Physical climate risk survey: those in the infrastructure investment industry are concerned and lack data

These risks could be huge, and we have no certainty on how they will affect global infrastructure

EDHEC Infrastructure & Private Assets Research Institute

January 2024

About the EDHEC Infrastructure & Private Assets Research Institute

Since 2019, and with the support of the Monetary Authority of Singapore (MAS), the EDHEC Infrastructure & Private Assets Research Institute has been developing ground-breaking research to document the risks and financial performance of investments in unlisted infrastructure equity and debt, as well as the climate impacts and risks of these essential assets.

The indices and benchmarks produced by EDHEC are recognised by the European Securities and Markets Authority (ESMA) and used by investors representing USD400bn in infrastructure assets under management. The data produced by the institute is grounded in modern financial theory and the principles of fair value accounting, which are key pillars of sound financial risk management.

Through its work, the institute has shown that it is possible to measure market dynamics in private and illiquid markets and produce credible measures of the risk-adjusted performance of private assets that makes them comparable to other asset classes. The same data is used by policy makers and prudential authorities including the G20, the OECD, IAIS, and more.

Since 2023, new research efforts have allowed this financial database to be complemented with a unique set of climate data for unlisted infrastructure, which is at the heart of the climate transition, since it represents more than 60% of total Scope 1, 2, and 3 greenhouse gas emissions. Whether it involves a dedicated green taxonomy or measurement of the exposure and quantification of transition and physical risk at the sub-asset level, the granularity, depth, and quality of the EDHEC Infrastructure & Private Assets data make it a unique reference point for public and private decision-makers.

This survey was conducted among investors and other professionals who were invited to a presentation of our latest research paper

Executive Summary

Investors and other industry professionals are concerned about physical climate risk and believe that they have almost no idea how it will affect unlisted infrastructure assets; that's the clear message they delivered when we surveyed them on their views regarding the risks to the asset class and whether they feel the advice and information they are getting is sufficient or even reliable.

This survey was conducted among investors and other professionals who were invited to a presentation of our latest research paper. Key takeaways from the survey data, which polled 70 investment industry professionals including managers with more than USD2 trillion under management, are as follows:

- 97% of investors polled believe physical climate risk is significant.
- Some 76% believe it will have a medium or high effect on their infrastructure investments.
- However, only 16% think we actually know how it will impact these assets.
- 76% also stated that the climate scenarios used by financial institutions to evaluate transition risk to infrastructure are inadequate for the assessment of physical climate risk.
- That said, some three quarters said that EDHEC's research had helped them to better assess these risks and their potential impact.

The survey also revealed that some two-thirds of those polled had carried out no evaluation of this physical risk themselves.

In very concrete terms, this survey confirms that despite the importance attributed to physical climate risk, investors and managers are not in a position to estimate its impact on their own portfolio. This inability is all the more detrimental in that investor portfolios, being highly concentrated, can be very strongly exposed to physical climate risk without awareness of this. This lack of knowledge of risks that can be very high at asset level and the high level of portfolio concentration is a situation that, in a context in which institutional asset owners are increasingly investing in private assets, notably unlisted infrastructure, raises important questions for the risk management and solvency measurement of insurance companies and pension funds.

The EDHEC Infrastructure & Private Assets Research Institute carried out this survey following a webinar arranged to present recent groundbreaking research into the physical climate risks overhanging the sector. In effect, in August 2023, EDHEC published the aforementioned new research paper, "It's getting physical", which revealed that an investor could incur losses of 54% on the value of their unlisted infrastructure portfolio due to the realisation of climate risks before 2050. This estimation was produced using the EDHEC Infrastructure & Private Assets Research Institute's database of financial and extra-financial database on unlisted infrastructure, the largest in the world today.

This high level of risk shows the importance of implementing more ambitious policies to cope with climate change. The energy transition and the alignment of economies bring a cost to private investors, but so does climate change! Importantly, however, our research also showed that if the relevant stakeholders could only organise the transition towards a decarbonised economy today, extreme losses could be reduced by half.

This survey also raises the question of the right information and the management of climate risks and their financial consequences for long-term investors in infrastructure.

Executive Summary

On 27 September 2023, the EDHEC Infrastructure & Private Assets Research Institute held a webinar to present these findings to 261 investment professionals globally, including asset managers, asset owners, consultants, banks, and regulators. Following this we polled our invited audience for their views on some of key questions regarding their views and practices regarding physical climate risk management for unlisted infrastructure assets.

The rest of this note summarises the research, the webinar at which we presented its findings[1], and an in-depth look at the survey that followed and its responses.

