Firms' climate expectations and adaptation: Pre-analysis plan*

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Abstract

This study investigates how firms form expectations about local climate risks and whether these expectations influence their adaptation decisions. We focus on extreme rainfall and flood risks and combine survey data with localized weather and climate information. The study includes a randomized information intervention, where some firms receive credible, localized projections of future heavy rainfall, and a natural experiment leveraging variation in recent heavy rain events. By comparing firms that receive the intervention with those that do not, we examine how updated beliefs affect private adaptation actions—such as insurance or structural investments—and expectations about public adaptation measures. The research aims to understand whether providing targeted climate information can shift firms' perceptions of risk and motivate protective measures. Outcomes are measured through survey responses collected before and after the interventions. Surveys will take place in September 2025, November 2025 (including information treatment) and September 2026.

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1 Introduction

This study addresses two central questions: (i) how do firms form expectations about local climate conditions?; and (ii) how do these expectations shape their adaptation to climate risks, business outlook, and investment plans? We focus on extreme rainfall events, which can cause significant disruption and damage to local firms.

Our empirical strategy combines novel firm-level survey data on climate expectations and adaptation measures with three components: (a) an information experiment embedded in the survey, (b) geocoded weather data that provide a natural experiment based on firms' exposure to extreme rainfall events, and (c) regularly collected survey data on firms' business expectations and investment behavior.

The survey is designed to disentangle the direct effect of personally experiencing extreme weather from the effect of revising expectations about future extreme weather events. First, we directly elicit firms' expectations about future local climate conditions, their adaptation decisions, and the scenarios they consider when assessing damage risks. This provides novel descriptive evidence on how firms reason about and prepare for extreme weather. Second, we link these forward-looking expectations to firms' business expectations and investment decisions, both before and after our intervention. Third, we exploit two complementary treatments: a randomized information intervention and a quasi-exogenous natural treatment arising from actual weather exposure. This design enables a direct comparison between the effects of subjective experience and those of objective climate information. Finally, we field the survey within a representative panel of German firms, enabling us to analyze sectoral and spatial heterogeneity and to explore potential temporal patterns.

In different empirical specifications, we estimate the drivers of firms' climate expectations as well as the impact of climate expectations on adaptation and other outcomes. The sequential survey structure specifically allows us to apply an instrumental variable approach to estimate the effect of *changes* in climate expectations.

2 Related literature and contribution

While we concentrate on firms, we relate to the broader literature on climate expectations, which so far has largely focused on households. When aiming to empirically estimate (revealed) climate expectations, a large part of the literature has relied on property prices. Studies find that properties in flood-prone areas tend to be overvalued before salient events, with price declines following shocks — suggesting belief updating (Atreya et al., 2013; Beltrán et al., 2018; Hino and Burke, 2021; Gourevitch et al., 2023). Other work uses surveys to directly elicit expectations. These studies show that personal experience with extreme weather shapes climate change beliefs (Marlon et al., 2021; Taylor et al., 2014), though worldview and ideology mediate responses (Howe et al., 2024; Anderson and Robinson, 2024; Bernstein et al., 2022). However, expectations regarding local climate change (as distinct from global climate change) have received comparatively little attention. Howe et al. (2014) find that individuals with strong livelihood dependence on local weather show greater sensitivity to local climate variation.

Our approach also relates to studies that combine survey data with observational data. Bakkensen and Barrage (2022), for example, link home price data with survey-based perceptions of flood risk. We adopt a similar strategy in spirit but improve on identification by conducting sequential surveys that embed an information experiment. This allows us to pinpoint changes in firms' local climate expectations, and trace how these beliefs influence expected damage, business outlook, and investment behavior.

The literature on *firms* in the climate context has so far focused on economic impacts of extreme weather, and on firms' adaptation. Using balance sheet data and flood records, multiple studies document mostly negative effects of floods (Clò et al., 2024; Fatica et al., 2022; Barrot and Sauvagnat, 2016; Leiter et al., 2009), although results are heterogeneous. Temperature shocks, for instance, affect firms differently depending on productivity (Tarsia, 2024). Financial constraints also matter: short-term debt can amplify flood impacts (De Carolis and Peters, 2025), while local bank relationships or recovery lending can mitigate them (Peters et al., 2024; Koetter et al., 2020). Firms do attempt to adapt, including along supply chains (Pankratz and Schiller, 2024), but extreme events remain surprising and may lead to overreaction (Pankratz et al., 2023; Grover and Kahn, 2024).

