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COMMENTARY

Tagging the Threats: Unpacking Propositions for Real Estate Climate Risk Labels in the Netherlands

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ABSTRACT: Climate risk labelling has emerged as a potential strategy for managing physical climate risks in the Dutch real estate sector, particularly following substantial flooding in the Limburg region in 2021. This study examines the concept of, implementation challenges, and implications of residential climate risk labels in the Netherlands through expert interviews with researchers and practitioners in urban governance, flood risk management, and real estate economics. The research explores how risk labels could influence climate adaptation, market dynamics, and equity concerns. Findings reveal methodological challenges in developing standardized and accurate labels, tensions between potential climate label user groups, and potential distributional effects on housing affordability. The study identifies key considerations for implementation: ensuring quality and transparency of risk information, clarifying adaptation action perspectives for homeowners, addressing scale mismatches between building-level and area-level risks, and embedding labels within broader climate adaptation policies. This research contributes to understanding how climate risk information provision mechanisms operate in practice and their implications for urban practitioners.

KEYWORDS: climate change adaptation, housing market, physical climate risk, risk labels

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SUMMARY FOR POLICYMAKERS

- This expert interview assesses contemporary proposals for residential climate risk labels in the Netherlands, exploring their formulation and potential effects on urban governance, climate data risk awareness, real estate market dynamics, and spatial equity.
- Dutch government and financial institutions view climate risk labels as a potentially effective strategy to manage physical climate risks in real estate. Risk labels provide information about a property's exposure to climate change, with the aim of improving risk awareness in housing markets and stimulating property-level adaptation strategies.
- Given the rapid development of risk labels and climate change adaptation strategies in general, urban practitioners must continually refine policies to mitigate the unintended side effects of adaptation strategies, such as climate gentrification.
- At present, there is a lack of clear guidance for households on how to adapt to specific physical risks. Urban practitioners can assist households by communicating which adaptation measures to take to prevent over- and underinvestment, and by helping to connect households with the right resources to take such measures.
- The quality and accuracy of risk information often do not meet stakeholders' objectives for labels. The expertise of urban practitioners is crucial in assessing the quality and accuracy of labels in reflecting local climate risks, as well as in connecting appropriate adaptation action perspectives for stakeholders.

Introduction

Like many countries, the Netherlands faces multiple physical climate risks such as waterlogging, heat waves, flooding, and droughts. Without effective mitigation and adaptation strategies, climate change exacerbates these physical climate risks. Finding new adaptation strategies is crucial for renovating and developing urban regions to be more resilient, inclusive, and equitable.

The concept of climate risk labelling has recently been highlighted as a potentially effective strategy to manage physical climate risks in the real estate sector in the Netherlands. In the summer of 2021, a substantial flood in the Limburg region impacted more than 5,000 residents and approximately 600 businesses, with estimated damages of 400–500 million euros (Kok et al., 2023). In response to the flood, the Dutch parliament formed a policy advisory body tasked with identifying strategies to mitigate future losses. One key finding and subsequent focus in broader post-Limburg debates has focused on the creation and implementation of residential climate risk labels, or building-level categorizations of exposure for a specific peril (with flood risk being the primary focus here).

The concept of the risk label follows examples set by energy labels and a broader array of building-level certifications for sustainability and wellness, which are now increasingly adopted by markets. More recently, Dutch financial institutions have drawn further attention to risk labels in several ways, including through a report by the [Dutch Authority for Financial Markets \(2023\)](#) and a jointly published study by the Netherlands' three largest banks: ING, ABN AMRO, and Rabobank (see [Bani et al., 2024](#)). Risk labels are now broadly positioned by the Dutch financial sector and other stakeholders as a key response to climate risk in the housing market.

