.1 we describe the business portfolios of the sampled Dutch tour operators according to the five resilience factors. In 5.2, we present the underlying assumptions of KLIMARISKSCAN_V1 regarding the relationship between these resilience factors and the climate risks identified in chapter 4. Finally, in paragraph 5.3 we discuss the results of applying KLIMARISKSCAN_v1 to the sample of Dutch tour operators.

5.1. Dutch tour operators' business portfolio

The sample of 199 ANVR member tour operators to which we apply KLIMARISK_v1 consists of independent companies; companies that are part of a group; companies registered as holding companies; and charities (see table 6). All these organisations operate in the leisure segment.

Type of organisation	N	%
Independent company	154	77,40%
Part of a group	31	15,60%
Holding	4	2,00%
Charity	9	4,50%
Unknown	1	0,50%
Total	**199**	**100,0%**

Table 6 Organisations sample by type

5.1.1. Annual revenue

Revenue data of the companies in the sample - with a few (listed) exceptions - are not publicly available. We therefore had to derive the revenue data of the companies within the sample. Starting from the most recent complete year (2022), we first looked at the 'revenue top-50' as published annually by TravMagazine (see TravMagazine, 2022). Companies that were not entered in ANVR's database and those with incomplete data were removed from this list (see chapter 2). In 2022, the lowest published revenue from the TravMagazine 'top 50' was 6.6 million euros. ANVR sets a minimum annual revenue of 250,000 Euro to qualify for ANVR membership (ANVR, 2023). The majority of the tour operators in the sample therefore fall into the revenue category 250,000 Euro - 6.6 million Euro; the remaining companies fall into higher revenue categories (see table 7).

Annual revenue	N	%	Revenue category
€250,000 - €6.5 million2	169	85,0%	low
€6.62 - €15 million	10	5,0%	average
€16 - €35 million	11	5,5%	
€36 - €55 million	3	1,5%	
€56 - €75 million	2	1,0%	
€76 - €99 million	1	0,5%	high
> €100 million (max €1.4 billion)	3	1,5%	
Total	**199**	**100,0%**	

Table 7 Annual revenue categories tour operators. (source: TravMagazine (2022)

5.1.2. Type of revenue model

For the companies within the sample, we distinguish three types of revenue models: *asset-light*; *asset-medium*; and *asset-heavy*. *Asset-light* revenue models operate mostly intangible assets, but in some cases have so-called *allotment contracts*: agreements with for example airlines and hotels for the purchase of a predetermined number of seats/rooms per year. *Asset-heavy* tour operators operate these tangible assets themselves directly (including capital-intensive assets with long depreciation periods, such as aircraft, real estate at destinations and cruise ships). *Asset-medium* tour operators combine intangible and tangible assets in their revenue model, but typically do not have the aforementioned capital-intensive tangible assets on their balance sheet. However, in addition to intangible assets, they do own, for example, offices and transport assets at destinations, such as safari jeeps (see Table 8 for illustration). Most tour operators in the

sample operate an asset-light revenue model; the largest (in terms of revenue) have an asset-heavy revenue model. The latter group is small (see table 9).

Tangible assets	Intangible assets
Support - office, equipment, etc.	*Goodwill* - Brand value and reputation, customer base.
Real estate - including hotels, resorts and other types of accommodation with associated services.	*Software* - e.g. CRM and reservation systems.
Transport - especially airlines and cruise lines/ships.	*Intellectual property rights* - copyright, domain names, innovations.
Activities - facilities and equipment.	*Network and partners* - 'allotment' contracts, travel agencies, with destination marketing organisations.

Table 8 Examples of tangible and intangible assets tour operators

Revenue model category	N	%
Asset-light	166	83%
Asset-medium	15	8%
Asset-heavy	18	9%
Total	199	100%

Table 9 Revenue models for tour operators

5.1.3. Destination

For the companies within the sample, we distinguish between geographical regions in Europe (the continent) and outside Europe. 156 tour operators offer trips outside Europe. Tour operators often serve multiple destinations inside and outside of Europe. We see the destination offerings as a factor determining the extent to which tour operators' business portfolio is exposed to the physical effects of climate change. To determine climate risks for destination regions, we used the score in the Climate Change Vulnerability Index for Tourism (CVIT) (see Scott et al., 2019). Table 10 shows the CVIT scores and associated risk levels. Tables 11 and 12 show the destinations offered by the tour operators in the sample with corresponding CVIT scores. Thus, according to the CVIT, destinations outside Europe are generally more vulnerable to climate change than destinations within Europe (with the exception of the Mediterranean).

CVIT Score	Risk
53-65	Low
66-88	Average
89-112	High and very high

Table 10 CVIT scores. Source Scott et al. (2019)

Destination offerings Europe	Climate change vulnerability (CVIT score)	% of tour operators[1]
Northern Europe	Low	54%
Central and Eastern Europe	Low	48%
Southern Europe excluding Mediterranean	Average	68%
Western Europe	Low	69%
Southeast Europe	Average	68%
Mediterranean	Average	53%

Table 11 Destination offerings Europe with CVIT scores
[1]Excluding tour operators not offering trips within Europe

Destination offerings outside Europe	Climate change vulnerability (CVIT score)	% of tour operators[2]
North America	Average	44%
Central America	High	34%
South America	Average	43%
Caribbean	High	38%
North Africa	High	41%
Central Africa	High	27%
South Africa	High	50%
Indian Ocean	High	35%
Southeast Asia	Average	49%
North and East Asia	Average	37%
Central Asia	Average	26%
South Asia	Average	40%
Middle East	High	42%
Oceania	Average	31%
Antarctica	Not available	22%
Arctic	Not available	24%

Table 12 Destination offerings outside Europe with CVIT scores
[2]Excluding tour operators not offering trips outside Europe

5.1.4. Preferred mode of transport

Companies within the sample offer destinations at different distances from The Netherlands (see table 13). Distance and mode of transport are determinants of the magnitude of GHG emissions (Lenzen et al., 2018). Distance plays a role in transport mode choice. Long-distance trips typically require the use of aviation as a means of transport. Conversely, aviation enables further destinations to be offered and tour operators may subsequently become increasingly dependent on this for their revenue (see 4.2). About 46% of tour

operators are currently fully aviation-dependent (use aviation exclusively, regardless of distance) about 36% of tour operators are partially aviation-dependent (use aviation and other modes of transport); about 10% do not use aviation. Companies in the 'other' category offer no or other types of transport (see Figure 2). Companies that do not use aviation are almost all in the lowest revenue category (see table 14).

Only offer <2000 km (closer)	37 (19%)
Exclusively offer >2000 km (further away)	51 (26%)
Combination of closer and further away	111 (55%)
Total	**199 (100%)**

Table 13 Distance categories tour operators

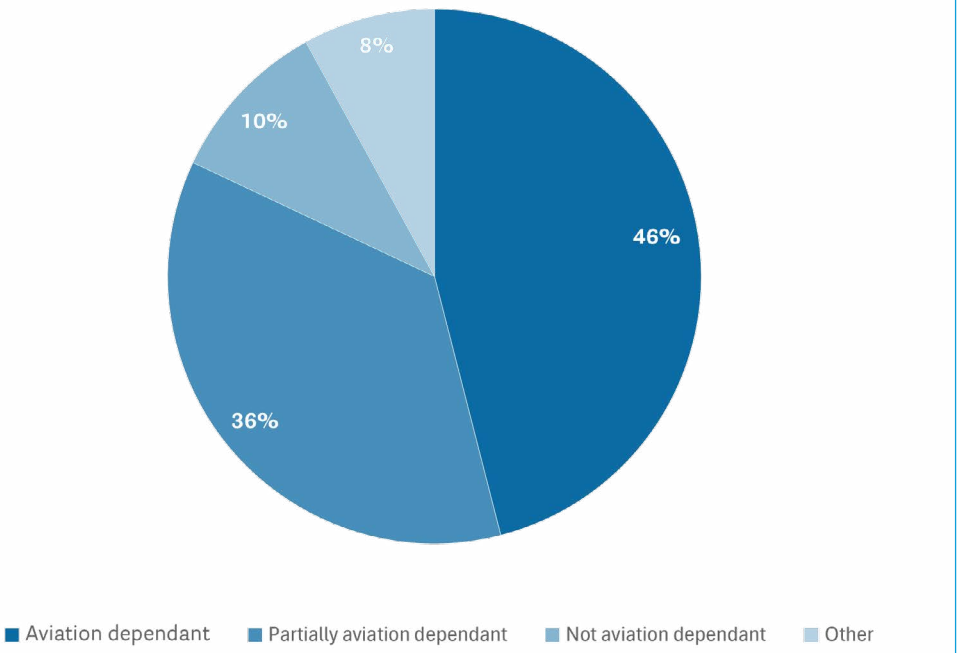

Figure 2 Luchtvaart-gebondenheid productaanbod (N=199)

Revenue category	N	100% aviation	Partly aviation	No aviation	Other	Total
Low	169	41.0%	29.0%	8.0%	7%	85%
Average	26	4.5%	5.5%	1.0%	1.5%	12.6%
High	4	0.5%	1.5%	0.0%	0.0%	2.0%
Total	**199**	**46%**	**36.0%**	**9%**	**8.5%**	**100%**

Table 14 Aviation dependence by revenue category

5.1.5. Core proposition

The companies within the sample may be tied to certain countries or geographical regions (see table 15) on the basis of their core proposition - the translation of their product offerings into a core target group and the corresponding market positioning. 48% of the tour operators in the sample are tied to destinations (e.g. country specialists); 14% have a core thematic proposition (e.g. cycling tours) or position themselves as a brand without a destination association. The remaining tour operators typically employ a combination of thematic and destination-specific proposition (e.g. cycling trips in Spain).

Destination	N	%
Geographic	95	48%
Thematic	27	14%
Geographical & Thematic	77	39%
Total	199	100%

Table 15 Destination

5.2. KLIMARISKSCAN underlying assumptions

Below we briefly describe the relationships assumed within KLIMARISKSCAN_v1 between the resilience factors and the climate risks identified in Chapter 4. These are summarised in a scoring matrix that allows individual companies to be scored on climate risk for each resilience factor (see Appendix IV).

