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New-build homes' exposure to flooding: a comparative analysis between France and the UK

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Abstract: In many parts of the world the costs of flooding are projected to rise sharply due to climate change and urbanization in flood-prone areas. This study compares the rate of construction in high-risk zones across France and the UK, and discusses the impact of insurance and urban planning policies. In both France and the UK, the housing stock in flood-prone areas keeps growing substantially every year, and new construction in flood risk areas has not shown any sizeable sign of slowing down in recent years. In France, second homes are overrepresented in flood-risk zones, contrasting with the UK. Both countries show higher rates in low-income neighbourhoods, raising concerns about the emergence of socially deprived areas at high risk of flooding that may not have access to insurance, sometimes called "flood ghettos". While insurance is subsidized in both countries, a key distinction is that new build homes at risk do not benefit from subsidized rates in the UK, whereas they do in France. However, this difference does not appear to substantially deter construction in risky areas in the UK compared to France. These findings highlight challenges in balancing risk reduction, affordability, and sustainable development.

1. Introduction

The costs of flooding have continued to increase in Europe, with expectations of a 60% increase in France (CCR, 2023) and an increase of between 27% and 40% across the UK (CCC, 2021). Alongside more frequent and severe floods due to climate change, one of the main drivers of the increasing cost of flooding is the growing urbanization of flood risk areas (Rentschler et al., 2023).

Protecting existing homes, businesses, and infrastructure from rising flood risks is a challenging task that demands significant investments. Governments may choose to construct flood defences to safeguard housing stocks or implement buyback programs to compensate households in high-risk areas. These policies, however, come at a substantial cost (Curran-Groome, 2021). In addition, it is unlikely that all areas can be fully protected from floods, necessitating a societal shift toward increased resilience and adaptive strategies.

In addition to the complicated task of addressing flood risk of the current housing stock, the situation is further aggravated by ongoing development in high-risk zones, as well as areas projected to become susceptible to flooding in the future (Rözer and Surminski, 2021). New homes built in these flood-prone areas generate substantial costs for future generations. Each new dwelling at risk today will lead to potential losses and damages in the future, and/or the need for government funding to buy back and demolish these properties. To mitigate future costs, it is essential to reduce the number of new assets in risky areas.

This is particularly important as, building new homes in flood-prone areas may lead to the emergence of uninsurable areas, sometimes called 'flood ghettos' (Jackson, 2020). These areas are characterized by a high concentration of low-income homeowners who are highly vulnerable to

flooding and may struggle accessing flood insurance. Avoiding the accumulation of new uninsurable dwellings in these already sensitive areas is a critical concern in adapting the housing market to current and future flood risk and protecting the government from increasing financial liabilities arising from flood damage to uninsured properties.

This raises challenging questions for society on how to avoid further risk creation and what to do about those exposed and unable to afford to protect themselves. What options exist for reducing new construction in flood-prone areas and to prevent the emergence of socially deprived areas at high risk of flooding without access to insurance?

In this study we investigate the case of France and the UK to gain insights on the role of public policy and insurance in addressing these challenges. We first provide a detailed description of insurance schemes and urban regulations. Both countries have opted for subsidized insurance to improve coverage and affordability: In France, flood insurance is part of CATNAT, a comprehensive government subsidized scheme against losses and damages from natural hazards (Charpentier et al., 2022). The UK has a specialised reinsurance pool, FloodRe, designed to provide affordable flood insurance in high-risk areas (FloodRe, 2015). We then examine the evolution of construction in the two countries, before discussing how the different insurance systems may influence flood risk trends for new build homes. This is particularly interesting given one key difference in the insurance approach between the two countries: whereas in the UK premiums are only partially subsidized and homes build after 2009 cannot benefit from the Flood Re scheme, in France the subsidized cover applies to all dwellings, including new build homes. We investigate if and how the subsidization may increase new construction in flood-prone areas and if there are any social implications arising from this.

In Section 1, we review the literature and provide more information on the data and methods that we use. In Section 2, we provide a comparison of the two insurance and urban planning systems. In Section 3, we present new stylized facts in France and the UK on the rate of construction in flood risk areas and the socioeconomic characteristics of neighbourhoods where these new homes are built. This work complements the analysis led by Rözer and Surminski (2021) for the UK. In Section 4, we discuss how insurance and regulation in the two countries may interact with new construction in flood risk areas.