Despite this seeming consensus from influential market actors, a clear picture of how risk labels would look, feel, and work in practice has yet to emerge. A recent exploratory survey of international examples found that existing and proposed climate risk labels serve a variety of objectives ([Hoogvliet et al., 2024](#)). Labels can provide guidelines for new buildings, encourage homeowners to take measures, or inform the investment strategies of municipalities, as examples. At the same time, there is a knowledge gap concerning the potential impacts of risk labels on the societal and financial aspects of climate adaptation across different scales, communities, and time horizons. This fragmentation occurs between public and private institutions, from the asset scale to the infrastructure system scale, and between hazard-centric views and those focusing on the housing market.

The discussion about risk labels unfolds against the backdrop of two major developments in the Netherlands, which parallel developments in cities grappling with the interplay between climate risks, urban development pressures, and increasing financial sector intervention in this domain.

First, there is a concerted effort to advance and expand climate risk management in Dutch society, with a particular emphasis on flood risk. Flood risks are decreasing in many areas across the Netherlands due to ongoing dike reinforcement projects to meet the high level of flood protection, effectively countering the adverse effects of climate change in the near to medium term. This reflects ongoing public investment in the primary, infrastructure-centric layer of the Dutch multi-layer safety system, which organizes responsibility for water safety in the urbanized delta nation.

In recent years, there have been a series of new initiatives and policy guidelines that bring new and deepened focus to climate risks and their management in the Netherlands, above and beyond this primary layer of intervention, and including a broader set of societal stakeholders in risk management. These include the “water and soil leading” guidance on new spatial development plans and building in cities, and efforts to bring additional sectoral interests, as seen in the “NLAAA Climate Proof” initiative connects the infrastructure, water, with an eye on addressing climate risks in the financial sector, respectively. The risk label discussion speaks to a broader extension in the scales and sites of climate risk intervention—from larger scale and publicly organized technical interventions (like dikes) to action at the building and urban area and, potentially, with more responsibility assigned to homeowners and city governments. It also illustrates how a new set of actors and conditions are influencing Dutch climate risk management,

such as the financial sector. These ongoing developments may have significant implications for how climate risks are managed in Dutch cities, which resonate with international developments in other contexts, as in debates about how to incorporate climate risk in U.S. housing finance, for example (Knuth et al., 2025).

Second, in parallel to this renewed climate adaptation agenda, the Dutch housing market—with 8.2 million houses and a total value of 3.3 trillion euros—is highly pressurized (Calcasa, 2023), characterized by high asset values relative to incomes and strong demand for additional housing. The Dutch government plans to build up nearly 1 million new houses before the close of the decade—despite concerns over the environmental suitability of many remaining development sites in the densely urbanized west of the country. By 2050, an investment of approximately 900 billion euros is planned specifically for urban developments (SWECO, 2023), infrastructure projects, sustainable energy initiatives, and climate adaptation measures in regions vulnerable to flooding from sea-level rise. This push for investment suggests the need for a well coordinated roll-out of awareness-raising measures and action perspectives for a number of stakeholders, including within the housing market.

In a complex and dynamic landscape of climate risk management, housing development, and finance, risk labels become a central and tangible point of potential intervention yet raise many questions: Who is responsible for defining climate risks, choosing assessment methodologies, and maintaining data and the labels themselves? How are adaptation measures—and “net risks,” or resilience—going to be defined for houses or urban areas? Are there clear action perspectives for individuals with labels, beyond raising awareness? How might these individual actions complement existing, larger scale, and collective public interventions in water safety? Can we anticipate how markets and society will react to labels, and how this could impact equity and affordability issues in the pressurized Dutch housing market?