5.2.1. Annual revenue

In KLIMARISKSCAN_v1, we do not consider annual revenue as a factor directly influencing the degree of exposure to physical or transition risks, but use annual revenue as a proxy for the degree of exposure to liability risks (C1; C2; C3). We assume that greater revenue on the one hand means more resources to invest in efficiencies of capital-intensive physical assets and/or revenue models based on them (see Erickson et al., 2015). This means more incentives to pursue legal claims to prevent depreciation of these tangible assets and/or declining profitability of revenue models based on them. On the other hand, more revenue means more resources to advertise and be a brand. This means a greater likelihood of being sued by civil society organisations for potentially misleading environmental and climate claims in advertisements and other communications regarding the brand and thus greater exposure to reputation risk (loss of brand value). Reputational risk applies to a lesser extent to smaller companies in the same industry that are not themselves the subject of a legal claim, as these companies have less brand awareness, have a closer relationship with (regular) customers or are less dependent on brand reputation.

5.2.2. Type of revenue model

In KLIMARISKSCAN_v1, we consider the type of revenue model *(asset-light/asset-medium/asset-heavy)* as a factor that directly affects exposure to certain physical and transition risks (A1; B1; B3). Assuming that each destination can be exposed to the physical effects of climate change to a greater or lesser extent, we assume that - despite this variation - an *asset-heavy* revenue model makes companies more vulnerable to damage to tangible assets in destinations due to the physical effects of climate change (A1) and to the physical impact of climate change on transport-related tangible assets (cruise ships; aircraft). This risk is smaller with an *asset-medium* revenue model and most limited in the case of an *asset-light* revenue model

(depending on contractual obligations). An additional risk for an *asset-heavy* revenue model is the rising insurance costs/uninsurability of some tangible assets (such as hotels in coastal areas) (B1). Furthermore, we assume that the risk of carbon lock-in is higher for an *asset-heavy* revenue model when it involves assets that remain (largely) dependent on fossil fuels (such as cruise ships and aircraft) (OECD, 2023) (B3).

5.2.3. Destination

In KLIMARISKSCAN_v1, we identify tour operators which offer travel to destination regions vulnerable to climate change as a factor directly influencing exposure to certain physical and transit risks (A2; A3; B2; B6; B7). We assume that tour operators organising trips to destination regions that are more vulnerable to climate change according to the CVIT are at higher risk of physical exposure of customers to acute or chronic effects of climate change (A2). Consequently, these companies are at risk of higher repatriation and compensation costs and more stringent solvency requirements (B2). We also assume that trips to more vulnerable destination regions are at risk of becoming impossible to operate over time because destinations may become unsuitable for certain forms of tourism (A3), and that these destinations and destination-related product forms will lose their appeal among consumers due to the effects of climate change before this point is reached (B6; B7).

5.2.4. Preferred mode of transport

In KLIMARISKSCAN_v1, we consider tour operators which mostly or entirely use transport modes that remain largely dependent on fossil fuels (aviation; cruise ships) as a factor that directly results in exposure to certain transition risks (B4; B5; B8; B9; B10). We assume that, despite technological innovations, these tour operators emit more CO_2 than tour operators transitioning to alternative forms of transport (Gössling et al., 2024; Lloret et al., 2021; Peeters & Papp, 2023) and thus are more vulnerable to transition risks (B4, B5). We also assume that tour operators which mostly or entirely use aircraft or cruise ships are more vulnerable to more stringent climate and environmental policies and related direct and indirect price effects (B8). We further assume that these companies will eventually be unable to advertise aviation- and cruise ship-related products in The Netherlands due to fossil advertising restrictions (B9), and that their sustainability claims are more likely to be seen as unrealistic and implausible, which may cause them to lose political and public support (B10).

5.2.5. Core proposition

Finally, in KLIMARISKSCAN_v1, we see tour operators with a destination-specific proposition as more vulnerable to transition risks because they are less agile than tour operators that do not have such a proposition (B11). We assume that tour operators with a destination-specific core proposition (e.g. country specialists) are not as easily able to switch destinations than tour operators with a thematic proposition or a combination of both.

5.3. KLIMARISKSCAN_v1 results

Here we describe the results of applying KLIMARISKSCAN_v1 to the sample of Dutch tour operators. All tour operators in the sample were scored using the scoring matrix (see Appendix IV). For the list of total scores, see Annex III. First, we present the overall climate risk score for the tour operators from the sample (5.3.1). We then elaborate on the nature of this vulnerability using the scores for each resilience factor (5.3.2).

5.3.1. Climate risk score Dutch tour operators

To determine the vulnerability of tour operators to climate risks, we determined the average climate risk score on the five resilience factors for each tour operator in the sample. We then calculated the average for the entire sample. Table 16 shows the climate risk score for Dutch tour operators. 33 (17%) companies have a climate risk score YELLOW (lower exposure to climate risk). Table 17 shows the score profile of companies in this category. 32 of these companies are in the lowest revenue category; the exception is in the medium revenue category (see 5.1.1). 2 companies score low on all resilience factors and are in the lowest annual revenue category; have an asset-light revenue model; offer destinations that score low in the CVIT; do not use carbon-intensive modes of transport (cruise ships; aircraft); and have a thematic core proposition. 8 companies have a significant score on one resilience factor (core proposition partly destination-specific or use fossil fuel-dependent transport modes). 5 companies score high on one resilience factor (only use fossil fuel dependent transport modes or have a destination-specific core proposition). 16 companies have a significant score on two resilience factors. This group is mainly concerned with business model type (*asset-medium*); use of fossil fuel-dependent transport; and core proposition (combination thematic/geographic).

Total	**N**	**%**
Low	33	17%
Significantly	165	83%
High	1	<1%
Total	**199**	**100%**

Table 16 Climate risk score Dutch tour operators

Annual revenue	**Revenue model type**	**Destination**	**Preferred transport modality**	**Core proposition**	**N**
Low	Low	Significant	Significant	Low	7
Low	Low	Low	Significant	Low	5
Low	Low	Low	Significant	Significant	3
Low	Low	Low	Low	Significant	3
Low	Low	Low	Low	High	3
Low	Low	Low	High	Low	2
Low	Significant	Low	Significant	Low	2
Low	Low	Significant	Low	Low	2
Low	Low	Low	Low	Low	2
Low	Low	Significant	Low	Significant	2
Low	Low	Low	Significant	Significant	1
Significant	Low	Low	Significant	Low	1
Total					**33**

Table 17 Score profile of tour operators in the climate risk category YELLOW (lower risk)

165 companies (83%) have a climate risk score ORANGE (significant exposure to climate risk). Table 18 shows the score profile of companies in this category. Most of these companies are in the low revenue category and have an asset-light revenue model. 43 companies offer destinations that have higher vulnerability to the physical impacts of climate change. 35 do so on the basis of a geographically bound proposition. 118 companies exclusively use fossil fuel-dependent transport modes. The highest risk concentration is among the group of 35 companies within this group that offer travel to destinations with higher vulnerability to the physical impacts of climate change based on a geographically bound proposition. 73 companies within this group have no destination-based proposition.

Annual revenue	Revenue model type	Destination	Preferred transport modality	Core proposition	N
Low	Low	Significant	Significant	Significant	13
Low	Low	High	High	High	24
Low	Low	Significant	High	Significant	21
Low	Low	Significant	High	Low	4
Low	Low	High	High	Significant	7
Low	Low	Significant	High	High	20
Low	Low	Significant	Significant	High	11
Low	Low	Low	Significant	High	7
Low	Low	Low	High	Significant	2
Low	Significant	High	High	High	10
Low	High	Significant	High	Significant	1
Low	High	Significant	Significant	Significant	2
Low	High	Low	Low	Significant	2
Low	High	Low	High	Low	2
Low	Significant	Significant	Significant	Significant	1
Low	Low	Low	High	High	1
Low	Significant	Significant	High	Significant	2
Low	High	Significant	Significant	High	1
Low	High	Low	Low	High	1
Low	High	Low	Significant	Significant	1
Low	Significant	Significant	High	High	1
Low	Significant	Low	Low	High	1
Low	Low	Significant	Low	High	2
Low	Low	High	High	Low	1
Significant	Low	Significant	High	High	7
Significant	Low	Significant	High	Significant	2
Significant	Low	Significant	Significant	Significant	4
Significant	Low	Significant	Significant	High	1

Significant	Low	Low	Low	High	2
Significant	Low	Low	Significant	Significant	3
Significant	High	Significant	Significant	Low	1
Significant	High	Significant	Significant	Significant	1
Significant	High	Significant	Significant	High	1
Significant	Low	Low	Significant	High	1
Significant	Low	High	High	High	1
High	Low	Significant	Significant	Significant	1
High	High	Significant	Significant	Significant	2
Total					**165**

Table 18 Score profile of tour operators in climate risk category ORANGE (significant risk)

One company has the climate risk score RED (high exposure to climate risk). Table 19 shows the score profile of this company in this category. This company scores significant or high climate risk scores on all resilience factors. It is vulnerable to liability risks; has an asset-heavy revenue model; scores average when it comes to CVIT for destinations; uses fossil fuel-dependent transport modes only; and has a core proposition that combines thematic and geographical.

Annual revenue	Revenue model type	Destination	Preferred transport modality	Core proposition	N
High	High	Significant	High	Significant	1

Table 19 Score profile of tour operators in climate risk category RED (higher risk)

5.3.2. Climate risk scores by resilience factor

To learn more about the vulnerability of tour operators to climate risks, we look at how often a climate risk score occurs for the different resilience factors. Tables 20 to 24 show the risk scores for the five resilience factors. **Annual revenue** falls in the lowest category for 169 (85%) of the companies and in the highest category for only four. Except for reputation risk (C3), tour operators' exposure to liability risk is therefore limited, according to KLIMARISKSCAN_v1. **Revenue model type** is in the asset-light category for 166 companies (83%). 18 companies (9%) have an asset-heavy business model. The latter group in particular is vulnerable to physical and transition risks A1; A4; B1; and B3, as they operate properties in high-risk destinations and/or fossil fuel-dependent transport modes (cruise ships; aircraft). **Destination offerings shows** that 150 companies (76%) are vulnerable to physical and transition risks A2; A3; B2; B6; and B7, because they offer destinations that are less suitable or possibly unsuitable for certain forms of tourism in the future. **Preferred mode of transport** shows that 107 companies (54%) are vulnerable to transition risks B4; B5; B8; B9; and B10 because they exclusively use fossil fuel-dependent modes of transport (cruise ships; aircraft). Finally, **core proposition** shows that 94 companies (47%) are vulnerable to transition risk because these companies have a geographically-specific core proposition (B10).