1 - "It's Getting Physical" webinar held on 27 September 2023, available here: https://www.youtube.com/watch?v=eRy6dRWSsjc

Authors

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Frédéric Blanc Brude is the founding Director of EDHEC Infrastructure & Private Assets Research Institute, a dedicated research unit at EDHEC developing a unique body of applied research on private investment since 2016. He is also the CEO of Scientific Infra & Private Assets, a provider of unlisted investment equity and debt index data and analytics since 2019. He joined EDHEC in 2012 after 10 years of private sector experience in the infrastructure finance field, and direct involvement in more than USD6bn of transactions. His research work focuses on asset pricing and the stochastic modelling of cash flows. He has published papers in economics and finance journals, recently co-authored a book on the valuation of unlisted infrastructure equity and debt investments. He is also a member of the editorial board of the *Journal of Alternative Investments* and a regular contributor to the work on long-term investment of the G20, EIOPA, IAIS and other regulatory bodies. He also represents EDHEC on the Advisory Board of the Global Infrastructure Facility of the World Bank and on the Blue Dot Network Executive Consultation Group. He holds graduate degrees from the London School of Economics, the Sorbonne, and Sciences Po Paris and a PhD in Finance (King's College).

Alice James is a writer for EDHEC Infrastructure & Private Assets Research Institute. She has previously worked as a fixed income and foreign exchange journalist at Bloomberg, the commissioning editor of *The Hedge Fund Journal* and a research editor at HSBC. Alice holds a maths degree from the University of Bristol.

Contents

1. Our Groundbreaking Research – physical risks could wipe as much as 54% off the value of portfolios

It's getting physical

In August 2023, we published a new research paper, "It's getting physical", which revealed that an investor could incur losses of 54% on the value of their unlisted infrastructure portfolio due to both the realisation of climate risks before 2050 and the high level of concentration of institutional investor portfolios. This estimation was produced using the EDHEC Infrastructure & Private Assets Research Institute's database of financial and extra-financial database on unlisted infrastructure, the largest in the world today. This high level of risk shows the importance of implementing more ambitious policies to cope with climate change. The energy transition and the alignment of economies bring a cost to private investors, but so does climate change! Importantly, however, our research also showed that if the relevant stakeholders could only organise the transition towards a decarbonised economy today, extreme losses could be reduced by half.

This research note was created by the research team at the EDHEC Infrastructure & Private Assets Research Institute: Noël Amenc, Director; Frédéric Blanc-Brude, Founding Director; Qinyu Goh, Sustainability Data Scientist at the EDHEC Infrastructure & Private Assets Research Institute; Bertrand Jayles, Senior Sustainability Data Scientist; Leonard Lum, Data Analyst; Nishtha Manocha, Senior Research Engineer; and Darwin Marcelo, Project Director. The findings reveal that the physical risks created by climate change are not limited to a distant future for investors in infrastructure, some of whom could well lose more than 50% of the value of their portfolio to physical climate risk before 2050 in the event of runaway climate change. Moreover, and beyond this extreme loss, it should be stressed that the average investor will also lose twice as much to extreme weather, which corresponds to a current policy scenario, mostly in OECD countries, compared to a low carbon scenario.

The numbers are also significant in absolute value: over the past two decades, institutional investors have increasingly allocated capital to private, mostly unlisted, infrastructure companies like toll roads, airports, power plants and pipelines. infraMetrics tracks a universe representing approximately USD4.1 trillion of enterprise value and USD2.2 trillion of market capitalisation at current market prices in 25 key markets. Floods and storms are the most common types of climate-related events, but extreme temperature events are also on the rise as global warming is increasing their frequency and intensity. If climate change speeds up, these trends are also forecast to become more frequent and more severe. Using a very granular database of asset-level physical risk estimates and financial data, we found that the impact of runaway Climate Change on the value of infrastructure investments before 2050 appears significant.

The research shows that the effect of extreme climate events is negative across all sectors. The cost of physical risks within the "Current Policies" scenario represents, on average, 4.4% of the total NAV of the assets in our reference database by 2050, or an amount of USD97bn. However, the maximum losses could be much higher. The most severely impacted sectors in terms of NAV are the Transport sector (with a maximum loss of -97%) and the Energy & Water Resources sector (with a maximum loss of -40%). The maximum NAV loss due to extreme climate events, on average across all super class sectors (eight in total following the TICCS® classification), is -27%. Moreover, most investors in infrastructure hold a few individual assets and

1. Our Groundbreaking Research – physical risks could wipe as much as 54% off the value of portfolios

therefore have potentially high concentration in physical risks. Investors who hold direct stakes in infrastructure assets, be they fund managers or asset owners, usually have fewer than 20 investments. The average asset owner typically has fewer than 10 direct stakes. As such, when an investor finds themselves exposed to the riskiest assets in the same portfolio, losses can mount to 27% in the orderly transition scenario and to 54% in the "Hot House" scenario. 2050 is still 30 years away and past the investment horizon of investment funds, but many are now exposed to much longer-term investments. It is this combination of the existence of assets that are highly exposed to climate risk and the high level of concentration of portfolios that can potentially lead to very high losses for investors.

Climate change risks are already material for a number of investors in infrastructure assets even if these are located in developed economies. This challenges the intuition of many investors that these risks would impact first and foremost the poorer populations of the global south. Instead, the reverse is true: more value will be destroyed in places where more valuable assets exist.