This interview aims to unpack these questions by reflecting on the current state of knowledge around risk labels in the Dutch context. Zac Taylor, an assistant professor in the Department of Management in the Built Environment at Delft University of Technology and co-lead of the Red&Blue impact research programme, leads a discussion with five experts. Cees Oerlemans is PhD candidate at Delft University with a background in hydraulic engineering, focusing on the development of long-term flood risk adaptation strategies for the Dutch delta. Alongside his PhD, Cees works as a flood risk consultant for HKV, is involved in adaptive delta management on a national scale, and has written on flood risk label assessment methodologies (Oerlemans et al., 2024). Marco Hoogvliet, a senior advisor at Deltares, a Dutch knowledge institute for water and the subsurface. Marco’s research focuses on sustainable urban development, climate effects, and climate stress testing, including a recent report commissioned by the Dutch Ministry of Infrastructure and Water Management on the development and application of climate labels for houses (Hoogvliet et al., 2024). Mats Lucia Bayer is PhD candidate at the Faculty of Architecture and the Built Environment at Delft University of Technology. Mats is studying the impact of climate risk on the Dutch

housing finance system, with an emphasis on the impacts associated with equitable housing provision. Dongxiao Niu is a postdoctoral associate in the Center for Real Estate at Massachusetts Institute of Technology, specializing in how climate risk information affects real estate markets. Her recent work includes a Dordrecht case study conducted during her previous postdoctoral position at Maastricht University (Niu et al., 2024). Anne Nobel, a climate and environmental economist (formerly a research associate at Massachusetts Institute of Technology and a postdoctoral scientist at Hasselt University), analyzes the costs and benefits of governmental policies. Anne recently contributed to a joint study on climate change and its implications for the Dutch housing market, highlighting the role of risk labels (Bani et al., 2024).

Zac Taylor: So, to kick us off: What are climate risk labels? And why are we so interested in them?

Marco Hoogvliet: Under existing approaches we surveyed, risk labels are intended to serve as a standardized grade indicating a property's resilience to climate change. A proposed or preferred approach would be where labels result from an expert assessment on various climate adaptation aspects. This envisioned method aims to provide actionable insights for homeowners and financial institutions, rather than just a simple standardized grade.

And why are we interested in risk labels? There are a lot of possible answers to that question, depending on whom you are talking to. As researchers, we find the whole concept of labels and their implications an interesting subject. Banks, insurers, and homeowners all have different reasons why a label could be of value, based on their obligations, needs and interests. I don't think there is a "one label fits all" approach because the motives for labelling houses vary among all stakeholders. That makes it difficult to find a label that can meet all the questions and demands. What I also notice is that information availability is now one of the main drivers in the discussions about labels, because as we get more detailed information, that triggers different parties to think about the potential uses of that information, for example, in a commercial sense.

Zac Taylor: Risk is a broad concept. What kinds of risk are we labelling?

Marco Hoogvliet: We're trying to label climate risks. However, underlying some of these risks are hidden defects of houses or shortcomings in neighbourhoods that are the major determining factor. Defects translate to spending money on repair or adjustment. Directly or indirectly, a climate label then represents financial risks for owners, mortgage providers or governments. So, behind the climate risks, there are mainly financial risks that parties are trying to get a grip on with the labelling.

Dongxiao Niu: I think Marco already gives us a very good description of what we expect labels to be: a standardized way to show risk levels. I want to add something to the question about why we are interested in both providing and receiving the label. I believe this interest can be viewed from two perspectives. The first one is from homeowners. From their perspective, they are the ones who are responsible for taking care of assets which might account for over 50% of

their family's wealth. They are entitled to know as much information as other stakeholders have. Currently, some experts in climate science, flood risk management or finance economics, like researchers in academia, know a lot about risks, which we share by generating maps, reading maps and interpreting risk information. However, in the property market, sellers and buyers don't always know about the risks and cannot properly consider the risks even if they are aware of the risk. Another perspective is from developers or the government, because they need to come up with a 5-year or 10-year plan of where to build and where not to build in the Netherlands.

Without climate risk consideration, they might use existing guidelines and approaches which are not sensitized to climate risks to choose which area and which land parcels to develop. However, with fast climate change, and corresponding severe consequences from disasters, events like extreme temperatures happen; we experience them almost every year. If we just stick to the original plan and build up, then maybe in the first 5 or 10 years it's fine. But the consequences could reach a tipping point, a point where we cannot bear it anymore, and it would just cost much more to recover or to repair in the wake of a disaster. So that's why I think it's really important to have this information first, and we could discuss later how we might expect markets to react to information.