2. Wider context, data and methodology

This paper connects to a growing literature studying the drivers of urban development in flood-risk areas. Barrage and Furst (2019) and Lin et al. (2023) show that between 1990 and 2010 in the U.S. the construction rate of new dwellings in areas exposed to sea level rise has been comparable to safe areas, illustrating that cities keep growing in areas exposed to flooding. Rözer and Surminski (2021) also found that in the UK the construction rate in flood-prone areas did not show any significant sign of decreasing in the recent years. Consistent with these findings, Kocornik-Mina et al. (2020) showed that economic activity is concentrated in high-risk areas and they only find little permanent movement of economic activity in response to floods.

This paper is also closely connected to the literature on the economic effects of subsidizing flood insurance. Studies such as Kousky and Kunreuther (2014) have discussed the affordability of the National Flood Insurance Program in the U.S. On the French insurance system, Charpentier et al. (2022) highlight that subsidizing insurance leads to transfers between a large majority of safe households toward a small minority of exposed ones. They show that flood risk is considerably concentrated in France, with 10% of households bearing 74% of the losses. They also highlight that high-income households and touristic locations are becoming more at risk with sea level rise and simulate alternative insurance pricing systems that would share the risk differently between safe and exposed areas. A growing part of this literature also studies the perverse effects of subsidizing flood insurance. Garbarino et al., (2024) showed that in the UK, the implementation of FloodRe led to significant overvaluation of properties at risk. Browne et al. (2019), Peralta and Scott (2024) and Fabian (2024) also showed that the U.S. National Flood Insurance Program lead to new construction

and migration toward exposed areas. In France, Bézy (2025) finds using dwelling-level data that the implementation of the French insurance system increased the rate of new construction in flood-prone areas. However, given that the replacement of the housing stock takes times and that not all floods take place in risky areas, this increase in construction would only translate in about a 1% decrease in the total cost of flooding. Tesselaar et al. (2023) model, using aggregate data, how the share of households in Europe living in flood-prone areas would evolve taking into account the effects of subsidizing insurance.

This paper also connects with the prior work linking local deprivation with flood exposure. In the U.S., Bakkensen and Ma (2020) showed that low-income and Hispanic households tend to cluster in high-risk areas. Wing et al. (2022) found that the costs of natural disasters disproportionately impact poorer communities, which also tend to have a higher proportion of White residents. In the UK, several studies such as Sayers, Penning-Rowsell & Horritt (2018), and Rözer and Surminski (2021) have observed that low-income households tend to be more frequently located in flood-prone areas. Similar results were found for Germany by Osberghaus (2021) using survey data. In France, Bézy (2025) shows that more than 50% of the residential housing stock at risk in France is owned by multi-property owners of rental, second and vacant dwellings, emphasizing the need to take into account ownership statuses when studying inequalities in exposure to risks. We add to this literature by considering not only the existing stock but also new build homes, and by comparing the exposure across France and the UK.

We contribute to these literatures by discussing how subsidizing insurance may interact with new construction in flood risk areas, using geolocated dwelling-level data, and provide the first comparative study between France and the UK.

France since 1982, flood insurance is financed through a mandatory additional fee on every home insurance contract amounting to 20% of the baseline insurance. As a result, all households pay the exact same rate to be covered against flooding, no matter their risk, resulting in safe households paying more and those at risk paying less than the fair market priced premium (Langreney et al, 2023).

Conversely, in the UK the insurance industry and government agreed to the creation of a reinsurance pool, designed as a private non-for-profit scheme providing subsidized reinsurance to insurers who underwrite home insurance in the UK. Funded through a levy charged to all home insurers in the UK the scheme offers reinsurance for eligible domestic properties at a premium capped based on the council tax band of a home with a standard excess of £250 per policy.[1]

The main difference between the French and UK flood insurance schemes is their treatment of new build homes. While the French system insures any domestic property independent of their flood risk and building year, UK's FloodRe does not cover homes built after 2009 with the goal to disincentivise new properties being built in high flood risk areas[2]. Comparing the two countries may thus shed light on how availability and affordability of insurance for new build homes can affect new construction in flood risk areas.

We also provide new stylized facts on the neighbourhood characteristics where these new homes are being built. The objective is to determine whether these new homes are primarily located in economically vulnerable areas, and what trends emerge for high-income and touristic locations.