It should also be noted that our loss estimates can be considered very conservative in the light of the very limited impact of physical risk on the economy implied by the scenario used by the Network for Greening of the Financial System (NGFS). A 'too little, too late' scenario, by which emissions keep rising and climate change happens faster, points to a rapidly decreasing value of infrastructure assets due to their loss of future revenues, itself the result of a less active economy, mostly due to chronic heat. This focus on the materiality of the physical risks allows climate risk to be seen not solely as the result of a public policy decision but as a reality that, without action from all stakeholders, including governments, will have a very significant impact on the value of investments.

2. Our Webinar – we explained how we calculated our results from the largest database on unlisted infrastructure in the world

As part of our mission to spearhead research in the pricing and risk of private infrastructure investments, we regularly hold conferences, webinars, and other events, both in person and online, to bring our research and expertise to professionals in the industry. On 27 September 2023 at 9am BST we held an eye-opening webinar where we presented the findings of our most recent paper to investment professionals globally.

We explored the urgent issue of physical climate risks faced by investors in infrastructure and discussed the impact of extreme climate events on infrastructure valuations. Together, we examined the extent of extreme climate driven physical risk in infrastructure investments and the potential concentration of such risks in the portfolio of investors in infrastructure.

Following this we polled our invited audience for their views on some of the key questions regarding their views and practices regarding physical climate risk management for unlisted infrastructure assets.

Some 261 members of the investment community tuned in. (It is worth noting when scheduling live online events that time zones mean you can broadly favour Europe, the Americas or Asia. This webinar was scheduled to appeal to European attendees and thereafter the US. Among the attendees, the main countries of location were UK (67), France (39), Switzerland (25), Germany (23) the Netherlands and the US (15). In terms of role, asset managers were at the top of the roster (97) followed by asset owner (51) and consultants (42). Full details are in Appendix C.

The Webinar presented the -54% (It's getting physical) paper and included a description of what climate change is and what physical risk implies for infrastructure investments as well as a description of our methodology to measure the impact on asset value in different scenarios of extreme weather events. It includes analysis of the impact on investor portfolios with different levels of concentration and shows that investor may be unknowingly exposed to high risks already.

Attendees submitted four interesting questions:

- Do you have some benchmarks with regards to appropriate discount rates to account for client risks?
- How do you reconcile discrepancies between desktop data predictions and the actual on-ground conditions which might differ significantly from the model's predictions?
- Do we need to reassess what defines a "1 in X-year" event, since they're all getting much more frequent? Does your model account for that or have a mechanism to update it over time?
- When looking at the impact effects on OpEx/ total debt/revenues etc, how did you exactly quantify this? Did you use historical data on the assets where a scenario may have occurred before?

3. Our Survey – concerned investors say they need better data

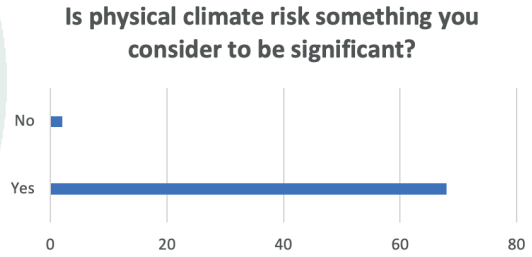
We posed seven questions to those invited do our webinar, some of which required simple yes/no answers, some of which were more nuanced, and several of which offered the opportunity for a narrative response.

Details of each are given below, plus a selection of the written responses submitted.

Question 1: Is physical climate risk something you consider to be significant?

Yes	68	97%
No	2	3%

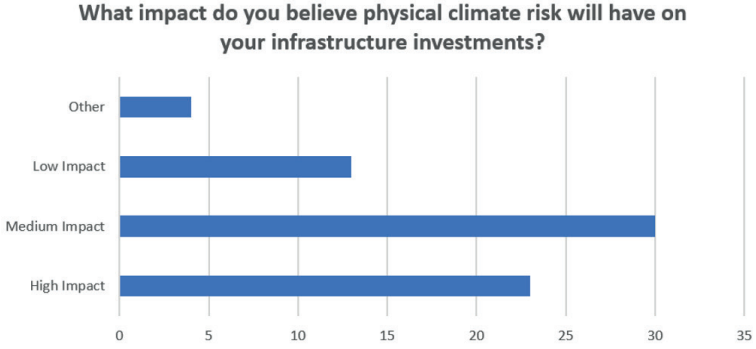
Unsurprisingly, and perhaps reassuringly, our cohort was almost unanimous on this front, with 68/70 (or 97%) stating that physical climate risk is something that they do consider significant. Indeed, it is perhaps most concerning that there are two respondents who still believe that they are not. In our recent paper, we showed that such risks are already material for a number of infrastructure assets even if these are generally located in developed economies; e.g. the UN Office for Disaster Risk Reduction reported that the number of major flood events already more than doubled between 2000 to 2019, while the incidence of storms grew by 40% during the same period. This is hardly stand-alone data; insurer SwissRe recently released a note on the growing number of natural catastrophes that are impacting the financial world.