Annual revenue	**N**	**%**
Low	169	85%
Significant	26	13%
High	4	2%
Total	**199**	**100%**

Table 20 Climate risk score for resilience factor 'annual revenue'

Revenue model type	**N**	**%**
Low	166	83%
Significant	15	8%
High	18	9%
Total	**199**	**100%**

Table 21 Climate risk score for resilience factor 'revenue model type'

Destination	**N**	**%**
Low	49	25%
Significant	113	57%
High	37	19%
Total	**199**	**100%**

Table 22 Climate risk score for resilience factor 'destination supply'

Preferred mode of transport	N	%
Low	21	11%
Significant	71	36%
High	107	54%
Total	**199**	**100%**

Table 23 Climate risk score for resilience factor 'preferred mode of transport'

Core proposition	N	%
Low	28	14%
Significant	77	39%
High	94	47%
Total	**199**	**100%**

Table 24 Climate risk score for resilience factor 'core proposition'

In summary, looking at the overall scores per resilience factor for all tour operators in the sample (see table 25), we see that destination; preferred mode of transport; and core proposition are the most critical issues when it comes to exposure to climate risk.

Resilience factor	Score	Classification
Annual revenue	1,2	Low
Revenue model type	1,3	Low
Destination	1,9	Significant
Preferred mode of transport	2,4	Significant
Core proposition	2,3	Significant

Table 25 Total climate risk scores across resilience factors

6. A industry and policy perspective on identified climate risks

In this chapter, we elaborate on the implications of climate risks for Dutch tour operators, which we mapped in the previous chapter using KLIMARISKSCAN_v1. We do so from the perspective of the travel industry (as discussed during a workshop on 6 November 2023) and from the perspective of national policy makers (as discussed during a group interview on 14 November 2023). Both perspectives are based entirely on input from participants in these sessions and do not include interpretations by the authors of this report. See Chapter 2 for the methodological justification. Below, we present both perspectives in 6.1 and 6.2 and conclude with a brief reflection by the authors of this report in 6.3.

6.1. Industry perspective

The workshop participants (from here on: participants) all stressed the importance of diversifying the business portfolio. Table 26 shows the distribution of participants' 122 comments across the nine segments of the Canvas business model. One in three comments related to value propositions. By this, participants meant not only diversification in the destinations offered, but also diversification in the modes of transport offered and diversification in the type of holidays, e.g. beach holidays versus hiking holidays. While all participants agreed that flying less leads to a reduction in CO_2 emissions, they noted that train capacity within Europe is largely insufficient to get all the tour operator's customers to their European destinations by rail.

Canvas business model element	Number of comments recorded	Percentage
Key partners	14	11,48%
Key activities	2	1,64%
Key assets	16	13,11%
Value proposition	41	33,61%
Customer relations	6	4,92%
Sales/distribution channels	14	11,48%
Market segments	4	3,28%

Cost structure	22	18,02%
Revenue streams	3	2,46%
TOTAL	**122**	**100,00%**

Table 26 Comments by Business Model Canvas segment

In terms of key activities, assets and partners, participants primarily looked at closer collaboration with providers of other modes of transport on the one hand and local governments on the other. Some participants indicated that the tour operators they represented strive not to provide air travel once they arrive in the destination country. Closer collaboration with the government should enable tour operators to take quick and appropriate action on behalf of their customers in case of natural disasters or heat stress. Furthermore, tour operators expressed a desire to work more intensively with companies focused on developing environmentally friendly fuels.

In terms of customer relations, sales/distribution channels and market segments, participants indicated that tour operators could use existing communication channels to support their customers in choosing environmentally responsible transport alternatives. A few of the tour operators present started to explicitly target customers who do not necessarily want to travel to a faraway country, but want to explore unknown corners of Europe as an alternative. Corners that, incidentally, travellers can reach without a plane. Another tour operator aims to offer destinations far from The Netherlands to customers on the other side of the world, for whom the destination in question involves a much shorter flight journey. All tour operators agreed that they need to be more vigilant than ever about what they publish about sustainable travel through their communication channels. *Greenwashing* is seen as an absolute no-go.

On cost structure, participants agreed that selling and reviewing long-term leases of tangible assets in the destination country deserves a high place on tour operators' agenda. It was also noted that offering more environmentally friendly rail travel drives up costs, as managing rail travel involves more communication with customers, and consequently higher labour costs. Insurance premiums for both tangible assets and contingency fund contributions are also likely to increase for tour operators whose travellers mainly stay in places with a high climate risk profile. Finally, in terms of revenue streams, it was suggested that the existing booking system and customer base could also be used to offer completely different products or services.

Finally, participants agreed that the current transition to reduce emissions by reducing the number of aviation kilometres passengers fly is going too slow. Tour operators agreed that employees and business owners realise that things have to change, but that consumer behaviour and the market are not changing fast enough (with the exception of specific market segments) and that consumer behaviour is difficult to change. Participants agreed that greater external pressure is needed to get companies to enter innovation mode and structurally adjust the share of aviation within their product portfolio. Here, the CO_2 ceiling for Dutch airports was mentioned as an example.

6.2. Policy perspective

The policy makers interviewed (from here on: respondents) see this research as valuable because it makes tour operators aware of climate risks and the possible consequences of falling behind in the sustainability transition. In an initial response, they refer to last summer's events. Respondents wonder whether the wildfires in popular tourist destinations during the 2023 peak season (Rhodes, among others) had an impact on

tour operators, as some companies had to repatriate customers. They also question whether tour operators communicate transparently and honestly to their customers when such physical climate risks apply to destinations within their product range: are tour operators not keeping up appearances to the outside world?

When asked whether a 'predictable government' that provides more guidance - for example, through clearer policy frameworks on climate risks and the aforementioned CO_2 cap - gives companies incentives to go into entrepreneurial mode in a general sense, respondents initially responded in a relativistic manner. According to respondents, the demand for clarity recurs throughout the climate policy debate. This then raises the question in their minds whether there will be no resistance if the government provides more clarity (incidentally, they do not see such resistance as an argument for not providing clarity as a government).

6.2.1. Climate risks and the competitiveness of tour operators

The current, wait-and-see attitude of tour operators, as outlined in paragraph 5.1, is considered understandable. Most businesses, such as the large group in the orange risk category, are mostly at a similar climate risk level. As shown in chapter 4, climate risks have varied impacts on these companies operationally. However, the competitiveness of these companies vis-à-vis each other has not yet been affected. This will change, according to respondents, if companies emerge that want to take the lead. For instance, because these companies expect that there will soon be fewer destinations to offer (at higher prices); long-distance travel will become more risky; alternative transport will be more difficult to organise; and available transport capacity will be more limited and/or transport costs will rise (especially for long-distance destinations). Forerunners can then firmly take their position, for instance by targeting (growing) niche markets with climate-proof concepts. So, as long as no frontrunners emerge, a certain degree of group protection applies. Without frontrunners, no one gets left behind: market conditions may deteriorate for the group in general though.

Current policy instruments and their limitations

Regarding the question of how sectors such as the travel industry can be encouraged to make an orderly transition (see Campiglio et al., 2018), a discussion is emerging about the current policy instruments and their limitations. This discussion mainly revolves around conflicting policy goals (this contradiction is seen as inherent to big government in a complex society) and focuses in particular on Dutch aviation policy.

Dutch aviation policy

Dutch aviation policy currently serves four public interests: safety; living environment; sustainability; and international accessibility (Min. I&W, 2023). International accessibility and sustainability are identified by respondents as (partly) contradictory. Regarding international accessibility, the recently published policy framework on network quality is used (see Harbers, 2022). Good accessibility through connections to global economic centres (London; New York; Singapore; etc.) is key, with a view to the business climate. A good business climate means that international companies settle in The Netherlands and it facilitates Dutch companies to operate globally.

Viewed from this policy framework, according to respondents, a business passenger (OD passenger) departing from The Netherlands to London - regardless of how they travel - is more important than a tourist to, say, Kenya. Transfer passengers indirectly create value for this direct passenger because - it is thought - transfer traffic maintains the direct connection. Without transfer traffic, it is argued, many of these destinations at Schiphol would disappear, which is also seen as bad for Schiphol's hub position. So, seen from the public interest 'international accessibility', holiday travellers from The Netherlands only contribute to the Dutch economy if they travel to an economic centre designated within the policy framework of network

quality. From an aviation policy perspective, holiday travel is seen as supply-driven. According to this view, holiday travellers use existing connections and holiday trips do not lead to new connections: these are set up solely on the basis of the economic contribution to the Dutch economy.

Current policy instruments and their goals

One wonders which instruments are effective in relation to a clear policy goal. What does an instrument relate to? For example: if the goal is to reduce CO_2 emissions from aviation, respondents mention CO_2 pricing and the CO_2 cap. A ban on fossil advertising is seen as a proxy measure (the effect on CO_2 reduction is not certain). On the other hand there is reducing the number of flights to and from Schiphol Airport, this 'tool' is mainly about noise.

Because the government has the freedom to levy air passenger taxes at the national level, measures are being reviewed that would make this tool more effective. Respondents argue that it is possible to further increase the current air passenger tax. Aviation is a very cost-efficient mode of transport because the (high) environmental costs are not internalised (CE Delft, 2019). Through a tax, these costs can be internalised. A person-based or frequency-based air passenger tax is considered not feasible (also due to privacy laws).

A more positive view is taken of a distance-based air passenger tax, which Schiphol now also advocates (because research shows that it would otherwise fail to meet the climate goals set out in the Paris Agreement, see NLR, 2024b; Schyns, 2024). The reasoning is that distance consumption is subject to a perverse incentive. Many long-distance trips take place because travellers can afford a standard of living in those destinations that they cannot afford in The Netherlands or Europe based on their salaries. A distance-based flight tax could neutralise this incentive. People who like to travel because they want to see a faraway country will go anyway; people who travel far just to see some sunshine, for example, will look for an alternative closer to home, the thinking goes. One adds that this discussion is (politically) sensitive because people 'just want to travel'.

With the exception of the air passenger tax, international policy is a bottleneck for national instruments. The aviation sector is difficult to regulate nationally (and at European level), as aviation is largely bound by international policy. These issues arise, for example, when it comes to the SAF blending obligation, the European emissions trading system ETS[1] , and the introduction of VAT on air tickets (it is argued that The Netherlands can only levy VAT on the part flown in The Netherlands). Schiphol's capacity limitation also clashes with European regulations on curtailing airport capacity due to noise pollution (see EASA, 2023). So - given the current international status quo - The Netherlands is limited in the measures it can take.