When considering local damages, much of the existing work focuses on sectors deemed particularly exposed to climate change (e.g. Downey et al. (2023) for construction, Annan and Schlenker (2015), Burke and Emerick (2016) and Deryugina and Kirwan (2017) for agriculture) and generally finds that firms respond to forecasts. Michel-Kerjan et al. (2011) discuss firms' decisions for insurance against catastrophe risks and find that firms' behavior differs from households, and that firms to some extent substitute insurance and debt. Much of this literature is based on observational data, limiting causal inference on how experience or information changes firms' beliefs and behavior.

Recent studies have begun to explore how firms form climate expectations. Li (2025) and Kölbel et al. (2024) use textual analysis of corporate reports to show that firms respond to salient physical risks and that markets recognize these risks. Norris Keiller and Van Reenen (2024) conduct one of the few firm-level surveys, eliciting climate expectations and linking them to disaster exposure and firm outcomes. While focusing on German firms, we extend the approach in several ways: 1) we use a (quasi-)experimental design, allowing to estimate the causal effect of a *change* in expectations; 2) we disentangle expectations of extreme weather and assessment of damage probability; 3) we add a textual question enabling us to understand what scenario firms have in mind; 4) we link local climate expectations to survey information on business expectations in addition to outcomes.

In summary, while much is known about how households update climate expectations and how firms respond to extreme weather, there is limited evidence on how firms form climate expectations and how these expectations influence decision-making. Our study aims to fill this gap by causally tracing the pathway from experience and information, through expectations and risk assessment, to business behavior.

3 Data

We combine firm-level survey data from the ifo Business Survey with high-resolution weather and disaster data, matched at the PLZ (postcode) level. The survey data include both standard monthly / half-yearly questions and custom modules on climate-related expectations and adaptation. Weather data are sourced from CatRaRe for extreme precipitation events and ERA5 for climate variables (temperature, precipitation). We validate extreme precipitation events with natural disaster records drawn from the DRKMC database, and draw additional information from balance sheet data from Orbis for a subsample. These sources are described in detail below. Data will be cleaned for outliers and low-quality responses as appropriate.

3.1 ifo Business Survey and ifo Investment Survey

The ifo Business Survey is a monthly survey of around 9,000 German firms in manufacturing, construction, trade, and selected services. Conducted since 1949, it gathers information on the economic outlook and firms' expectations. The results are widely used for short-term forecasting and business cycle analysis and feed into the ifo Business Climate Index, a key indicator of the German economy.

In half-yearly additions to the ifo Business Survey, the ifo Investment Survey is carried out to cover investment plans and realisations. For simplicity, we refer to the ifo Business Survey and the ifo Investment Survey jointly as "ifo survey". Sauer et al. (2023) provides an overview of the surveys and derived indicators.

We focus on the manufacturing, service, and retail/wholesale industries.[1] Also, our custom questions are limited to online participants and participation is voluntary, resulting in roughly 5,500 responses per wave.

Standard questions We use three sets of standard questions from the ifo survey. First, two monthly questions on the business situation: one on the current situation (good/satisfactory/poor), and one on future development (favorable / not changing / unfavorable). Second, a set of investment questions covering realised investment in the previous year and expected investment in the current year and the next year (asked annually / biannually). Third, a set of monthly questions measuring uncertainty with regard to commercial operations and the uncertainty in the prediction of the business situation. The exact wording of the questions is available in Appendix A.

Further questions, asked regularly at different intervals, can be used to assess potential heterogeneous effects or mediating factors, and to explore further outcomes. For instance, every four months, firms assess access to bank credit; and there are now yearly questions on

[1]The ifo Business Survey also covers construction firms. However, we exclude them due to sector-specific peculiarities in the survey (see Link, 2018), such as the absence of the standard investment questions. These are not asked in the construction sector, as it only accounts for 1% of overall economic investment investments (Sauer et al., 2023). Construction firms face unique exposure and responses to extreme rainfall events, including direct disruptions to outdoor activities, substantial project delays, and distinct post-event dynamics such as heightened reconstruction demand. However, construction activities frequently occur at locations distinct from the firms' registered postcodes, complicating spatial analyses of rainfall impacts. Therefore, an individual, targeted analysis of the construction sector would be more suitable for capturing and accurately interpreting these distinct economic responses and geographical complexities and is outside the scope of this study.

investments in climate mitigation (as opposed to adaptation).