Zac Taylor: Dongxiao, you talk about the accumulation of risk in 10–15 years. How do you think about that from a finance and economics perspective? What are we talking about in the Dutch context, for example?

Dongxiao Niu: If we are homeowners, then we tend to hold these assets for a long time. However, when we think about the commercial sector, it is a different story because contracts are often renewed every 3 to 5 years. For them, a 10-year period is a little bit too long because their contracts are short-term. Homeowners, in contrast, do not have the incentive or option to buy and sell very frequently, making long-term considerations more salient and important to them.

Zac Taylor: What are the main challenges for the assessment and standardization of risk labels?

Marco Hoogvliet: At the moment, we have a variety of labels, methodologies, and grades for houses on offer, both within the Netherlands and internationally. They are all introduced with a specific goal by a specific stakeholder or from a specific field of expertise. This variety is confusing, not only for homeowners but also for banks and insurance companies trying to choose which "label service" they should use to assess risks in their portfolio. "Cleaning up the playground" would be one of my first actions. Some labels are really not good. We need a standard methodology both for the quality of the information that's being used and for the quality of experts that do the assessment, similar to compulsory annual roadworthiness checks for cars.

Cees Oerlemans: The major challenge is that we talk about very distinct physical risks each having specific modelling approaches that sometimes involve arbitrary choices. For example, from a flood risk perspective, we combine flood probabilities of dikes and inundation maps from flood scenarios to calculate risk levels.

This information is derived for water management practices, which means that we want to be conservative—better safe than sorry. Thus, we make conservative choices throughout the modelling process.

Additionally, in the domain of water management in the Netherlands, this flood information needs to be open source. While this is beneficial, it can also be tricky because the information might be used for purposes other than water management, such as in spatial planning or the financial sector—and also for risk labels. What we see is that by using this open-source information, you overestimate the flood risk by a factor of 10 or even 100, given the conservative impulses in the water sector. For example, if you calculate all the flood risk probabilities of the dikes in the Netherlands and combine them, the data might suggest a flood every 10 years, an obvious overestimate. Correcting this overestimation is challenging because it requires consensus on a standardized approach to flood risk modelling for spatial planning and financial purposes. I'm sure the similar issues apply to other physical climate risks as well.

A second challenge: flood risk information is mainly calculated for an area rather than for individual properties. Of course, there are methods to compensate for that by integrating building properties into the risk label, but these methods are challenging because they often require an expert or another form of assessment, which incurs costs. This process is particularly challenging to implement across the Netherlands. Unlike energy labels, which focus on building-level energy performance, many physical risks that we talk about are dependent on climate adaptation at the area level. For example, flood risk can decrease over time when you reinforce dikes. Frequent updates to labels may be necessary to maintain accuracy as we adapt, presenting a considerable challenge, even if not an impossible one.

Marco Hoogvliet: I have a follow-up question to one of the last points that Cees mentioned. Do you think it's possible that changes in policy, alterations to the water system, and subsequent updates to labels could lead people to sue the government or water board due to a decrease in their asset value? That is one of the factors in my list of possible complications related to labelling and especially to inaccurate labelling. It could open up a can of worms. It's also one of the factors that are relevant for climate adaptive spatial planning that's oriented toward the far future of 50-plus years. Risk labels, or the perception of risks for houses, can change because of these long-term plans. For instance, when a house appears to be located on the "wrong side" of a newly planned dike or dike re-enforcement that is necessary to retain flood safety in the future.

Anne Nobel: Many homeowners have accrued a lot of surplus asset value over the past 10 years. Therefore, if they experience losses due to government policies, they have a large financial buffer to deal with these losses. But there would always be a group of households who lack this buffer. This is the group of households that the government should be most concerned about, especially from a fairness perspective. It could be considered unfair if they end up in homes that have become devalued due to a poor climate label, for example.