The aviation sector takes advantage of this, for example when it comes to the SAF blending obligation. National ambitions are high, but innocuous for the industry, because The Netherlands is not allowed to go beyond the European blending commitment. Airlines know this and so can gratuitously ask for more national ambitions when they know it is not possible. This is seen as a form of greenwashing. On top of this, the sector lobbies internationally against more ambitious climate policies for aviation (InfluenceMap, 2021). Respondents perceive this as uncomfortable. Ambitious policy is thus harder to enforce at the international level than at the national level, and at the national level it is sometimes just for show.

1 Within the current ETS, aviation has emissions allowances but these are decreasing. This is partly predicted to make flying more expensive. Globally, the aviation industry is putting pressure on the EU to abandon its intention to include flights to and from the EU under the ETS. These flights are now temporarily exempted (see Transport & Environment, 2023).

In case national policies become more ambitious than European policies, for example, leakage effects may arise (in the case of aviation, travellers start flying from surrounding countries, for example). Road leakage effects are regularly mentioned. However, there are nuanced views on them. It is assumed that for shorter distances, leakage effects are limited, except perhaps for travellers living close to the border. For longer distances, the leakage effect may be stronger, while these trips may be problematic from a climate perspective (it has not been established that air passengers travelling from neighbouring countries emit more greenhouse gases than when travelling from a Dutch airport).

It is therefore difficult - when it comes to containing (aviation-related) climate risks - to deploy clear and effective policy instruments at the national level. Instruments such as the SAF blending obligation and the ETS are policy instruments at the European level.

6.2.2. Possible policy instruments for the future

Given the limited possibilities of unilateral, regulatory instruments, respondents automatically arrive at somewhat softer measures: not setting standards but raising awareness and creating a shared sense of direction. Respondents indicated that policies should ideally ensure that tour operators are not dependent on specific aviation policies and are incentivised to move towards sustainable operations. People indicate they would prefer a mechanism that supports companies that want to change and automatically removes some of the competition. People suggest the following possible alternative instruments.

Personal CO_2 budget

Respondents raise this measure, but are immediately critical of it because it is not considered legally feasible. Since almost half of the Dutch do not fly (see also Martensen et al., 2023), this measure could give the impression that flying is not so bad.

CO_2 limit for the travel industry

Given the travel industry's emissions challenge, respondents also reflect on the possibility of a CO_2 limit for tour operators (an instrument which indirectly curbs supply). One wonders to what extent this is legally possible. They also question whether companies would be willing to swap capacity among themselves to make room for distance-related tour operators. Again, the risk of leakage effects is raised.

Lending based on climate risk differentiation.

Climate risks are particularly financial risks for companies. This, it is believed, impacts lending to these companies in the long run. When it comes to the travel sector, one wonders whether financial service providers should not differentiate more on the basis of the degree of exposure to climate risks. People refer to the Financial Markets Authority (AFM), which recently suggested pricing in climate risks into the housing market (see AFM, 2023). One does note that the differentiation potential is low as long as, as explained before, companies behave similarly and no frontrunners emerge.

Sector covenant

Respondents also suggested making performance agreements with the sector through a sector covenant as a possible policy direction. A sector covenant is a joint agreement on a target and the various actions the parties involved take to achieve it. An example of a performance agreement is a percentage of sustainable supply linked to a target year. The government's role could then be to manage process coordination and communication (e.g. through awareness campaigns). It is felt that this would at least boost the transition to more climate-friendly tourism, although respondents also indicated that little is currently known within the

ministry about the effectiveness of sector covenants. In addition, the government can facilitate alternatives (e.g. better rail connections).

6.3. Final reflection

The sector perspective outline shows that, for the time being, the climate risks identified using KLIM-ARISKSCAN_v1 will not lead to adjustments in the revenue model of tour operators which are (largely) dependent on aviation. With regard to the *value proposition*, deliberately replacing far-away walking holidays with equivalent holidays in Europe appears to be one of the most drastic, strategic choices. With regard to *customer segments*, that would be the attempt to reduce air travel distance to Curaçao by pushing holidays on that island also in the US market.

To mitigate transition risks, tour operators know that they need to drastically reduce their CO_2 emissions, and when asked how to do so, all participants know the answer: fly less. But, they indicate, more outside pressure is needed to get this transition going: for now, there are insufficient incentives in the short term to actually take action On the one hand, because adjusting the product portfolio involves a high commercial risk and is a long-term project ('the customer hardly requests it'); on the other, because business logic states: "as long as the cost of the damage experienced by tour operators does not outweigh the loss of revenue by no longer offering certain air travel, travellers will be flown from The Netherlands to high-risk destinations." Doing nothing is therefore seen - for now - as the logical option, as long as the extra costs due to, for example, compensation and repatriation do not outweigh the lost revenue should relevant destinations be removed from the travel offer.

The outlined policy perspective shows that policy makers expect more external pressure, for example through clearer policy frameworks - such as the CO_2 ceiling for Dutch airports - will not automatically break this wait-and-see attitude and put companies in an entrepreneurial mode. Certainly not when - as in the case of The Netherlands regarding the growth of Schiphol Airport - there is a 'policy lock-in': when the government facilitates something for a long time while knowing that it is actually controversial, there comes a moment when one is forced to take drastic measures. As parties invest heavily on the facilitated policy, that intervention itself becomes jarring and problematic (e.g. an airline ordering new aircraft and then having to surrender slots)[2]. If the government more regularly checks whether emerging developments are in line with the public interest, it will - it is thought - become easier for companies to plan investments (in the required transition).

2 Incidentally, the reverse also happens. For instance, airlines recently used the argument of ordered new aircraft to persuade the government to hold on to the enabling policy (see e.g. Silent, 2023).

7. Conclusion

Tourism is vulnerable to climate risks and tour operators have a significant market share in The Netherlands' outbound tourism (UNEP, 2023; TPCC, 2023; NRIT, NBTC & CELTH, 2022). However, climate risks for this industry have not been specifically investigated before. The aim of this study was therefore to identify climate risks for Dutch tour operators. To this end, we developed a climate risk checklist for tour operators (KLIMARISKSCAN). We then applied a first version of KLIMARISKSCAN to a sample of 199 tour operators affiliated to travel industry organisation ANVR. Below, we answer the main research question (7.1) and elaborate on the implications for tour operators and policy (7.2 & 7.3). We conclude with recommendations for follow-up research (7.4).

7.1. Climate risks for Dutch tour operators

KLIMARISKSCAN_v1 scores tour operators on 18 climate risks divided into three risk categories (physical risks; transit risks; liability risks) and does so using five resilience factors (revenue; revenue model type; product offerings; preferred mode of transport; core proposition). KLIMARISKSCAN_v1 distinguishes three risk levels: lower (YELLOW); significant (ORANGE) and higher (RED). A company with a lower risk score on all resilience factors is in the lower revenue category; has an asset-light revenue model; has product offerings exclusively in Central and Eastern Europe, Northern Europe and/or Western Europe (destinations with a low score in the CVIT); does not use fossil fuel-dependent transport modes; and has a thematic core proposition. A company with a higher risk score on all resilience factors is in a higher revenue category; has an asset-heavy revenue model; also has product offerings in Africa, the Caribbean, Central America; and/or the Middle East; exclusively uses fossil fuel-dependent transport modes; and has a geographically-specific core proposition.

The vast majority of tour operators (165 companies) fall between these extremes and have a significant climate risk level score (table 27). The risk scores for the resilience factors 'annual revenue' and 'type of business model' are relatively low (table 28). Companies that score higher climate risk levels on these resilience criteria tend to own tangible assets at destinations and in the transport sector. This profile concerns a small group of companies. The risk scores for the resilience factors 'destination supply', 'preferred mode of transport' and 'core proposition' are relatively high. Companies that score higher on these resilience criteria offer products in destinations with an average or high score in the CVIT; use (exclusively) fossil fuel-dependent transport modalities; and/or operate on the basis of a (partly) geographically bound core proposition. This profile applies to the majority of Dutch tour operators and consists of companies that differ widely in terms of size (revenue), destination offerings and proposition. Mitigating climate risks requires therefore

a tailor-made solution and requires looking at the specific business portfolio for each company or group of companies.

Lower climate risk level	Significant climate risk level	Higher climate risk level
The probability of asset impairment is lower. There is no immediate need to make changes to the business portfolio. Monitoring the risk is sufficient.	The probability of asset impairment is significant. It is prudent to improve the organisation's resilience to this risk.	The probability of asset impairment is higher. It is inevitable to improve the organisation's resilience to this risk
33 (17%)	165 (83%)	1

Table 27 Climate risk levels Dutch tour operators

Resilience factor	Climate risk score	Lower	Significant	Higher
Annual revenue	1,2	169 (85%)	26 (13%)	4 (2%)
Type of revenue model	1,3	166 (83%)	15 (8%)	18 (9%)
Destination	1,9	49 (25%)	113 (57%)	37 (19%)
Preferred mode of transport	2,4	21 (11%)	71 (36%)	107 (54%)
Core proposition	2,3	28 (14%)	77 (39%)	94 (47%)

Table 28 Climate risk levels by resilience factor

7.2. Implications for Dutch tour operators

What can tour operators do to reduce exposure to climate risks and avoid depreciation and asset stranding? Table 29 shows possible interventions for each resilience factor for the climate risks identified within KLIMARISKSCAN. These interventions are operational or strategic in nature. Operational interventions involve smaller adjustments limited to a specific part of the organisation. Strategic interventions cover multiple organisational units and potentially impact the company's revenue model.

Climate risks by resilience factor	Possible risk mitigation interventions
Annual revenue	
Climate lawsuits to prevent loss of asset value and asset stranding (C1).	**Public affairs**. Refrain from legal claims against the state regarding expected loss of asset value - regardless of the likelihood of eventual legal success - to avoid reputational damage to own brand and industry. Instead, dialogue with civil society actors on climate & environmental policies.
Climate lawsuits challenging alleged greenwashing and inadequate climate action by companies (C2).	**Corporate communication & reporting**. Careful, truthful and transparent communication of own climate impact and actions in line with ESG guidelines can remove some of this risk. **Marketing & communication**. Careful greenwashing check on all marketing communications, including expressions by management and employees via (social) media.
Reputational risks and loss of brand equity due to climate litigation and radiating risks to peers (C3).	**Corporate communication & reporting**. Careful, truthful and transparent communication of own climate impact and actions in line with ESG guidelines can remove some of this risk.
Type of revenue model	
Damage to destination assets due to climate change (incidental and chronic) (A1).	**Operation**. Climate adaptation measures (changes regarding property). **Business development**. Divest/accelerate depreciation and invest in assets with more limited risk at destination; invest in assets in alternative destinations less vulnerable to this risk.
Physical impact of climate change on the transport sector (A4).	**Operations**. Climate adaptation measures (planning; routing; safety). **Business development**. Divest/accelerate depreciation and invest in assets with lower risk; deploy assets to alternative uses (product development).
Rising insurance costs & increasing uninsurability of tangible assets (B1).	**Business development**. Divest/accelerate depreciation and invest in insurable assets with lower risk (product development).
Carbon lock-in effect of (investments in) tangible assets dependent on fossil fuel (B3).	**Operation**. Climate mitigation measures (efficiency improvements; use of more sustainable fuels). **Business development**. Divest/fossil fuel dependent assets accelerated depreciation and investment in assets that can be operated without fossil fuel dependence (product development).
Destination	
Physical exposure of clients to acute or chronic effects of climate change (A2).	**Operation**. Tighten security protocols. Temporarily not offering destinations. **Product management**. Phase out destination (gradually) and replace with alternative destinations less vulnerable to this risk (product development).
Destinations that will eventually become unsuitable for (certain forms of) tourism (A3).	**Product management**. Phase out destination (gradually) and replace with alternative destinations less vulnerable to this risk (product development).
Higher repatriation & claims costs and stricter solvency requirements (B2).	**Product management**. Phase out destination (gradually) and replace with alternative destinations less vulnerable to this risk (product development).