Custom questions. We supplement the standard survey with a small set of additional questions to track how firms' expectations and adaptation plans evolve over time in response to experienced weather conditions. To this end, we conduct two main survey waves in September 2025 and September 2026. Both waves follow a consistent structure, eliciting:

1. **Damage expectations:** The subjective probability that the firm will experience economic damage during days of extreme rainfall, defined as days with precipitation exceeding the monthly average.[2]

2. **Local climate expectations:** Firms' expectations about changes in the intensity of extreme rainfall days in their *Landkreis* (county), classified as "increase," "decrease," or "no change."

3. **Private adaptation:** Measures already implemented by the firm to mitigate the consequences of extreme rainfall. These include insurance-based instruments, technical measures, and other types of private action.

4. **Public adaptation:** Expectations regarding whether local, state, or federal authorities will implement additional protective measures, either through infrastructure improvements or financial assistance.

We also conduct a shorter intermediate wave in November 2025 with two main goals: the information experiment (see below) and an open-ended question. Here we ask firms to describe—in their own words—how an extreme rainfall event might affect their operations. The goal is to explore which risks firms perceive as most salient, such as direct physical damage versus indirect effects like production downtime or supply chain disruption.

In the second main wave (September 2026), we additionally ask firms whether they have directly experienced local extreme rainfall events (similar to the rain experience question we have from preceding waves, described above). This allows us to validate our external weather data against self-reported exposure.

The text of the custom questions is available in Appendix B.

[2] We ask first about damage expectations, as this question is directly relevant to firms and provides context for the subsequent question on local climate expectations, which may otherwise appear less salient to respondents.

Apart from the custom questions for this study, the ifo survey regularly implements additional questions to the standard questions (asked only once or at irregular intervals). The responses to those can be used in our study. Our custom questions partly build on previous survey questions on extreme weather experience and adaptation (Berlemann and Lehmann, 2020), asked in 2019 and 2022; to a limited extent, it is possible to compare the results.

Information experiment. In the intermediate wave (November 2025), we randomly assign firms to receive information on projected changes in rainfall intensity in their county. We then elicit updated expectations to assess whether and how firms revise beliefs in response to this information. The information experiment is described in more detail in Appendix C.

3.2 Weather data

Extreme precipitation Extreme rainfall events in this study are identified using the CatRaRE dataset from the German Meteorological Service (DWD). CatRaRE records heavy precipitation events that exceed Warning Level 3 (WL3), which indicates the potential for severe damage (Lengfeld et al., 2021).[3]

By scaling the warning level threshold by duration, the WL3 trigger targets rainfall intensity rather than absolute depth, unlike traditional station-based daily thresholds. The duration-specific threshold therefore better reflects the capacity limits of urban drainage systems and allows to extend previous analyses by accounting for localized flash flooding (Lengfeld et al., 2021). The focus on intensity aligns closely with our survey questions, which focus on intensity and which use a simplified definition of a heavy rain event relating rain amounts to a specified time frame.

To link rainfall events to the firm-level survey, which is reported at the postcode-month level, the CatRaRE data is aggregated by postcode and calendar month.

[3] The WL3 threshold is scaled by event duration to reflect rainfall intensity rather than absolute volume. Specifically, events qualify as WL3 when sub-daily precipitation exceeds at least one of the following thresholds: 25mm within one hour; 35mm within six hours; 40mm within 12 hours; 50mm within 24 hours; 60mm within 48 hours; 90mm within 72 hours. Spatially, each event is defined by contiguous 1 km^2 radar cells exceeding the threshold, with the minimum event area being at least 9 km^2 (or Duration × 3 km^2 for $D > 3$ h). Only those km^2 cells whose accumulation exceeds the relevant WL3 limit are retained, so the resulting event polygons represent the truly hazardous core of each event.

ERA 5 data. We obtain weather data from the ERA5 reanalysis product developed by the European Centre for Medium-Range Weather Forecasts (ECMWF), which provides hourly observations of 2-meter air temperature and total precipitation at a spatial resolution of 0.25 arc-degrees (Hersbach et al., 2020). From these data, we construct annual averages of daily temperature, total precipitation, and relative humidity, at the postcode (PLZ) level, which we match to firms based on their PLZ identifiers. Each firm is assigned the annual weather averages corresponding to the year prior to its survey interview. To flexibly account for weather shocks in our econometric analysis, we also compute polynomial terms of each weather variable up to the fourth degree. In addition, we compute long-term climatic averages over the twenty years preceding the survey year to capture local climate conditions.