Question 2: What impact do you believe physical climate risk will have on your infrastructure investments?

High Impact	23	33%
Medium Impact	30	43%
Low Impact	13	19%
Other	4	6%

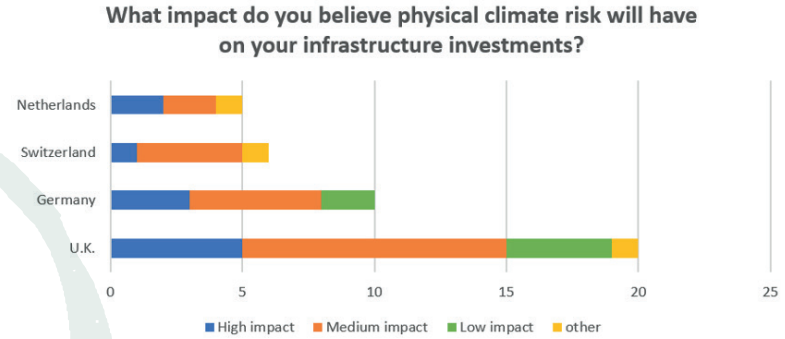
Our respondents gave a slightly more mixed response to this question, but overall 76% stated that they anticipated physical climate risk having a medium or high impact on their infrastructure investments. The fact that we see such a broad spread between the responses highlights the impossibility of quantifying future damages armed with only the limited data on both effects and policy responses that we have today.



3. Our Survey – concerned investors say they need better data

Perhaps the most interesting takeaway from the responses to this question is that close to a fifth of the polled sample of industry professionals are confident that their investments are reasonably secure; the answers to Question 1 suggest that this is not because they are blasé about climate change; it may be that they believe that their particular investments have been selected in the belief that they are less vulnerable.

There was no particular pattern to those stating they saw low impact: they were quite evenly scattered geographically. That said, those considering the potential impact would be small were overwhelmingly from the UK and Germany; however, these were also the largest categories of responders, and the sample size is small.



Note: This graph shows the geographical distribution of responses from the UK, Germany, Switzerland and the Netherlands. Together these accounted for 40 of the 70 respondents.

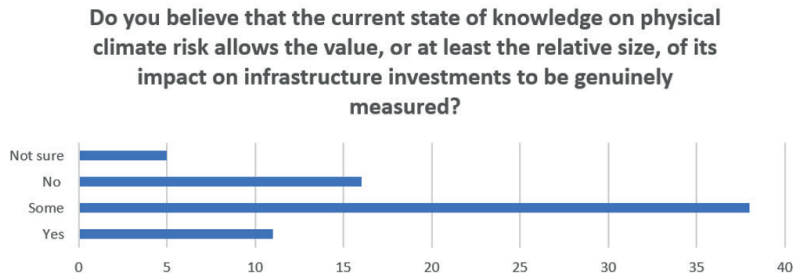
Question 3: Do you believe that the current state of knowledge on physical climate risk allows the value, or at least the relative size, of its impact on infrastructure investments to be genuinely measured?

Yes	11	16%
No	16	23%
Somewhat	38	54%
Not Sure	5	7%

Responses to this question were more nuanced, but the overall message is one of a lack of confidence in our current ability to gauge the magnitude of climate risk impact on the asset class. Just 16% believe we currently have the tools to get it right.

That said, more than half do believe we are partway there, which is encouraging but suggests that research will have to improve substantially to reassure the investment community that they have all the data needed on the potential magnitude of climate risk impact.

In terms of clustering geographically, UK responders were the most negative, casting seven out of the 16 "no" votes. That said, the sample size is small.



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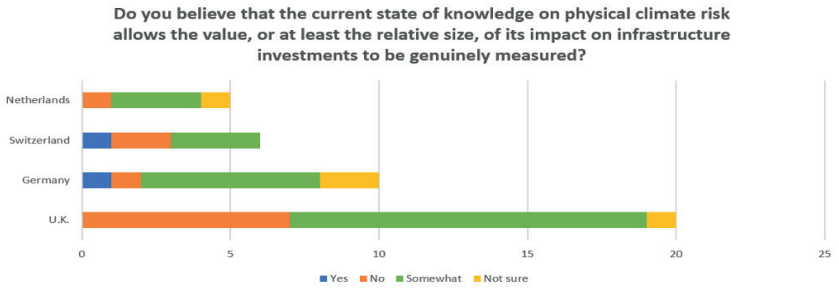

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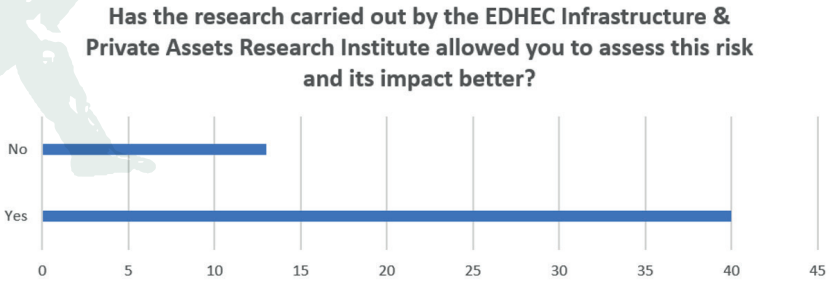
Question 4: Has the research carried out by the EDHEC Infrastructure & Private Assets Research Institute allowed you to assess this risk and its impact better? Yes/ No? Please explain why.