Destinations becoming less attractive to consumers due to the effects of climate change (B6).	**Product management**. Phase out destination (gradually) and replace with alternative destinations less vulnerable to this risk (product development).
Product forms losing appeal among consumers (B7).	**Product management**. Phase out (gradually) product form and replace with alternative product forms that are less vulnerable to this risk (product development).
Preferred mode of transport	
Dependence on fossil fuel to supply the product (B4).	**Business development**. Develop low-emission product forms at distances from the home market suitable for efficient use of low-carbon transport.
CO_2 emissions (B5).	**Operation**. Climate mitigation measures (efficiency improvements). **Business development**. Develop low-emission product forms at distances from home market suitable for efficient use of low-carbon transport.
Stricter climate & environmental policies and related direct and indirect price effects (B8).	**Business development**. Develop low-emission product forms at distances from the home market suitable for efficient use of low-carbon transport.
Curbing fossil advertising (B9).	**Business development**. Develop low-emission product forms at distances from the home market suitable for efficient use of low-carbon transport.
Loss of political support (B10).	**Public affairs**. Refrain from legal claims against the state regarding expected loss of asset value - regardless of the likelihood of eventual legal success - to avoid reputational damage to own brand and industry. Instead, dialogue with civil society actors on climate & environmental policies.
Core proposition	
Geographically-bound (B11).	**Marketing**. Geographically-bound proposition replaced by thematic proposition. **Business development**. Invest in destinations and products that can be marketed thematically without creating new geographical ties and aviation dependencies and in such a way that destinations and products can be easily replaced by alternative destinations and products when circumstances demand it.

Table 29 Risk mitigation interventions by resilience factor

Liability risks (C1; C2; C3) can be mitigated relatively easily. At the operational level, a thorough green-washing check on all marketing and communication statements and truthful, transparent climate impact reporting in line with ESG guidelines (see chapter 3) suffice. The exception is the required restraint when it comes to legal claims against the state aimed at delaying climate and environmental policy. This restraint is strategic in nature (in the long run). It limits reputational damage to individual companies and the sector in general, but it may put current revenue models under pressure, for example through higher transaction costs and prices due to capacity constraints. Such a situation can also act as an incentive for innovation, according to tour operator managers (see Buijtendijk et al., 2021).

Specific physical and transition risks (A1; A4; B1; B3) regarding the operation of capital-intensive tangible assets, such as destination real estate, cruise ships, and/or aircraft, can be mitigated at the operational level through climate adaptation and mitigation measures (efficiency improvements; use of more sustaina-

ble fuels). In the longer term, however, strategic shifts in the investment portfolio are inevitable to minimise carbon lock-ins. Due to their focus on efficiency and risk aversion, it is plausible that tour operators with heavy-asset revenue models may want to maintain these revenue models (see Doz & Kosonen, 2010). In that case, they may wind down financial positions in risky assets (real estate in destinations vulnerable to climate change and fossil fuel-dependent transport modes) and build up financial positions in less risky assets (real estate in destinations moderately vulnerable to climate change; low-carbon transport modes). Here, the distance between destinations and markets plays a central role. Greater distance perpetuates carbon lock-ins, as real estate in such destinations can only be efficiently operated by using fossil fuel-dependent transport modes, such as aeroplanes. On the other hand, aircraft may be less risky financially than real estate because aircraft - like cruise ships - can be exploited globally and also for purposes other than tourism, such as hosting or deporting asylum seekers (see, for example, Bolle, 2023; TUI Group, 2022).

Physical and transit risks regarding product forms and destinations vulnerable to the effects of climate change (A2; A3; B2; B6; B7) can usually be mitigated at the operational level. Tour operators can tighten safety protocols and temporarily not offer or phase out product forms and destinations and replace them with alternative product forms and destinations that are less vulnerable to these risks. However, interventions become more complex in nature if tour operators can only use fossil fuel-dependent transport modes to deliver these products, because destinations are too far away from the home market for the deployment of low-carbon transport alternatives (Peeters & Papp, 2023).

This aviation dependence exposes them to a number of transition risks (B4; B5; B8; B9; B10). Some of these risks can be partly mitigated with operational-level interventions, such as efficiency improvements and the use of more sustainable fuels, but in the long run this is insufficient as long as the Paris Agreement is the starting point of global climate policy (Peeters & Papp, 2023; TPCC, 2023). Possible interventions at the strategic level include reducing or completely avoiding aviation dependency, by developing low-emission products at distances from the home market suitable for the use of low-carbon transport combined with waiving legal claims against the state on expected loss of asset value in the event of stricter climate and environmental policies. However, effective implementation of such interventions requires strategic agility in the management of these companies (Doz & Kosonen, 2010).

Such strategic agility is more challenging for tour operators whose core proposition is destination-based (B1). This transition risk can be overcome operationally through marketing: by replacing a geographically bound core proposition with a thematic core proposition. It also requires many tour operators, such as country specialists depending on *long-haul* air travel to get customers to destinations, to invest in destinations and products that can be marketed thematically without creating a new geographical tie (a situation where one destination cannot easily be replaced by another if circumstances demand it).

7.3. Policy implications

The 18 climate risks we identified in this study can be mitigated for citizens and businesses by making tourism less dependent on aviation. Indeed, both physical risks and transit risks are reduced if aviation is not or less used as a transport modality. Destinations that are more vulnerable to climate change are further away from The Netherlands and can only be exploited with the help of aviation (see chapter 5). And aviation can only meet (net) zero emission targets with demand reduction - especially in the long-haul segment (Gössling & Humpe, 2024; NLR, 2024b; Peeters & Papp, 2023; TPCC, 2023). Reducing aviation-dependent tourism helps the Dutch government reduce CO_2 emissions from foreign holiday travel. The Knowledge Institute for Mobility Policy calculated that 74% of these emissions come from air travel and 37% of these

come from long-haul trips, which account for only 5% of outbound recreational travel (Martensen et al., 2023).

Making tourism less dependent on aviation is thus a real policy option (Peeters & Papp, 2023; TPCC, 2023). Aviation cannot de-carbonise at the scale required as long as it proposes sham solutions to maintain current revenue models based on volume growth (see, e.g., Peeters et al., 2023). More sustainable fuels are impossible to self-finance based on historically low margins and run into structural resource constraints when scaling up (Gössling & Humpe, 2024; Peeters & Papp, 2023). The transition and liability risks of aviation-dependent product offerings for the market travelling from The Netherlands will remain significant as long as the status quo does not change (see Merz et al., 2023).

National policy interventions that could contribute to reducing tourism's aviation dependence are a distance-based flight tax, as already repeatedly suggested by Schiphol itself (see Schyns, 2024, 2023; NLR, 2024), a legally enforced CO_2 cap for Dutch airports and a ban on fossil advertising. Such advertisements undermine effective government policy and a ban could help shift norms and trigger the required behavioural change that would enable tour operators to accelerate the necessary transition (see 6.3). International policy interventions include an international tax on kerosine and tightening the European emissions trading scheme (see also Lenzen et al., 2018). The aviation sector itself also calls for this at the national level (see NLR, 2024a), although this demand is somewhat gratuitous and such a narrative also serves to throw sand in the eyes of national policy makers. The industry knows it has an effective counter-lobby at the international level. For example, Air France - KLM previously lobbied at the European level against EU climate policies; in favour of airport expansions and against aviation climate policies such as taxes on airline tickets and kerosine (InfluenceMap, 2021; Mooldijk et al., 2022).

Without the aforementioned measures from the government - despite stated ambitions and rhetoric on sustainability - business-as-usual remains the international norm within the sector (Gössling et al., 2024; TPCC, 2023). This study on tour operators also shows that continuing on the current path is perceived as the best option as long as one is making profit, mutual competitive relationships do not shift and (growth in) revenue or profit outweighs the rising transaction costs caused by climate change. And the revenue prospects for the Dutch travel sector are good for now (NBTC, 2024). On the other hand, as chapter 6 shows, in terms of their thinking and actions, policy makers in The Netherlands have historically become used to the role of facilitator, seeking self-regulatory solutions together with economic sectors, and the soft approach is usually preferred to direct interventions in order to avoid political fallout (see Van Adrichem et al., 2022). This study shows that continuing on this path and thus maintaining the current stalemate is also questioned by tour operators themselves: external pressure is seen as a means to accelerate the necessary transitions.

7.4. Constraints and recommendations for further development of KLIMARISKSCAN

The main output of this report is the development and first application of KLIMARISKSCAN. It is a useful tool that allows companies and policy makers to understand climate risks for tour operators and tourism in general. KLIMARISKSCAN can help companies and policy makers to make climate action an integral part of strategy and policy-making, thus improving the future resilience of tourism.

The latter is crucial from a policy and strategic point of view. Many private parties and sectors affiliated with tourism traditionally consider the climate issue separately - for example, within a dedicated CSR, public affairs and/or sustainability team. However, effective climate risk management requires that climate action is an integral part of corporate strategies and policies and plays a central role in investment decisions and setting policy priorities (see also chapters 3 and 4 of this report). In addition, it is valuable for companies such as tour operators to have their own insight into the climate risks they face, so that they can report on this to possible financiers and proactively apply climate risk management within their business operations. This is also important because Dutch financial institutions increasingly have to use ESG criteria when assessing requests for financing to comply with national and European policy frameworks (see chapter 3). KLIMARISKSCAN can therefore come in handy here.