Zac Taylor: Anne, regarding "value buffers," could you clarify this for those who may not be familiar with the Dutch housing context?

Anne Nobel: In the climate housing market report we published earlier this year (Bani et al., 2024), we looked at loan-to-value ratios to see whether households can deal with financial losses caused by climate risks and climate information. On average, this ratio is very low in the Netherlands. The average surplus asset value in the Netherlands exceeded 200,000 euros in 2022. The highest surplus values are found in urban centers such as Amsterdam, The Hague, and Utrecht. These surplus values are smaller in the peripheral areas of the Netherlands, where households also typically have lower incomes. Households in these areas might be less able to cope with climate change impacts, simply because they have smaller financial buffers and lower incomes. This also implies that they are less able to cope with the potential losses caused by introducing a climate label.

Mats Lucia Bayer: In general, I think there's a sort of tension we talk little about, without always naming it. It lies between the need to have something accurate and to have something standardized. You're right, Marco; the process of deriving labels should be methodologically sound. In general, this is not the main focus in articles or presentations on labels. They focus more on the accuracy of the label and its tangibility, rather than on the process itself. Many of us recently discussed how there's an emerging market for these labels, highlighting a demand for something tangible, especially for homeowners. However, this may not be the most accurate way of analyzing the risks, because, to make this information tangible, maybe you cannot put all the relevant information in it, or it cannot be updated constantly and so on. For me, this is the main discussion. I mean, what's the aim of the label?

Zac Taylor: Mats, what are the assumptions about how markets will react? Is there a clear action perspective for stakeholders?

Mats Lucia Bayer: There are many aims for risk labels, and all of them are understandable, but sometimes there are tensions between these aims. Labels may make the markets more transparent and more liquid, yet the assumption that this will trigger climate adaptation is not given in reality. Questions remain: How can we make it such that households can adapt, and who is responsible for that adaptation?

Maybe labels can also be used as a strategic tool for governments. But then it's a different conversation and a different type of label, potentially related to government actionability. Moreover, stakeholders may also feel the need to have something to refer to in common, like a one-to-one reference. In essence, I see all these tensions, and at the same time, the pressure from some institutions, especially those involved in real estate markets, to have something tangible—a tool to better control exposure, which is completely rational.

If changes in valuations are high and the costs of adapting are also high, this may negatively affect some households. They may find themselves in a position where they prefer to sell their property because they cannot afford the adaptation costs which ultimately worsens their financial situation. This is particularly true in cases where subsidence-induced housing foundation issues intersect with flood risk. This raises the question: What are the eventual consequences of risk management? We are focusing on property and assuming it will help homeowners, but eventually it will keep [the] property market afloat but not homeowners per se.

Zac Taylor: Anne, what were your findings regarding the action perspectives of stakeholders based on the climate housing market report published earlier this year?

Anne Nobel: It can be argued that the housing market currently operates under incomplete information. So, providing the currently lacking information to potential home buyers is crucial. From an economic perspective, the goal is to internalize physical climate risks into home-buying decisions. If you do so, you can expect several effects. First, there will be a price effect: properties at higher risk will devalue. Second, there will be a distributional effect. Unknown climate risks are currently passed on to future home buyers. Once more information is available and risks are priced into current home prices, you avoid shifting risks to future homeowners. The third impact is that these labels could incentivize adaptation, thereby preventing even higher costs in the future. A climate risk label in the housing market could also lead to upstream impacts throughout the value chain of residential area development. For example, project developers would need to think about climate adaptation when calculating the costs of building a house or developing a residential area.

Marco Hoogvliet: What has been said highlights the differences between labelling existing and new housing. New housing can be built according to current adaptation guidelines, but necessary funding is required. I'm wondering whether the mechanism for incorporating climate adaptation costs is the same for both existing and newly built properties. Last week, a map for newly built housing was publicized ([Ministerie van Infrastructuur en Waterstaat & Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2023](#)), showing areas where building in a climate-adaptive way requires more or less effort. Theoretically, land prices should be lower in more difficult areas, allowing developers to build quality homes and aim for an "A" climate label for each new house. However, I have not yet seen land prices decrease in areas where development is more complex due to climate considerations. For existing housing, you need another mechanism to create options to decrease risks.