Yes	40	75%
No	13	25%

Three quarters of our sample are finding that our research is helping them to better assess physical climate risks and their potential impacts.

It is essential that providers of services, particularly investment services, regularly seek input on how they are meeting client needs. The EDHEC Infrastructure & Private Assets Research Institute, as a research centre of the EDHEC Business School, was created in 2016 to spearhead new research in the asset pricing and credit risk of private infrastructure investments. Since then, we have also developed groundbreaking research in the area of climate risk measurements for private assets.



With nil background I was persuaded by EDHEC's methodological approach. You really have to get granular, and it's difficult to deversify away from the risk.

Never seen it explained better somewhere else, and I wonder whether EDHEC provides advisory support for private infra investors.

3. Our Survey – concerned investors say they need better data

Through our Scientific Infra and Private Assets Ltd entity, we are also a regulated provider of market indices, benchmarks, and valuation analytics for investors in unlisted infrastructure and our infraMetrics® platform, launched in 2020, provides robust and granular data to investors with USD400bn of infrastructure AUM. We regularly poll our clients and those in the wider community for their views on key developments within the industry, the challenges of they face, and how we are helping them in this space.

> **Crucially important and compelling!**

> ***It's geting Physical* should be condensed to a PowerPoint and taken on the road- by Frederic and team immediately, particularly to the major European and North American dedicated infrastructure funds.**

As such, it is reassuring that some 75% of respondents stated that our research is helping them to understand the climate risks that threaten investments in this field and their impacts.

Below is a section of the narrative responses:

- Deep granularity.
- Crucially important and compelling!
- «It's Getting Physical» should be condensed to a PowerPoint and taken on the road- by Frederic and team immediately, particularly to the major European and North American dedicated infrastructure funds.
- Yes - some idea re how to calculate the risk in a more scientific way.
- With nil background I was persuaded by EDHEC's methodological approach. You really have to get granular, and it's difficult to diversify away from the risk.
- Yes, investment into infrastructure will continue within multi asset funds, but we need to be aware of the ever-changing material risks associated
- Even such a one-hour online event was very interesting and useful in order to develop a more resilient investment considerations for the future.
- Yes, the research seems to be based on solid scientific data. So I would assume the results are relevant and accurate.
- This whole body of work will evolve, and it is really important to look at physical risk sooner rather than later
- Helpful perspectives on the methodology and data needed to try to predict climate risk and value at risk to a given asset under a given scenario
- Never seen it explained better somewhere else, and I wonder whether EDHEC provides advisory support for private infra investors
- The granularity of data is key as the speaker mentioned. The specific geographical location of the asset is critical but also the asset itself including any resilience built into or in region
- I learned that it is important to consider the probable impact of physical risks and to be as precise as possible in its estimation. We would assign the Asset Manager to initiate an analysis.
- It allows us to consider that physical risks could eventually be higher than estimated.
- Yes, it was interesting, it takes time to be integrated in active portfolio management. The significance of the risk is relatively well

3. Our Survey – concerned investors say they need better data

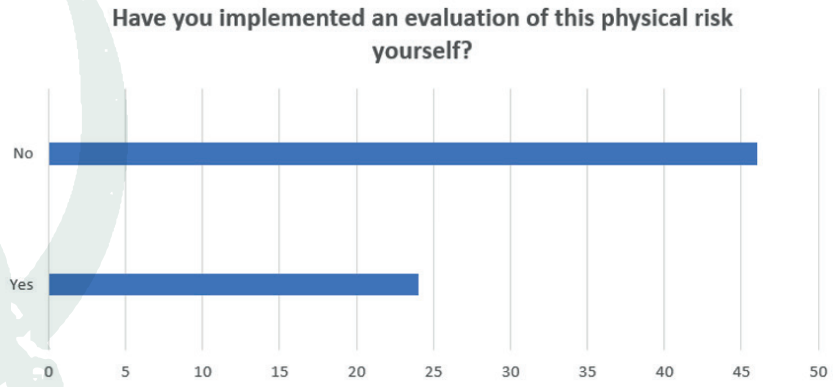
understood, moving to the proposed solutions would be good.

- Yes, important risk metrics were shown, as well as the methodology, lessons learned (Thames) and the impact of assumptions

Question 5: Have you implemented an evaluation of this physical risk yourself?