KLIMARISKSCAN_v1 is a first step along this path and is obviously not without limitations. For instance, the seven revenue scales used by version 1 are the result of setting scale limits at points where larger revenue differences occurred within the sample and are thus determined quite arbitrarily. Such randomness is not unusual in tour operator-specific research, where revenue plays a role in sample design (see, for example, Goffi et al., 2018). However, it is recommended that in the further development of KLIMARISK, a standard methodology for scaling revenue within a sample should be adopted.

The same applies to some extent to the three revenue categories used within KLIMARISKSCAN_v1 (low; medium; high). In broad terms, these revenue categories correspond to the SME definition as used by the European Commission (2020). The low category consists entirely of small and micro companies. The medium category consists of small and medium-sized enterprises. The high category consists of companies outside the SME definition. It is therefore recommended that the further development of KLIMARISK in any international context takes the aforementioned SME definition guideline as a starting point.

In addition to these methodological limitations, further research is required to further strengthen KLIMARISKSCAN. KLIMARISKSCAN_v1 assumes that larger companies are more vulnerable to climate risks than smaller companies. This assumption is based on the Dutch aviation policy context; the fossil dependency of larger companies due to their physical assets and the liability risks they face and sometimes take with them (for example by litigating against environmental policies). Conversely, however, it can also be reasoned that larger firms have more resources and a more extensive product portfolio, which allows them to shift supply more easily than smaller firms. Further research on the effect of firm size on climate risk management capacity is therefore important.

Such research should look separately at cruise ship and aircraft operations. Such physical assets are highly standardised; can be operated globally in terms of markets, destinations and routes; will remain largely dependent on fossil fuels (see TPCC, 2023, among others); and are hardly nationally regulated. This makes them potentially a profitable investment asset at a time when other sectors that do fall under countries' national climate policies are reducing their fossil dependence. The cruise sector is particularly interesting in this respect. Despite the huge environmental and climate impact of cruise holidays, the financial performance of this growth industry seems robust (Lloret et al., 2021; Syriopoulos et al., 2022). It cannot be ruled out that cruise lines - due to the flexibility inherent in multinationals that operate global mobile tangible assets and can tap into markets and capital - are less vulnerable to climate risks than companies operating destination property. Research into the political, moral-ethical, and social implications of maintaining the operation of capital-intensive, mobile tangible assets within tourism is therefore crucial.

Taking these points into account, companies, (sub-)sectors and policy makers can perfectly use KLIMARISKCAN_v1 as an initial quick scan, to estimate the climate risks applicable to their portfolio. The current

version of the tool lends itself perfectly to further refinement and validation, using data input from individual companies or specific sub-sectors. More detailed analyses become possible when weighting factors are assigned to different climate risks based on stakeholder inputs: KLIMARISKSCAN_v1 assumes that each climate risk category and each climate risk has equal weight, while some climate risks naturally weigh more heavily than others. The assignment of weighting factors is ideally done through a transparent and participatory process. For each (sub)sector or company, it therefore makes sense to assign specific weighting factors to the identified climate risks jointly with the parties involved. This can be done on the basis of revenue distribution across specific destinations and markets, for example. Feedback loops can also be taken into account (the extent to which different climate risks influenced each other). Thus, KLIMARISKSCAN can be applied as a full-fledged tool that allows policy makers and companies to identify climate risks for different forms of tourism activity and be built into a (context-specific) climate risk model for tourism. Such a course of action could be taken as part of an international partnership

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Annexes

Annex I Interview guide

This document contains all the information for the semi-structured interviews of WP2. This information is for interviewers only and not for respondents. It contains the following information:

1. Interview framework and structure

The interview consists of 4 parts. Each part covers 1 specific topic (A-D).

A Perceived, different types of climate risks affecting assets in general
B Criteria, current and future (legal) requirements, and tools used to determine and evaluate climate risks affecting assets
C Perceived, specific climate risks affecting specific assets in the tour operating sector.
D Current and suggested ways to determine and evaluate climate risks affecting assets in the tour operating sector.

Topic A and B deal with climate risks in a general sense and current criteria and tools to determine and evaluate these risks, including (legal) requirements that apply to estimating, reporting and addressing these risks. Topic C and D deal with the touring sector specifically (as described in the portfolio letter) and look at climate risks for this sector and current and new possible ways to determine and assess these risks.

2. Information to share with respondents in advance

2-3 days before the interview, respondents should have received the portfolio letter (MS Teams folder) and the informed consent form (MS Teams folders), along with the email below, which you can customise yourself: (English below).

Geachte ...

Op [DATUM] om [TIJD] treffen wij elkaar online voor het interview in het kader van het CELTH-project "Investeringsrisico's van luchtvaartafhankelijkheid in de Nederlandse uitgaande touroperatingsector." Naast deze email heeft u een MS Teams meeting invite ontvangen voor het interview.

Het doel van het interview is vanuit uw perspectief meer te leren over hoe financiers en investeerders de klimaatrisico's voor assets bepalen en evalueren. Onder klimaatrisico's verstaan we zowel de fysieke risico's van klimaatverandering voor assets als de transitierisico's voor assets die gepaard gaan met (wettelijk verplichte) decarbonisatie van bedrijven.

Het interview zal ongeveer 45-60 minuten duren en bestaan uit vier onderdelen. We zullen achtereenvolgens praten over: (1) de risico's van klimaatverandering voor assets in algemene zin; (2) gangbare criteria, (wettelijke) eisen en tools om deze risico's te bepalen en evalueren; (3) specifieke klimaatrisico's van toepassing op de Nederlandse uitgaande touroperating sector; en (4) huidige en mogelijke manieren om klimaatrisico's voor assets in de tour operating sector te bepalen en evalueren.

Mocht u nog vragen hebben vooraf, neemt u gerust contact met mij op. In de bijlage vindt u ter voorbereiding een investment portfolio brief document met verdere informatie over de Nederlandse outbound tour operating sector en een informed consentformulier. Zou u dit formulier willen ondertekenen en aan mij kunnen retourneren?

Bedankt vast en hartelijke groeten,
@@

Dear ....

On [DATE, TIME] we meet online for the interview in relation to the CELTH project 'investment risks of aviation-dependency in the Dutch outbound tour operating sector'. Alongside this email, you have received a MS Teams invite for this interview.

The aim of the interview is to learn more about your perspective on how financers and investors determine and evaluate the climate risks for assets. With climate risks we mean: both the physical risks of climate change for assets and the transition risks for assets that come with (legal requirements for) the decarbonisation of companies.

The interview will take approximately 45-60 minutes and consists of four parts. We will discuss: 1) the climate risks for assets in general; 2) current criteria, legal requirements and tools to determine and evaluate asset-related climate risk; 3) specific climate risks for assets of outbound tour operators; 4) current and possible ways to determine and evaluate climate risks for assets of outbound tour operators.

In case you have any further questions, please contact me directly. Attached you find, in preparation for in the interview, an investment portfolio brief document with background information about the Dutch outbound tour operating sector and an informed consent form. Could you return a signed copy of this form by email?

Many thanks in advance and kind regards,
@@

3. Lead questions, follow up questions en probing questions per topic

TOPIC A Perceived, different types of climate risks for assets in general

We start the interview with very broad and general questions. This gives respondents room to provide their own direction on (their interpretations of) the topic and thus we learn more about how they, as experts, view this topic. However, we should avoid making it too vague and abstract. Therefore, if necessary, ask for specific examples or explanations ("what exactly do you mean by that?"/"can you explain that in further detail?"/etc.) (can you elaborate a bit, can you illustrate your point with an example, etc.).

Lead questions (Dutch/English)

- Wat zijn volgens u klimaatrisico's voor assets in algemene zin?
- Welke verschillende categorieën klimaatrisico's onderscheidt u?
- What are, from your perspective and in general terms, climate risks for assets?
- If you are to group or categorise these risks, how would you go about this?
- What risk categories do you distinguish?

Follow-up questions

- Welke klimaatrisico's zijn momenteel het relevantst voor investeerders/financiers en waarom?
- What climate risks are currently most relevant for investors/financers and why?

Probing questions

- Transitierisico's, fysieke risico's, aansprakelijkheidsrisico's
- Transition risks, physical risks, litigation risks

TOPIC B Criteria, current and future legal requirements and tools to identify and evaluate climate risks for assets

Here we try to find out whether: the determination and evaluation of climate risk investment and finance is institutionalised or whether it is a still more or less virgin territory where different parties are trying to reinvent the wheel. We are also trying to find out whether there are criteria and tools currently in use that would be useful to integrate into our climate risk investment benchmark. Finally, it is useful to get a picture of relevant (legal) requirements (rules, legislation) that encourage investors and financiers but also companies to report climate risks and minimise them through transitions in their business operations.

Lead questions (Dutch/English)

- Hoe worden momenteel de klimaatrisico's voor investeringen en financiering van assets in kaart gebracht?
- How do investors/financers currently determine or evaluate the climate risks of the assets they are financing/investing in?

Follow-up questions

- Wat zijn algemene criteria en tools om risico's van investeringen/financiering te bepalen/evalueren?
- Wat zijn criteria om de klimaatrisico's van investeringen/financiering te bepalen/evalueren?
- Welke criteria hanteert men hierbij?
- Welke tools worden hiertoe gebruikt?
- Aan welke klimaatgerelateerde (wettelijke) eisen moeten financieringen of investeringen voldoen?
- What are the mainstream tools used to evaluate risks of investments?

- What different criteria are used to determine or evaluate the climate risks of assets?
- What tools are currently used to determine or evaluate the climate risks of assets?
- What climate-related (legal) requirements should investment or finance flows meet?

Probing questions

- Hoe berekent de financiële sector hun blootstelling van investeringen en portfolio's aan klimaatrisico's en gestrande activa?
  - Carbon footprinting
- Hoe betrokken is de financiële sector bij de bedrijven waarin ze beleggen op het gebied van klimaatverandering?
  - Direct besproken, stemrecht aandeelhouders, klimaat – gestrande activa risico's moeten in kaart gebracht worden
- How does the financial sector calculate the exposure of their investments and portfolios to climate-related risks?
  - Carbon footprinting
- How engaged are investors with their investee companies when it comes to climate change?
  - Directly discussed, shareholder voting, demand disclosure on stranded assets/climate risks

TOPIC C Perceived, specific climate risks for specific assets in the tour operating sector

Lead questions (Dutch/English)

- Wat zijn volgens u klimaatrisico's voor assets in de tour operating sector?
- Op welke assets hebben deze risico's betrekking?
- What are, from your perspective, climate risks for assets in the tour operating sector?
- What (specific) tour operator assets are affected by these climate risks?