3.3 Additional data

Natural disasters. We use data on the impacts of hydrological hazards from the Disaster Risk Management Knowledge Centre (DRMKC) Risk Data Hub, developed by the European Commission's Joint Research Centre (JRC). The Risk Data Hub compiles information from multiple sources, including the Emergency Events Database (EM-DAT), the Historical Analysis of Natural Hazards in Europe (HANZE), the Dartmouth Flood Observatory (DFO) Global Active Archive of Large Flood Events, and the Cooperative Open Online Landslide Repository (COOLR). It tracks natural disasters and severe weather events across Europe from 1980 onwards, recording details such as the event date, duration, and location—available down to the NUTS3 level—as well as the type of hazard. Impacts are reported in terms of affected population and estimated economic damages. Hydrological events in the database include a broad range of hazards such as flash floods, riverine floods, coastal floods, landslides, and avalanches.

Balance sheet. For a subset of the ifo Business Survey and the ifo Investment Survey, data from corresponding balance sheet data (Orbis) is available. Orbis is a comprehensive, global firm database that provides balance sheet information and other data. For the purpose of our research, this data can be leveraged to compare expectations to real outcomes, such as revenues, profits, capital, employment, or value added. It also provides control variables for some specifications.

4 Drivers of firms' climate expectations

This section explores the determinants of firms' climate expectations, comparing the role of local climatic conditions with firm- and sector-level characteristics.

Empirical framework. To identify cross-sectional differences in climate expectations, we will exploit variation across firms and survey waves. Our econometric framework is as follows:

$$C_{it} = \gamma H_{p(i)t} + W'_{p(i)t}\theta + \overline{Z}'_{p(i)t}\phi + X'_{it}\lambda + \mu_{p(i)} + \mu_{s(i)y} + \varepsilon_{it}, \tag{1}$$

where C_{it} denotes the climate expectation reported by firm i in wave t, measured either as the subjective probability of extreme rainfall in the firm's postcode or the expected damage from such an event (we estimate separate regressions for lower and upper damage bounds); $H_{p(i)t}$ represents the number of heavy rain days that occurred in postcode p in the year prior to the survey wave; $W_{p(i)t}$ includes a vector of weather variables realized in the year prior to the survey wave, including squared polynomials of average daily temperature, precipitation, and humidity in postcode p; $\overline{Z}'_{p(i)t}$ is a set of twenty-year averages of heavy rain days and weather variables included in W, capturing long-term local climatic conditions; X_{it} is a vector of firm- and district/sector-level controls;[4] $\mu_{p(i)}$ and $\mu_{s(i)y}$ are respectively postcode and sector-year fixed-effects to control for local unobservables as well sectoral shocks across waves; and ε_{it} is the error term. Standard errors are clustered at the firm level, and all regressions are weighted using survey weights.

Importantly, this specification leverages between-firm (cross-sectional) variation in climate expectations. By including postcode fixed effects, we will focus on how firms with similar local climate conditions differ in expectations, depending on observable characteristics, rather than on how firms form their climate expectations over time.

[4]Specifically, we include balance sheet data such as firm size (revenues / number of employees); and, depending on availability, assets, liabilities, and other balance sheet data, as well as average pre-survey growth. In addition, previous extra questions from the ifo survey can be used, such as previous heavy rain experience.

5 Do climate expectations affect adaptation?

In this section we now turn to testing whether heterogeneity in firms' climate expectations is related to differences in firms' adaptation.

Empirical framework. To examine whether beliefs about climate risk predict adaptation, we will estimate a similar model to Equation 1, replacing the outcome variable with an indicator for adaptation:

$$A_{it} = \beta\, C_{it} + \gamma H_{p(i)t} + W'_{p(i)t}\theta + X'_{it}\lambda + \mu_{p(i)} + \mu_{s(i)y} + \varepsilon_{it}. \tag{2}$$

The only difference is that the outcome of interest is now A_{it}: an indicator equal to 1 if firm i in wave t has implemented—or plans to implement in the next six months—at least one adaptation measure against flood risks. We distinguish between two types of private adaptation: (i) insurance-related measures and (ii) technical or structural measures. In additional specifications, we also examine firms' expectations about public adaptation measures in their area. The dependent variable in these regressions is a dummy equal to 1 if the firm expects state-led adaptation efforts in its postcode, either in the form of infrastructure improvements or financial support (e.g., subsidies or emergency aid).

Given that climate expectations are likely to be primarily shaped by local climatic conditions, our main specification includes both climate expectations C_{it} and weather variables $H_{p(i)t}$ and W_{it} on the right-hand-side. In additional regressions, we explore alternative specifications to assess the drivers of firms' adaptation. Specifically, we will estimate models that include only long-run climatic conditions, only weather variables, only expectations, or combinations thereof. This will allows us to separately and jointly examine the contributions of climate, weather, and expectations in explaining firms' adaptation choices. We will also flexibly add to the vector of observable firm characteristics X_{it} information on self-reported heavy rain experience or damage experience from previous survey waves.