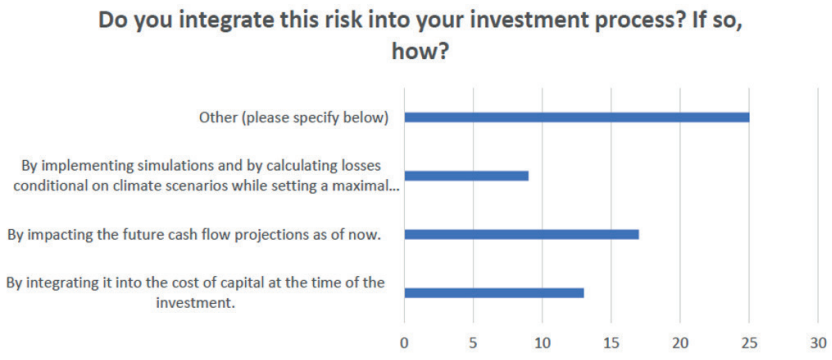
Yes	24	34%
No	46	66%

Two thirds of respondents have carried out no evaluation of physical climate risks themselves. This response serves to highlight just how dependent professionals in the industry are on the advice and data available from researchers and consultants. It is clear that this lack of real evaluation of the climate risk to which investors' assets are exposed heightens the risk to which these assets are exposed, because these same investors have highly concentrated investments in assets whose exposure to potentially very high risks is not measured.



Question 6: Do you integrate this risk into your investment process? If so, how?

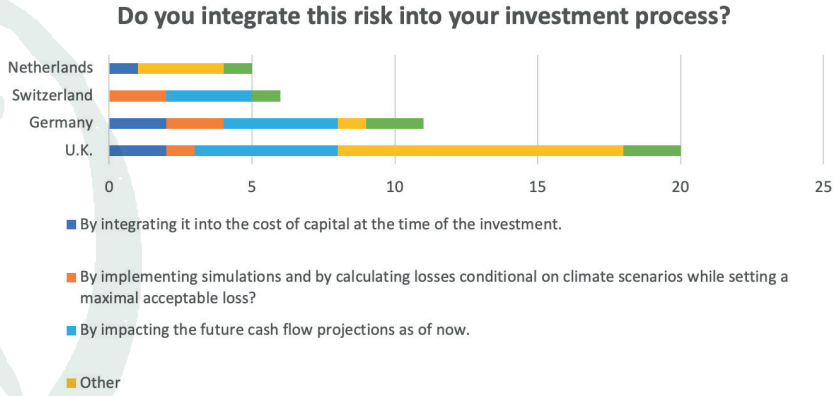
By integrating it into the cost of capital at the time of the investment.	13	20%
By impacting the future cash flow projections as of now.	17	27%
By implementing simulations and by calculating losses conditional on climate scenarios while setting a maximal acceptable loss?	9	14%
Other (please specify below).	25	39%



3. Our Survey – concerned investors say they need better data

The replies to this question show how very varied approaches to incorporating risk can be – even when considering a single class of risks on a single asset class within a highly regulated industry. Responses were spread across the four options, with 25 saying they use a different approach to integrate physical climate risk into their investment process, 17 favouring impacting the future cash flow projections as of now, 13 integrating it into the cost of capital at the time of the investment and nine by implementing simulations and by calculating losses conditional on climate scenarios while setting a maximal acceptable loss.

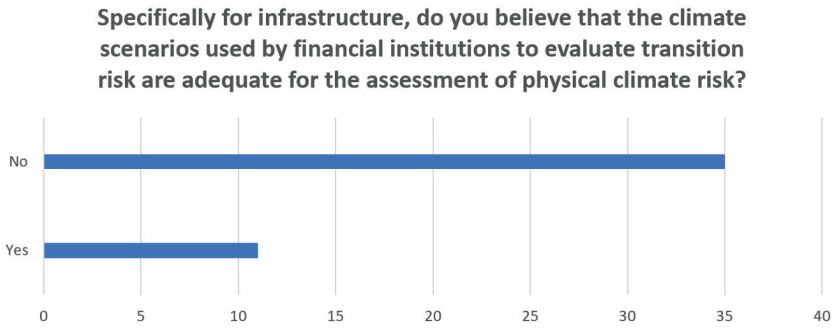
The "Other" option refers essentially to investors who do not have a quantified or formal approach to assessing climate risk in the investment process. It should be noted that even when the investments have a process that integrates this risk, the inadequacy of the assessment of the reality of this risk makes this integration questionable.



Note: This graph shows the geographical distribution of responses from the UK, Germany, Switzerland and the Netherlands. Together these accounted for 40 of the 70 respondents.

Question 7: Specifically for infrastructure, do you believe that the climate scenarios used by financial institutions to evaluate transition risk are adequate for the assessment of physical climate risk?

Yes	11	24%
No	35	76%



3. Our Survey – concerned investors say they need better data

Once again, the answers to this question reveal industry professionals' frustration with the data that is available to them. More than three quarters do not think that the climate scenarios used by financial institutions to evaluate transition risk are adequate for the assessment of physical climate risk.