Zac Taylor: Dongxiao, could you reflect on what has been said based on your research about climate risk information provision and price effects in the Netherlands?

Dongxiao Niu: I feel this is not a simple question, where we can simply say the land value would immediately decrease or increase based on labelling a region. It's not that simple because labels are not fixed and can change over time if conditions change. For instance, consider a polder (a low-lying human-made landscape area common in the Netherlands). Technically this could be the riskiest type of development site, but if it's protected by a dike that protects it from being flooded, then actually this might be one of the safest places. In that case, I don't think the risk label for this initially risky area should be "G," it should actually be "A" or "B." The management and design of risk labels should be dynamic, and homeowners should be part of the system. If a homeowner is assigned label B but has taken measures such as building to a higher elevation to protect their house, they could submit a request to authorities to revise the label. This dynamic

process allows for ongoing adjustment and communication about the label to the market.

If an environmental event occurs but the area was previously considered very safe, we might see an immediate housing price drop because it's totally new for the local market. But this decrease might only be transitory and may revert to the original level after several years. In contrast, people in risk-prone areas might be willing to bear this risk. For them, a label is not new information, it's just a more standardized form of what they already know. Then the effect of the label might be smaller. However, in areas where residents are less aware of the risks, introducing a label might come as a shock. Before labelling, we can also provide "soft" information about relevant risks to prepare people, making the introduction of a label smoother.

For example, in the delta city of Dordrecht, there is some level of awareness of flood risks among residents of unembanked (*buitendijkse*) areas because they are really close to the river. After the municipality sent flood warning letters, we found a slight decrease in housing transaction values but not very significant from a statistical perspective. In contrast, after this area experienced a small flood in 2012, there was an immediate 3% drop in housing values. However, the 3% drop reverted very quickly in 1 year because there's not much damage and people think such events happen only infrequently. Hence, we do not see a permanent influence on the housing prices in the risky area.

Zac Taylor: What (else) do we need to know more about for implementation, looking ahead?

Anne Nobel: It is important to ask the question: under what conditions does a climate label lead to desirable outcomes? This should be made explicit in a benefit–cost analysis. What are the costs of creating and especially keeping this label up to date? How much foundation or flood damages do we avoid by implementing a label? What are the assumptions underlying the societal business case of the label? A benefit–cost analysis would make these assumptions explicit. Another concern is that user requirements for this label are still unclear. What specific needs and desires do users have regarding this label? What are the data needs?

Cees Oerlemans: One aspect I would like to consider is the comparison of different risks, which is challenging due to their varying nature. Specifically, I'd like to assess their varying probability distributions and impacts. For example, the expected annual damage from flood risks may be low, but the severity when they do occur can be substantial. This risk profile is different for other physical risks such as water logging. Additionally, the primary concern is not when your property is at risk but when you cannot adapt your property to climate change. It may be useful to shift the focus from labeling the risk itself to the adaptability of a property to climate change.

A key question is whether private companies or government entities should be responsible for managing this data. And we must consider the transparency not only of the label itself but also of the methodology used to derive it. Without clarity on these issues, we may end up with many different labels. Besides the

ethical considerations, this raises the question: What is the informational value for consumers when faced with all these different labels?

Mats Lucia Bayer: The current approach is geared toward homeowners and property owners and eventually aims to tackle property-related climate risk issues. For some cases it might work, but sometimes it lacks elaboration at a more strategic level. The main goal is to improve market transparency. However, in terms of housing, there are large differences—many people live in social housing or as a tenant. I am currently working on a case in Rotterdam where a large majority of households live in social housing. They are likely to face subsidence-induced foundation problems in the future, although the timing remains uncertain. This presents a strategic challenge for Rotterdam and similar areas, as entire neighbourhoods are impacted and social housing associations struggle to cover costs and investments themselves.