6 Experiment: the role of information

This section tests whether exogenously shifting firms' climate expectations through localized information is sufficient to induce changes in their adaptation and investment behavior.

6.1 Experimental setting

We are interested in how firms change their expectations about the local climate, and how these changes affect their adaptation behaviour and business expectations.

In our setting, we will test whether these changes in climate expectations can occur either via localized climate projection information (information experiment, T) or via being exposed to a heavy rain event (natural experiment, H).

Our experimental intervention will consist of randomly providing a subset of firms with postcode-level information on projected future climate conditions—for example, "*In your county, heavy rainfall is expected to increase by 50% over the next 20 years*."[5] Outcomes are measured in two survey waves, before and after the intervention. In both waves, we elicit firms' expectations (e.g., the perceived probability of extreme rainfall and the expected damage if it occurs) as well as their stated or planned adaptation actions, and expectations for public measures.

Our natural experiment will leverage naturally occurring variation in recent weather shocks, specifically the exposure to heavy rainfall between the two survey waves. This variation will allow us to assess whether actual experience with extreme weather events generates similar behavioral responses as the information treatment. In that sense, it will serve as a useful comparison to contextualize the effects of the information intervention.

6.2 Empirical Framework

We will implement three econometric specifications corresponding to our core hypotheses.

Intention-to-treat (reduced form). We will begin by estimating the intent-to-treat (ITT) effect of the information experiment on firms' beliefs and adaptation decisions. To do so, we will use

[5]The information given will be localized based on the firm's county, using projections from the Climate Service Center Germany (GERICS). Percentage numbers are rounded to the nearest integer, to ease processing without biasing answers.

the following specifications:

$$\Delta C_i = \beta\, T_i + \gamma \Delta H_i + \Delta W'_{p(i)}\theta + \Delta X'_i \lambda + \mu_{s(i)} + \varepsilon_i \tag{3}$$

$$\Delta A_i = \beta\, T_i + \gamma \Delta H_i + \Delta W'_{p(i)}\theta + \Delta X'_i \lambda + \mu_{s(i)} + \varepsilon_i \tag{4}$$

Here, ΔC_i and ΔA_i denote changes in firm i's climate expectations and adaptation actions between waves, respectively.[6] The treatment variable T_i is defined either as a simple treatment indicator (*Treatment dummy*) or, as an intensity measure that interacts the treatment dummy with the absolute difference between the information provided and the firm's baseline beliefs (*Treatment intensity*). ΔH_i denotes the change in heavy rain days and is a measure of the natural experiment. As such, it corresponds to a different kind of treatment intensity. It can also be defined as a dummy (equal to 1 if $\Delta H_i > 0$). $\Delta W_{p(i)}$, ΔX_i, and $\mu_{s(i)}$, respectively, represent changes in other weather variables, changes in postcode and firm-level characteristics, and sector fixed effects. We will run regressions excluding and including this set of controls.

The coefficients β and γ capture the intent-to-treat (ITT) effects—equivalent to an average treatment effect (ATE) under perfect compliance. This is since treated firms might not necessarily update their climate expectations, complying with the information treatment or the natural experiment.

As a robustness check, we will also estimate an alternative specification, which models Wave 2 outcomes while controlling for pre-treatment (Wave 1) levels:

$$C_{i2} = \beta\, T_i + \gamma H_i + \delta C_{i1} + W'_{p(i)}\theta + X'_i \lambda + \mu_{s(i)} + \varepsilon_i$$

$$A_{i2} = \beta\, T_i + \gamma H_i + \delta A_{i1} + W'_{p(i)}\theta + X'_i \lambda + \mu_{s(i)} + \varepsilon_i$$

We will also examine alternative outcomes to assess whether our two treatments affect firms' expectations for public adaptation measures, and their uncertainty about future climate risks and business conditions. Specifically, we analyze the range between lower and upper bounds in expected damages from extreme rainfall, as well as survey responses related to firms' expectations about their future business situation and operational continuity.[7]

[6]First-differencing is here equivalent to controlling for firm fixed effects.

[7]More descriptively, we will also test whether the standard deviation and interquantile range of climate expecta-

Drawing on the results from 1, we will also consider testing for heterogeneous treatment effects. In further specifications, balance sheet data from Orbis can be used as further outcome variables, such as changes in capital, employment or value added (thus e.g. allowing for comparisons with Norris Keiller and Van Reenen, 2024). Note that the two types of treatment mean that we have a 2x2 factorial design (4 treatment arms). Interaction terms can be used to account for potential combined effects.