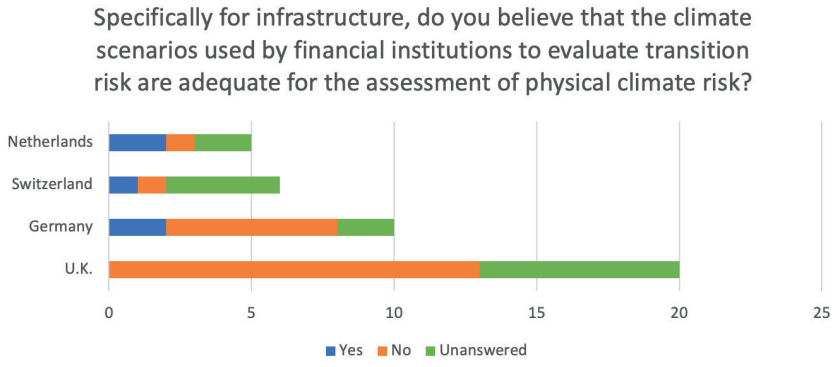
> **In my experience, the reasons you cite – 10-year investment periods, etc. – have presented serious consideration of physical climate risk until now. *It's Getting physical*... is most timely and should reach the widest audience ASAP.**

> **They're often irrevelant. The average infrastructure equity fund has a life of 10 to 12 years, so it may be another 10 to 12 years before 2050 risks become relevant to current asset valuations.**

And here, for a change, the geographic data does reveal something interesting. Not a single one of the UK respondents had confidence in this data. Again, sample sizes are small, but it is interesting that UK respondents were the most pessimistic.

> **No, because current models run on regression of historical data and climate change might bring us a completely unknown scenario.**

> **No – all models are too optimistic about the low level of security of the impacts.**



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3. Our Survey – concerned investors say they need better data

Below is a selection of the narrative response to this final question:

- I think it's a starting point, but needs to be improved in the future.
- Better than no scenarios.
- Especially in Turkey, infrastructure for local governments is constantly neglected because it is not visible, and when it rains excessively, floods in the city, financial losses as well as deaths are encountered.
- I don't believe they are, institutionally, Financial Services remain traditional, material change such as climate effected changes continue to be viewed with an element of cynicism
- No - all models are too optimistic about low level of severity of the impacts
- Likely no or not enough yet being implemented in this present stage.
- No, because results are based on old data. Like the Northern Italian Map of Flooding shows a significant gap between old patterns in black and recent floods in blue. So I find it difficult to estimate.
- No - definitely not. There are some huge concerns around the present state of scenarios … but fortunately, further work is ongoing to develop better scenarios
- They're often irrelevant. The average infrastructure equity fund has a life of ten to twelve years, so it may be another 10 to 12 years before 2050 risks become relevant to current asset valuations.
- Not ideal but is probably a good way to think about it. Otherwise you will have separate set of scenarios for transition risk and a separate set of scenarios for physical risk. And can't combine risks
- They seem to me too simplistic for the most part, still provide a starting point.
- I suspect the risk is currently understated and reflective of experience rather than potential futures
- Cannot say for sure, but will challenge asset managers on this
- Yes but more data is required
- No, because current models run on regression of historical data and climate change might bring us a completely unknown future scenario.
- No, they are present and in development but insufficient or inadequate. Right now we apply full risk methodology with no regards for the project specificities, it needs to be tailored by sector.
- Yes because these scenarios exist and allow to share a common understanding.
- No because these scenarios are not that likely to occur and have some shortcomings.
- No. Recent rainstorms with flooding in Skiathos Greece early Sept reported in mainstream media to be 1-in-16,000 year event. No engineers are designing infrastructure and drainage systems to that spec
- In my experience, the reasons you cite – 10-year investment periods, etc. – have prevented serious consideration of physical climate risk until now. It's Getting Physical… is most timely, and should reach the widest audience ASAP.

These responses are generally consistent with our research and with the importance of going beyond the NGFS scenarios to estimate physical climate risk.

The EDHEC Infrastructure and Private Assets Research Institute is improving on the macro-level understanding of physical risk, which consists of a national-level damage function impacting the productivity of factors, by estimating very granular physical risk exposures at the asset level (down to a 30-metre resolution) for floods, storms, and heat. This technology combined asset-level characteristics, e.g. types of physical assets, with the most recent assessment of physical hazards and state-of-the-art, hazard- and activity-specific damage

3. Our Survey – concerned investors say they need better data

function damage functions. The result is a refined estimate of the Physical Damage at Risk (PDaR) for a given hazard return period today, which can serve as the basis for asset-level physical risk exposures in different scenarios.

Conclusions

Our survey reveals that industry professionals have much pessimism about the data they are being given regarding physical climate risk, considering it to be both incomplete and unreliable. They have doubts about the models being used, and they want more and better research.