Marco Hoogvliet: What we are missing in this discussion is the involvement of the people who created the information used for labelling, such as the modellers, GIS experts, and researchers. These people, who understand the quality, accuracy, and usability of the information, often keep away from the labelling discussion because they are uncomfortable with how their information is being used. In collaboration with the (Dutch) National Delta Program, which creates much of the information that's being used by label services, we proposed to assess potential issues regarding the use of their information by third parties, including awarding risk labels, and if there are reasons to react to incorrect use.

Following the flood in Limburg, the option to increase awareness about flood risks with homeowners using a water label was raised by a policy advisory body formed by the Dutch parliament ([Beleidstafel wateroverlast en hoogwater, 2023](#)), including an exploration of pros and cons. An alternative would have been to pinpoint where the significantly riskier areas are. I believe it would be better to take a spatial step back and start classifying areas and neighbourhoods and not houses, particularly when the information is not suitable for judging the risks on the scale of individual properties. This approach aligns better with the action perspective of stakeholders, as adaptation responsibilities and options in the Netherlands are mostly with water authorities or municipalities, not homeowners.

Anne Nobel: There are different sets of problems and solutions related to climate risk in the Netherlands. Therefore, you will have to view the development of a climate label in light of the broader policy context. What other climate adaptation policies exist, and how do we embed climate labels in these policies? Addressing these questions is crucial, also, to help define a label and determine what it is supposed to do.

Conclusion

This interview explores residential climate risk labels and their effects on climate risk management, urban governance, climate science, and real estate economics in the Netherlands. Risk labels provide a point of entry to understand the complexity

of climate risk management, particularly in the context of an ongoing renegotiation of institutional and individual roles and responsibilities and, given the emergence of “new” actors, such as the financial sector, in the domain of climate adaptation. Interviewees highlight how risk labels can provide households with risk information but note that the variety of labels and lack of standardization reflect a fragmented approach to climate risk management in the Dutch context and beyond. This fragmentation results in unclear adaptation incentives and pathways for homeowners and hinders the internalization of climate risk into urban planning and homeowner decision-making.

The discussion on risk labels carries implications for urban practitioners, particularly those involved in urban planning, real estate, and municipal governance. It underscores the importance of broadening our perspective on climate adaptation beyond mitigating physical risks by technical measures. Instead, we must also comprehend the mechanisms of risk information provision and its distributional effects on markets, neighbourhoods, and social groups. Urban practitioners should consider the following when reflecting on the suitability of risk labels:

- Given the rapid development of risk labels, and climate change adaptation strategies in general, urban practitioners must continually refine policies to mitigate the unintended side effects of adaptation strategies, such as climate gentrification.
- While current evidence does not suggest that existing labels influence homeowners’ and buyers’ decisions, urban practitioners should acknowledge the variety in labels and their potential to impact preferences to varying degrees. It is essential to note that risk labels may hold relevance not only for homeowners but also for all parties involved in residential development, such as property developers.
- At present, there is a lack of clear guidance for households on how to adapt to specific physical risks. Urban practitioners can assist households by communicating which adaptation measures to take and helping connect households with the right resources to take such measures.
- The quality and accuracy of risk information often do not meet stakeholders’ objectives for labels. Urban practitioners should assess the quality and accuracy before deciding to use a label, for example, when risk labels are used to prioritize adaptation measures. The expertise of urban practitioners is crucial in developing and validating labels to ensure they are based on transparent methodologies, reflect local climate risks, connect with appropriate action perspectives for stakeholders, and safeguard inclusion and equity concerns in their communities.

Addressing these issues will require a collaborative effort to define how risk labels are used and developed. These forms of integrated analysis and deliberation are key if risk labels are to better capture the dynamic nature of climate change and the complexities of adaptation strategies and climate policies and, ultimately, spark effective urban action.

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