Instrumental variable. We will then examine whether belief updating is a mechanism through which the treatment affects adaptation. Since post-treatment expectations may be endogenous—e.g., firms more inclined to adapt may also revise beliefs upward—we will instrument beliefs using treatment assignment:

$$\Delta A_i = \rho\,\Delta\hat{C}_i + \gamma \Delta H_i + \Delta W'_{p(i)}\theta + \Delta X'_i \lambda + \mu_{s(i)} + \varepsilon_i \tag{5}$$

where $\Delta\hat{C}_i$ is the predicted change in beliefs from the first stage regression of ΔC_i on T_i and the predetermined variables.

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tions and adaptation responses increases among treated firms in the second wage.

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A ifo survey

A.1 ifo Business Survey: Monthly questions on business outlook and uncertainty

- **Current situation: We evaluate our state of business to be**

  ☐ Good

  ☐ Satisfiable

  ☐ Bad

- **Plans and expectations for the next 6 months: Our business situation will be**

  ☐ Favourable

  ☐ Not changing

  ☐ Unfavourable

- **The future development of our business situation is currently** ...

  ☐ Easy to predict

  ☐ Moderately easy to predict

  ☐ Moderately difficult to predict

  ☐ Difficult to predict

- **We assess the uncertainty with regard to commercial operation in the next six months as**...

  [Slider from 0 - low to 100 - large]

A.2 ifo Investment Survey

March:

- **Last** year, our total investments were

  ☐ higher ☐ approximately the same ☐ lower

  (compared to the previous year)

- **This** year, our total investments are expected to be

  ☐ higher ☐ approximately the same ☐ lower

  (compared to last year)

November:

- **This** year, our total investments are expected to be

  ☐ higher ☐ approximately the same ☐ lower

  (compared to last year)

- **Next** year, our total investments are expected to

  ☐ be higher ☐ remain approximately the same ☐ be lower

  (compared to the current year)

Breakdown: investment in buildings, equipment, software, R&D.

B Custom questions

B.1 German original

September 25

A: [KT – alle] Falls Ihr Unternehmen an mehreren Standorten aktiv ist: Bitte beziehen Sie sich bei den folgenden Antworten auf den Standort, an dem Sie beschäftigt sind.

Intro: Starkregen kann Unternehmen erheblich beeinträchtigen, z. B. durch Überflutungen von Geschäftsräumen und Anlagen, aber auch durch Schäden an Straßen oder an der Stromversorgung. Das Risiko ist je nach Standort unterschiedlich. Wir möchten Ihre Einschätzung dazu erfahren.

B Falls es in Ihrer Gemeinde zu einem Starkregenereignis kommt (es regnet an einem Tag mehr als normalerweise in einem Monat), wie hoch schätzen Sie die Wahrscheinlichkeit, dass Ihr Unternehmen wirtschaftliche Verluste erleidet? Denken Sie z. B. an Betriebsunterbrechungen oder Schäden an Gebäuden und Maschinen (vor Versicherungsleistungen).
Wahrscheinlichkeit: ____________ % bis ____________ %

C Erwarten Sie, dass sich die Regenintensität an Starkregentagen in Ihrem Landkreis in den nächsten 10 Jahren verändert?
Regenintensität = Liter Regen pro Quadratmeter an einem Starkregentag

- Zunahme um ____________ %
- keine Veränderung
- Abnahme um ____________ %

D Hat Ihr Unternehmen Maßnahmen zur Vorbereitung auf Starkregen ergriffen oder implementiert es aktuell solche Maßnahmen?

- Ja, Zusatzversicherungen
- Ja, technische Vorkehrungen, und zwar: ____

- Ja, andere: ____________________
- Nein (exklusive Option)

E Glauben Sie, dass Bund, Länder oder Kommunen in den nächsten 10 Jahren zusätzliche Maßnahmen ergreifen, um Unternehmen vor Extremwetter zu schützen oder im Schadensfall zu unterstützen?

- Ja, durch Infrastrukturmaßnahmen
- Ja, durch Staatshilfen für betroffene Unternehmen
- Ja, durch andere Maßnahmen, und zwar: ____________________
- Nein,(exklusive Option)

November 25

Treatment (50% der Unternehmen): Das Auftreten von Starkregenereignissen ist regional sehr unterschiedlich. Laut Wissenschaftlern der Helmholtz-Gemeinschaft könnten extreme Starkregenereignisse in Ihrem Landkreis in den nächsten 15 Jahren um xx% stärker werden (d. h. es gibt an den extremen Regentagen xx% mehr Niederschlag).