Responses to the seven questions highlight the following:

1. Responders overwhelmingly consider that physical climate risk is something significant.
2. Expectations of its impact vary hugely, but most believe it will have a medium or high impact on their infrastructure investments.
3. They display a lack of confidence in our current ability to gauge the magnitude of climate risk impact on the asset class. Very few believe we currently have the tools to get it right.
4. Most say that our research is helping them to understand how these risks threaten investments in this field and their potential impacts.
5. Most have carried out no evaluation of physical climate risks themselves.
6. Almost all integrate consideration of these risks into their investment process, though in many different ways, and most of those who do not do so yet say they plan to.
7. Most believe that the climate scenarios used by financial institutions to evaluate transition risk are inadequate for the assessment of physical climate risk.

This high level of risk shows the importance of implementing more ambitious policies to cope with climate change. The energy transition and the alignment of economies bring a cost to private investors, but so does climate change! Importantly, however, our research also showed that if the relevant stakeholders could only organise the transition towards a decarbonised economy today, extreme losses could be reduced by half.

And our research has shown that investors are right to be concerned and to question the calibre of the data that they are receiving. On the one hand, runaway climate change could lead to losses as large as half of the portfolio of some investors because of physical damage; on the other, a delayed transition, even if it achieved decarbonisation, would create a gigantic price and interest rate shock and could wipe out as much as USD600bn of infrastructure asset value for the same investors.

The climate impacts and risks to infrastructure assets are a key point of focus but investors often lack the full picture of their level of impact or exposure. And they are incorporating them into their strategies in many different ways. Moreover, physical risk estimates are often simplified to a 'point on a map' estimation and do not take into account the granularity of the terrain or the type of damage that different hazards can cause to an asset.

Proper integration of climate risks requires an evaluation of the impact of these risks, which, the survey shows, has been insufficiently developed. It is clear that given the level of concentration of the portfolios, and therefore of the potential concentration in the riskiest assets, proper knowledge of these risks and their consequences is essential. The results of the survey show that this is not unfortunately the case currently.

Appendix A: our respondents – a cross section of the infrastructure investment industry

Our survey drew responses from 70 investment industry professionals across the globe including managers with more than USD2 trillion under management. Not all fields were filled in. The full results are as follows:

Respondents by industry segment

Nature	No of respondents
Asset Manager	27
Consultant	15
Asset Owner	8
Banks	6
Regulator	3
Research	2
Media	1
Supplier	1
N/A	7

Respondents by industry segment

Country	Numbers
UK	20
Germany	10
Switzerland	6
Netherlands	4
France	4
USA	3
Australia	2
Luxembourg	2
Sweden	2
Denmark	1
China	1
HK	1
Italy	1
Iceland	1
Norway	1
Singapore	1
South Africa	1
Spain	1
Turkey	1
NA	7

Appendix B: breakdown of responses

1. Is physical climate risk something you consider to be significant?

Yes	68	97%
No	2	3%

2. What impact do you believe physical climate risk will have on your infrastructure investments?

High Impact	23	33%
Medium Impact	30	43%
Low Impact	13	19%
Other	4	6%

3. Do you believe that the current state of knowledge on physical climate risk allows the value, or at least the relative size, of its impact on infrastructure investments to be genuinely measured?

Yes	11	16%
No	16	23%
Somewhat	38	54%
Not Sure	5	7%

4. Has the research carried out by the EDHEC Infrastructure & Private Assets Research Institute allowed you to assess this risk and its impact better? Yes/ No - Please explain why

Yes	40	75%
No	13	25%

5. Have you implemented an evaluation of this physical risk yourself?

Yes	24	34%
No	46	66%

6. Do you integrate this risk into your investment process? If so, how?

By integrating it into the cost of capital at the time of the investment.	13	20%
By impacting the future cash flow projections as of now.	17	27%
By implementing simulations and by calculating losses conditional on climate scenarios while setting a maximal acceptable loss?	9	14%
Other (please specify below)	25	39%

7. Specifically for infrastructure, do you believe that the climate scenarios used by financial institutions to evaluate transition risk are adequate for the assessment of physical climate risk? Yes/No - Please explain why

Yes	11	24%
No	35	76%

Appendix C: breakdown of webinar attendees

Some 261 industry professionals tuned in to our webinar. The full results are as follows:

Nature	Attended
Asset Managers	97
Asset Owners	51
Consultants	42
Banks	21
Regulators	9
Others	41
Total	261

Location	Attended
United Kingdom	66
France	42
Switzerland	25
Germany	23
United States of America	17
Netherlands	16
Australia	10
Luxembourg	8
Singapore	7
Denmark	5
Hong Kong	5
Norway	5
Japan	4
Ireland	3
Sweden	3
Austria	2
Canada	2
China	2
Finland	2
Iceland	2
Italy	2
South Africa	2
Andorra	1
Croatia	1
Kenya	1
Morocco	1
Parked	1
Portugal	1
Spain	1
Vietnam	1
Total	261

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