Follow-up questions

- In hoeverre kunnen de eerder besproken klimaatrisico-categorieën ook op de tour operating sector worden toegepast?
- Zijn er aanpassingen (binnen/buiten deze categorieën) nodig en zo ja welke/zo nee waarom niet?
- To what extend is it possible to apply aforementioned risk categories to the tour operating sector?
- Are adjustments required (to these categories)? If yes, what adjustments? If not, why not?

Probing questions

Should answers remain vague/general, ask for specific examples or explanations ("what exactly do you mean by that"/"can you explain this in further detail"/etc.) (can you elaborate a bit, can you illustrate your point with an example, etc.).

TOPIC D Current and proposed ways to determine and assess the climate risks of assets in the tour operating sector

Here we try to find out if: the determination and evaluation of climate risks of investments and financing for tour operating is institutionalised or if it is a still more or less virgin territory where different parties are trying to reinvent the wheel. We also try to find out whether specific criteria and tools for tour operating/tourism are currently in use or to be put into use that would be useful to integrate into our climate risk investment benchmark. Finally, it would be good to get a picture of tour operating-specific, (legal) requirements (rules, legislation) that encourage investors and financiers but also companies to report climate risks and minimise them through transitions in their operations.

Leading questions (Dutch/English)

- Hoe worden momenteel de klimaatrisico's voor investeringen en financiering van assets in de tour operating sector in kaart gebracht?
- How do investors/financers currently determine or evaluate the climate risks of assets in the tour operating sector?

Follow-up questions

- Welke criteria en tools gebruikt men hierbij volgens u?
- Welke criteria en tools zou u ze aanraden gebruiken?
- Met welke (wettelijke) eisen moeten financiers, investeerders en de tour operating zelf rekening houden als het gaat om investeringen en financiering t.b.v. deze sector?
- What criteria and tools are currently used according to you?
- What criteria and tools would you recommend them to use?
- What (legal) requirements should the financers, investors and the sector itself take into account when it comes to financing and investments into this business?

Probing questions

- Zijn (potentiële) investeringen in Nederlandse touroperators een klimaatrisico?
  - Indien ja, waarom en hoe zouden investeerders (moeten) handelen?
    - Probes: kapitaal terugtrekken, kapitaal herbeleggen, investeren in groene sectoren
    - Is er hier een groter risico voor AHBM dan voor ALBM? Door bijv. investeringen in materiële activa als luchtvaartmaatschappijen.
  - Indien nee, waarom niet? Zou het in de toekomst een risico kunnen worden

4. Data storage and analysis

Please save recordings of the interviews in the MS Teams folder provided for this purpose, as NAME RESPONDENT_DATE_file format. Please add a short (max 1 A4) report (can be bullet points) of the interview and the most interesting/noteworthy passages according to the interviewer. These can be saved in the same MS Teams folder as NAME RESPONDENT_DATE_report.doc.

Annex II Climate risks for Dutch tour operators

Number	Climate risk for tourism	Notes
A	**Physical risks**	
A1	Damage to assets at destination due to climate change (incidental and chronic).	Tour operators are increasingly facing damage to physical assets at destinations, such as hotels and resorts, due to the effects of climate change, such as extreme weather (storms, precipitation), natural disasters (forest fires) and increased sea level.
A2	Physical exposure of customers to acute or chronic effects of climate change.	Tour operators offering destinations vulnerable to the effects of climate change and/or offering these destinations during periods when these destinations are vulnerable to the effects of climate change risk exposing customers to negative health effects (e.g. heat stress from heat waves, poor air quality due to forest fires).
A3	Destinations that will eventually become unsuitable for (certain forms of) tourism.	Tour operators dependent on offering vulnerable destinations that will eventually become unsuitable for (certain forms of) tourism due to the effects of climate change.
A4	Physical impact of climate change on the transport sector.	Tour operators offering destinations vulnerable to the effects of climate change are at risk of damage and disruption related to the use and operation of road and rail networks, waterways, aircraft and airports.
B	**Transition risks**	
B1	Rising insurance costs & increasing uninsurability of tangible assets.	Tour operators with tangible assets in destinations vulnerable to the effects of climate change are increasingly facing rising insurance costs and uninsurability.
B2	Higher repatriation & compensation costs and stricter solvency requirements	Tour operators organising trips to destinations vulnerable to the effects of climate change or dependent on one or a limited number of destinations for their offerings may eventually face higher repatriation & compensation costs and/or stricter solvency requirements from the Travel Guarantee Fund (SGR).

Number	Climate risk for tourism	Notes
B3	Carbon lock-in effect of (investments in) tangible assets dependent on fossil fuel.	Path dependency risk. Tour operators owning (investing in) capital-intensive assets largely dependent on fossil fuel (aircraft, cruise ships) may find it difficult to make transitions due to related corporate cultures focused on continuity and long-term stability.
B4	Dependence on fossil fuel to deliver the product.	Tour operators that are largely dependent on fossil fuels based on their core proposition and/or product offering.
B5	CO_2 emissions	Industry associations, financiers and social stakeholders will increasingly demand tour operators to demonstrate emissions reductions and periodic progress reports.
B6	Destinations becoming less attractive to consumers due to the effects of climate change.	Tour operators organising trips to destinations vulnerable to the effects of climate change face changes in destination preferences among consumers and related loss of value of (tangible) assets.
B7	Product forms losing appeal among consumers.	Certain products, such as air holidays to beach destinations or long-haul travel, may lose their appeal among consumers (through, for example, shifting norms and price effects) due to the effects of climate change and changes in public opinion and government policies.
B8	Stricter climate & environmental policies and related direct and indirect price effects.	More stringent climate and environmental policies at national and international levels and related direct and indirect price effects (pricing, cost price changes).
B9	Curbing fossil advertising.	Tour operators which sell fossil-dependent products in particular and actively advertise these products are at risk of losing sales and value of (advertised) assets.
B10	Loss of political support.	Tour operators and the travel industry at large lose political-social support among politicians and policy makers when sustainability claims and reported sustainability performance are seen as implausible or non-transparent by civil society organisations and pressure from action groups increases. This can lead to higher interest rates, higher staff revenue, higher wage demanded by employees and less support from non-governmental organisations (NGOs) and governments.

Number	Climate risk for tourism	Notes
B11	Destination	Tour operators with a destination-specific core proposition (e.g. country specialists) cannot switch destinations as easily and are more dependent on aviation if the destinations are further from the home market. This lack of agility can lead to loss of value and stranding of assets.
C	**Liability risks**	
CC1	Climate lawsuits to prevent loss of asset value and asset stranding.	Tour operators are at risk of (legal) costs arising from lawsuits filed to delay governments' climate and environmental policies and asset depreciation.
CC2	Climate lawsuits challenging alleged greenwashing and inadequate climate action by companies.	Tour operators' risk (legal) costs arising from lawsuits filed by civil society organisations to accelerate transitions to a low-carbon economy.
CC3	Reputational risks and loss of brand value due to climate litigation and passing risks to peers	As a result of climate lawsuits affecting the industry, tour operators are at risk of reputational damage and loss of asset value.

Annex III Microsoft Excel coding scheme

Climate risk score = (climate risk score annual sales + climate risk score revenue model type + climate risk score destination offer + climate risk score preferred mode + climate risk score core proposition) / 5

TO number	KR Score JO	KR Score VT	KR score BA	KR Score T	KR Score KP	Total	Klimarisk score
1	2	1	2	3	2	10,00	2,00
2	2	1	2	3	3	11,00	2,20
3	1	1	2	2	2	8,00	1,60
4	2	1	1	1	3	8,00	1,60
6	1	1	2	3	2	9,00	1,80
7	1	1	3	3	3	11,00	2,20
8	1	1	3	3	3	11,00	2,20
9	1	1	3	3	2	10,00	2,00
10	1	2	3	3	3	12,00	2,40
11	1	1	2	3	2	9,00	1,80
12	1	1	2	2	2	8,00	1,60
13	1	1	2	2	2	8,00	1,60
14	1	1	3	3	3	11,00	2,20
15	1	1	2	2	1	7,00	1,40
16	1	1	2	3	1	8,00	1,60
17	1	1	2	3	1	8,00	1,60
18	1	1	3	3	2	10,00	2,00
19	3	1	2	2	2	10,00	2,00
20	1	3	2	3	2	11,00	2,20
21	1	1	1	3	1	7,00	1,40
22	1	1	1	2	2	7,00	1,40
24	1	1	3	3	2	10,00	2,00
25	1	1	2	3	2	9,00	1,80
26	2	1	2	2	2	9,00	1,80
27	2	1	2	2	3	10,00	2,00
28	1	2	3	3	3	12,00	2,40

TO number	KR Score JO	KR Score VT	KR score BA	KR Score T	KR Score KP	Total	Klimarisk score
30	1	1	1	3	3	9,00	1,80
31	1	1	2	2	2	8,00	1,60
32	1	1	2	3	3	10,00	2,00
33	1	1	2	2	3	9,00	1,80
36	1	3	2	2	2	10,00	2,00
38	1	2	3	3	3	12,00	2,40
39	1	1	2	3	2	9,00	1,80
40	2	1	1	2	2	8,00	1,60
41	1	1	2	3	2	9,00	1,80
42	1	3	1	1	2	8,00	1,60
43	1	1	1	1	2	6,00	1,20
44	1	1	1	1	2	6,00	1,20
45	1	1	1	2	3	8,00	1,60
46	2	3	2	2	1	10,00	2,00
47	3	3	2	3	2	13,00	2,60
48	1	1	2	3	2	9,00	1,80
49	1	1	2	3	2	9,00	1,80
50	1	1	2	3	2	9,00	1,80
51	1	1	2	3	2	9,00	1,80
52	1	1	2	3	2	9,00	1,80
53	1	1	2	2	1	7,00	1,40
54	1	1	1	3	3	9,00	1,80
55	2	3	2	2	2	11,00	2,20
57	1	1	1	3	2	8,00	1,60
58	1	1	2	2	1	7,00	1,40
60	1	1	2	2	2	8,00	1,60
61	1	1	2	2	1	7,00	1,40
62	2	1	2	3	2	10,00	2,00
63	1	1	2	3	2	9,00	1,80
64	1	1	2	3	3	10,00	2,00
65	1	1	2	2	3	9,00	1,80
66	1	1	3	3	2	10,00	2,00
68	1	1	2	2	2	8,00	1,60
69	1	1	1	2	2	7,00	1,40
70	1	1	2	3	3	10,00	2,00