Kontrollgruppe (50% der Unternehmen): In Deutschland hat es in den vergangenen 20 Jahren durchschnittlich knapp 800 mm Niederschlag pro Jahr gegeben. Das Auftreten von Starkregenereignissen ist regional sehr unterschiedlich.

A: [KT – alle] Falls Ihr Unternehmen an mehreren Standorten aktiv ist: Bitte beziehen Sie sich bei den folgenden Antworten auf den Standort, an dem Sie beschäftigt sind.

E Bitte beschreiben Sie kurz, wie ein Starkregenereignis Ihr Unternehmen betreffen könnte.

____

____

____

C2 Erwarten Sie, dass sich die Regenintensität an Starkregentagen in Ihrem Landkreis in den nächsten 10 Jahren verändert?

- Zunahme um ________ %
- keine Veränderung
- Abnahme um ________ %

September 26

A: [KT – alle] Falls Ihr Unternehmen an mehreren Standorten aktiv ist: Bitte beziehen Sie sich bei den folgenden Antworten auf den Standort, an dem Sie beschäftigt sind.

Intro: Starkregen kann Unternehmen erheblich beeinträchtigen, z. B. durch Überflutungen von Geschäftsräumen und Anlagen, aber auch durch Schäden an Straßen oder an der Stromversorgung. Das Risiko ist je nach Standort unterschiedlich. Wir möchten erneut Ihre Einschätzung dazu erfahren.

B2 Falls es in Ihrer Gemeinde zu einem Starkregenereignis kommt (es regnet an einem Tag mehr als normalerweise in einem Monat), wie hoch schätzen Sie die Wahrscheinlichkeit, dass Ihr Unternehmen wirtschaftliche Verluste erleidet? Denken Sie z. B. an Betriebsunterbrechungen oder Schäden an Gebäuden und Maschinen (vor Versicherungsleistungen).
Wahrscheinlichkeit: ________ % bis ________ %

C3 Erwarten Sie, dass sich die Regenintensität an Starkregentagen in Ihrem Landkreis in den nächsten 10 Jahren verändert?

- Zunahme um ________ %
- keine Veränderung
- Abnahme um ________ %

D2 Hat Ihr Unternehmen Maßnahmen zur Vorbereitung auf Starkregen ergriffen oder implementiert es aktuell solche Maßnahmen?

- Ja, Zusatzversicherungen
- Ja, technische Vorkehrungen, und zwar: ____________________
- Ja, andere: ____________________
- Nein (exklusive Option)

E2 Glauben Sie, dass Bund, Länder oder Kommunen in den nächsten 10 Jahren zusätzliche Maßnahmen ergreifen, um Unternehmen vor Extremwetter zu schützen oder im Schadensfall zu unterstützen?

- Ja, durch Infrastrukturmaßnahmen
- Ja, durch Staatshilfen für betroffene Unternehmen
- Ja, durch andere Maßnahmen, und zwar: ____________________
- Nein (exklusive Option)

F War die Region, in der Ihr Unternehmen angesiedelt ist, in den letzten 10 Jahren von Starkregenereignissen betroffen?

- Ja
- Nein

Wenn "Ja": Können Sie sich erinnern, in welchem Jahr das letzte Starkregenereignis stattgefunden hat?

Dann entweder Jahresoptionen:

- Ja, 2026
- Ja, 2025
- Ja, 2024
- Ja, früher (zwischen 2016 und 2023)

- Nein (exklusive Option)

oder Freitext: ______________________________

Alternative (falls die Filterfrage nicht möglich ist):

F War die Region, in der Ihr Unternehmen angesiedelt ist, im letzten Jahr von Starkregenereignissen betroffen?

- Ja

- Nein

B.2 English translation

September 25

A: [KT – all] If your company operates at multiple sites, please refer in your answers to the site where you are employed.

Intro: Heavy rainfall can seriously affect companies, e.g., through flooding of premises and facilities, as well as damage to roads or to the power supply. The risk varies by location. We would like to learn your assessment.

B If your municipality experiences a heavy rainfall event (it rains in one day more than it usually does in a month), what do you think is the probability that your company will incur economic losses? Please think of business interruptions or damage to buildings and machinery (before insurance payouts).
Probability: __________ % to __________ %

C Do you expect rainfall intensity on heavy-rainfall days in your district to change over the next 10 years?
Rainfall intensity = liters of rain per square meter on a heavy-rainfall day

- Increase by __________ %
- No change
- Decrease by __________ %

D Has your company taken measures to prepare for heavy rainfall, or is it currently implementing such measures?