TO number	KR Score JO	KR Score VT	KR score BA	KR Score T	KR Score KP	Total	Klimarisk score
71	2	3	2	2	3	12,00	2,40
74	1	2	1	2	1	7,00	1,40
75	1	1	2	2	3	9,00	1,80
76	1	1	1	2	1	6,00	1,20
78	1	1	2	3	3	10,00	2,00
81	1	2	3	3	3	12,00	2,40
82	1	1	3	3	3	11,00	2,20
83	1	1	2	1	1	6,00	1,20
85	1	1	3	3	3	11,00	2,20
86	1	2	1	2	1	7,00	1,40
87	1	3	1	3	2	10,00	2,00
88	1	1	1	2	2	7,00	1,40
90	1	1	2	2	2	8,00	1,60
91	1	1	2	3	2	9,00	1,80
92	1	1	2	3	2	9,00	1,80
93	1	1	2	2	2	8,00	1,60
95	1	1	2	2	2	8,00	1,60
96	1	2	2	2	2	9,00	1,80
98	1	2	2	3	2	10,00	2,00
99	1	1	2	2	1	7,00	1,40
102	1	2	3	3	3	12,00	2,40
104	1	1	2	3	3	10,00	2,00
106	1	3	2	2	3	11,00	2,20
108	1	1	1	3	3	9,00	1,80
109	1	1	1	2	3	8,00	1,60
111	1	2	2	3	2	10,00	2,00
112	1	1	1	1	1	5,00	1,00
113	1	1	2	2	2	8,00	1,60
114	2	1	2	2	2	9,00	1,80
115	1	1	2	3	3	10,00	2,00
116	1	1	2	2	2	8,00	1,60
118	1	3	1	1	2	8,00	1,60
120	2	1	2	2	2	9,00	1,80
121	1	1	1	1	1	5,00	1,00
122	1	1	3	3	3	11,00	2,20

TO number	KR Score JO	KR Score VT	KR score BA	KR Score T	KR Score KP	Total	Klimarisk score
123	1	1	3	3	3	11,00	2,20
124	1	3	1	1	3	9,00	1,80
126	1	2	3	3	3	12,00	2,40
127	1	1	3	3	3	11,00	2,20
128	1	1	3	3	3	11,00	2,20
130	1	1	3	3	2	10,00	2,00
133	1	1	1	2	1	6,00	1,20
134	1	1	1	2	3	8,00	1,60
135	1	1	2	3	3	10,00	2,00
136	1	3	1	3	1	9,00	1,80
137	1	1	2	2	3	9,00	1,80
138	1	1	2	3	3	10,00	2,00
139	1	1	2	3	1	8,00	1,60
140	1	1	1	2	3	8,00	1,60
141	1	1	1	2	3	8,00	1,60
142	1	1	1	2	1	6,00	1,20
143	1	1	1	3	3	9,00	1,80
144	2	3	1	2	2	10,00	2,00
146	1	1	2	1	2	7,00	1,40
147	1	1	2	3	2	9,00	1,80
148	1	1	3	3	3	11,00	2,20
149	1	1	3	3	3	11,00	2,20
150	1	2	3	3	3	12,00	2,40
151	1	1	2	3	2	9,00	1,80
152	1	1	3	3	2	10,00	2,00
153	1	3	1	2	2	9,00	1,80
155	2	1	1	2	2	8,00	1,60
158	1	1	2	2	1	7,00	1,40
159	1	1	2	1	1	6,00	1,20
160	1	1	1	2	3	8,00	1,60
161	1	1	3	3	3	11,00	2,20
162	1	1	2	3	3	10,00	2,00
163	1	1	3	3	3	11,00	2,20
164	1	1	3	3	3	11,00	2,20
166	1	2	2	3	3	11,00	2,20

TO number	KR Score JO	KR Score VT	KR score BA	KR Score T	KR Score KP	Total	Klimarisk score
168	1	1	3	3	3	11,00	2,20
178	1	1	3	3	3	11,00	2,20
179	1	1	1	2	1	6,00	1,20
180	1	1	2	3	3	10,00	2,00
182	2	1	2	1	3	9,00	1,80
183	1	2	1	1	3	8,00	1,60
185	1	1	1	3	1	7,00	1,40
186	1	1	2	3	3	10,00	2,00
187	1	1	2	3	3	10,00	2,00
188	1	1	2	3	3	10,00	2,00
190	2	1	2	3	3	11,00	2,20
191	1	1	1	3	2	8,00	1,60
193	1	1	2	2	3	9,00	1,80
195	1	1	2	3	2	9,00	1,80
196	1	1	2	2	2	8,00	1,60
197	1	1	1	1	3	7,00	1,40
198	1	1	2	1	2	7,00	1,40
203	2	1	2	2	2	9,00	1,80
205	1	1	1	2	2	7,00	1,40
206	1	3	2	2	2	10,00	2,00
207	1	1	2	2	3	9,00	1,80
209	1	1	3	3	2	10,00	2,00
210	1	3	2	2	2	10,00	2,00
212	1	1	2	2	2	8,00	1,60
213	1	1	1	1	2	6,00	1,20
214	1	1	2	3	2	9,00	1,80
215	2	1	1	2	3	9,00	1,80
216	1	1	2	3	2	9,00	1,80
220	3	3	2	2	2	12,00	2,40
221	1	1	2	3	2	9,00	1,80
222	1	1	2	3	3	10,00	2,00
223	1	2	3	3	3	12,00	2,40
227	1	1	2	3	2	9,00	1,80
228	1	1	2	1	3	8,00	1,60
229	1	1	2	3	3	10,00	2,00

TO number	KR Score JO	KR Score VT	KR score BA	KR Score T	KR Score KP	Total	Klimarisk score
230	1	1	1	3	3	9,00	1,80
231	2	1	2	3	3	11,00	2,20
233	1	1	3	3	3	11,00	2,20
235	1	1	2	2	3	9,00	1,80
237	1	1	2	3	3	10,00	2,00
239	1	1	2	3	3	10,00	2,00
240	2	1	2	3	3	11,00	2,20
242	1	1	3	3	1	9,00	1,80
243	1	1	2	2	3	9,00	1,80
244	2	1	2	3	3	11,00	2,20
245	1	1	2	2	3	9,00	1,80
246	2	1	3	3	3	12,00	2,40
247	1	1	2	3	3	10,00	2,00
248	1	1	1	1	3	7,00	1,40
249	1	1	1	2	3	8,00	1,60
251	3	3	2	2	2	12,00	2,40
252	1	1	3	3	3	11,00	2,20
254	2	1	2	3	3	11,00	2,20
255	1	1	2	3	2	9,00	1,80
256	1	1	2	2	3	9,00	1,80
257	2	1	1	1	3	8,00	1,60
260	1	1	2	3	3	10,00	2,00
261	1	1	1	1	3	7,00	1,40
262	1	1	3	3	3	11,00	2,20
263	1	1	2	3	3	10,00	2,00
266	1	1	2	1	3	8,00	1,60
267	2	1	1	2	1	7,00	1,40
268	1	1	2	2	1	7,00	1,40
270	1	1	1	2	1	6,00	1,20
271	1	1	2	3	1	8,00	1,60
273	1	1	2	2	3	9,00	1,80
276	1	1	3	3	3	11,00	2,20
277	2	1	2	3	3	11,00	2,20

Annex IV KLIMARISKSCAN_v1 score matrix

Resilience factor	Climate risk criteria applicable
Annual revenue (VM)	C1; C2; C3
Lower	Tour operators in the lower or medium revenue category have limited exposure to liability risks
Significant	Tour operators in the low or medium revenue category are significantly exposed to liability risks
Higher	Tour operators in the high revenue category's exposure to liability risks is above average.
Revenue model type (VM)	A1; A4; B1; B3;
Lower	Tour operators with an asset-light revenue model have limited exposure to the financial consequences of physical impacts of climate change on physical assets in destinations and in relation to the transport sector, as well as rising insurance costs/uninsurability of these physical assets. These tour operators are less likely to face carbon lock-in effects and related liability risks.
Significant	Tour operators with an asset-medium revenue model are significantly exposed to the financial consequences of physical impacts of climate change on tangible assets in destinations and in relation to the transport sector, as well as rising insurance costs of these tangible assets. Tour operators are significantly at risk of carbon lock-in effects and related liability risks.
Higher	Tour operators with an asset-heavy revenue model are more than averagely exposed to the financial consequences of physical impacts of climate change on tangible assets in destinations and in relation to the transport sector, as well as rising insurance costs of these tangible assets. These tour operators are at an above-average risk of carbon lock-in effects and related liability risks.
Destination offers (P)	A2; A3; B2; B6; B7
Lower	Tour operators that mostly offer travel to destinations that score low on the CVIT are at a limited risk of exposing their customers to the physical effects of climate change and related potential implications of rising repatriation/damage costs and solvency requirements. It is currently unlikely that some of these trips cannot be offered in the future.
Significant	Tour operators that mostly offer trips to destinations that score low or medium on the CVIT face some risk of exposing their customers to the physical effects of climate change and related potential implications of rising repatriation/damage costs and solvency requirements. There is a risk that some of these trips may not be offered in the future.

Resilience factor	Climate risk criteria applicable
Higher	Tour operators that mostly offer trips to destinations that score average or high on the CVIT are at a greater risk of exposing their customers to the physical effects of climate change and related potential implications of repatriation/ damage costs and solvency requirements. The risk that some of these trips can no longer be offered in the near future is significant.
Preferred mode of transport (P)	B4; B5; B8; B9; B10
Lower	Tour operators that do not use transport modes that continue to rely on fossil fuels have lower CO_2 emissions and thus limited exposure to stricter climate policies and related price effects, marketing restrictions, and plausible loss of political and public support.
Significant	Tour operators that (mostly) use transport modes that remain dependent on fossil fuels have higher CO_2 emissions and are thus partly exposed to stricter climate policies and related price effects, marketing restrictions, and plausible loss of political and public support.
Higher	Tour operators that exclusively use transport modes that remain dependent on fossil fuels have high CO_2 emissions and are thus fully exposed to stricter climate policies and related price effects, marketing restrictions, and plausible loss of political and public support.
Core proposition (VM)	B11
Lower	Tour operators that have a core thematic proposition are basically not destination-specific.
Significant	Tour operators that have a combination of a geographical and thematic core proposition are partly destination-specific but can adapt this relatively easily.
Higher	Tour operators that have a fully geographical core proposition are destination-specific. Adjustments to this proposition require major changes within the company.

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