- Yes, additional insurance
- Yes, technical precautions, namely: ____
- Yes, other: ____
- No (exclusive option)

E Do you think that the federal government, states, or municipalities will take additional measures in the next 10 years to protect companies from extreme weather or to support them in case of damage?

- Yes, through infrastructure measures
- Yes, through state aid for affected companies
- Yes, through other measures, namely: ________________________________
- No (exclusive option)

November 25

Treatment (50% of companies): The occurrence of heavy rainfall events varies greatly by region. According to scientists of the Helmholtz Association, extreme heavy-rainfall events in your district could become xx% more intense over the next 15 years (i.e., on extreme rainfall days there would be xx% more precipitation).

Control group (50% of companies): In Germany, average annual precipitation over the past 20 years has been just under 800 mm. The occurrence of heavy rainfall events varies greatly by region.

A: [KT – all] If your company operates at multiple sites, please refer in your answers to the site where you are employed.

E Please briefly describe how a heavy rainfall event could affect your company.

____

____

____

C2 Do you expect rainfall intensity on heavy-rainfall days in your district to change over the next 10 years?

- Increase by __________ %
- No change
- Decrease by __________ %

September 26

A: [KT – all] If your company operates at multiple sites, please refer in your answers to the site where you are employed.

Intro: Heavy rainfall can seriously affect companies, e.g., through flooding of premises and facilities, as well as damage to roads or to the power supply. The risk varies by location. We would like to learn your assessment again.

B2 If your municipality experiences a heavy rainfall event (it rains in one day more than it usually does in a month), what do you think is the probability that your company will incur economic losses? Please think of business interruptions or damage to buildings and machinery (before insurance payouts).
Probability: __________ % to __________ %

C3 Do you expect rainfall intensity on heavy-rainfall days in your district to change over the next 10 years?

- Increase by __________ %
- No change
- Decrease by __________ %

D2 Has your company taken measures to prepare for heavy rainfall, or is it currently implementing such measures?

- Yes, additional insurance
- Yes, technical precautions, namely: ____________________
- Yes, other: ____________________
- No (exclusive option)

E2 Do you think that the federal government, states, or municipalities will take additional measures in the next 10 years to protect companies from extreme weather or to support them in case of damage?

- Yes, through infrastructure measures
- Yes, through state aid for affected companies
- Yes, through other measures, namely: ____________________
- No (exclusive option)

F Has the region where your company is located been affected by heavy rainfall events in the last 10 years?

- Yes
- No

If "Yes": Can you recall the year in which the most recent heavy rainfall event occurred?

Then either year options:

- 2026
- 2025
- 2024
- Earlier (between 2016 and 2023)
- No (exclusive option)

or free text: ______________________________

Alternative (if the filter question is not possible):

F Was the region where your company is located affected by heavy rainfall events in the last year?

- Yes
- No

C Information experiment

The German Climate Service (GERICS) is part of the Helmholtz Association, Germany's largest scientific research organization. GERICS provides standardized climate outlooks for all 401 administrative districts and independent cities in Germany. Each report summarizes projected developments in key climate indicators—such as temperature, number of hot days, dry days, and heavy rainfall days—under three emissions scenarios (high, medium, and low mitigation).

To proxy the projected intensity of extreme rainfall days, we focus on the 99th percentile of the daily precipitation distribution (in mm/day) for the period 2036–2065 under the high-emissions scenario (RCP8.5). We take the median across model simulations for each district and express it as a ratio relative to the long-term historical average over 1971–2000. This yields a projected growth rate in heavy rainfall intensity.

The control group receives generic information on historical average precipitation in Germany, while the treatment group receives localized projections based on their district. The exact wording is as follows:

- **Treatment**: The occurrence of heavy rainfall events varies greatly from region to region. According to the Helmholtz Association, heavy rainfall events in your district could become [X]% more intense in the next 15 years (i.e. there will be [X]% more precipitation on heavy rainfall days).

- **Control**: In Germany, there has been an average of just under 800 mm of precipitation per year over the past 20 years. The occurrence of heavy rainfall events varies greatly from region to region.

D Pilot

In May 2025, we conducted a pilot of our information experiment with a set of German firms within the ifo Management Panel (a separate panel from the ifo Business Survey), obtaining 293 responses. The pilot aimed to assess how firms respond to the information treatment and to refine the way we communicate the information.