The study is underpinned by fine-grained dwelling-level data.

For France, we use the *FIDELI* administrative dataset provided the National Institute of Economics and Statistics (INSEE). This dataset gives the precise location of all dwellings in the country. We exclude oversea departments in this analysis, as administrative coverage in these areas is less reliable. Then, we overlap this administrative dataset with the flood risk maps for riverine and coastal

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flooding called *Territoires à risques d'inondations*, available from *Géorisques*[3]. Surface flooding is not available in France. These maps cover around 45% of the total population in France, and target specifically critical areas where flood risk is high. We then use data at the municipality level available on the *INSEE* website that gives the share of owner-occupied, rental and second homes per municipality as well as average income.

For the UK, we use the AddressBase Premium dataset provided by the Ordnance Survey (OS)[4] to determine the precise location of residential buildings. The OS dataset is combined with the postcode directory from the Office of National Statistics (ONS) to filter for residential dwellings built between 2008 and 2018 based on the year a specific address has been activated. The resulting data set comprises data points representing new homes in England and Wales built between 2008 and 2018, their year of completion, their location and the dwelling type (flat, detached, semi-detached, terraced, other). For the information on the average income we use the Admin-based income statistics for the tax year ending 2018, which is provided on the Lower layer Super Outputs Areas (LSOAs) as an experimental dataset by the ONS[5]. The income data shows the average net individual income for all LSOAs in England and Wales, which each comprises of 400 to 1,200 households. The income category (low, middle, high) for each LSOA is calculated based on 1/3 percentiles. To identify areas with a large share of second homes, we use the Second address dataset from 2021 Census and filter for the top 20% lower tier local authority areas with the highest share of holiday homes in England and Wales.

The flood hazard maps used in this study are from the Environment Agency for England and by Natural Resources Wales for Wales. For the river and coastal flood hazard the 'Risk of Flooding from Rivers and Sea (RoFRS)' flood maps are used[6]. To make the flood hazard information comparable to the French dataset surface water flooding is not considered in this study. The flood maps have nation-wide coverage, are available as GIS shapefiles and show the chance of flooding as one of four flood risk categories, taking into account flood defences and their condition.

Using this data, we quantify the total number of newly constructed dwellings between 2008 and 2018 in areas with varying levels of risk, categorized as High Flood Risk (HFR) and Low Flood Risk (LFR), with different thresholds in the UK (>1% for HFR and 0.1%-1% for LFR) and France (>3.3% for HFR and 0.3%-1% for LFR). It is important to note that the definition of risk varies between these two countries: in France, HFR encompasses areas with a higher likelihood of flooding compared to HFR in the UK, and the same distinction applies to LFR.

Importantly, this study has several limitations. It compares the rate of construction in flood-prone areas across two countries with differing public insurance strategies. However, it does not examine the impact of specific changes in insurance such as rising premiums (see Hudson et al., 2016; Fabian, 2024; Garbarino et al., 2024; Peralta and Scott, 2024; Bézy, 2025). Additionally, the analysis faces data limitations, particularly regarding risk maps: surface flooding data for France is not included, and risk thresholds vary between the countries. And the data used for the UK does not take into account the latest update of the National assessment of flood and coastal erosion risk data, published in spring 2025 (EA, 2025). Despite these limitations, the findings offer insights into insurance and urban planning implications.

3. Comparison of Insurance Systems and Urban Planning Regulations

Before looking at the evolution of new build homes in the two countries, we review the characteristics of flood insurance schemes and urban planning regulations. We use the framework of Surminski (2018) to compare the different insurance systems. We add a comparison of the planning systems

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[3] https://www.georisques.gouv.fr/donnees/bases-de-donnees/zonages-inondation-rapportage-2020
[4] https://www.ordnancesurvey.co.uk/products/addressbase
[5] https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/datasets
[6] https://www.data.gov.uk/dataset/bad20199-6d39-4aad-8564-26a46778fd94/risk-of-flooding-from-rivers-and-sea

and its interplay with insurance based on the work of Surminski and Thieken (2017) for Germany and UK.

3.1 Insurance systems

The French CatNat insurance system operates as a compulsory additional fee on every insurance contract to fund coverage against natural disasters. This additional fee amounts to a fixed rate of the initial insurance premium and does not depend on risk. Safe and exposed households pay exactly the same rate. The amounts collected through this fee are then transferred to the Caisse Centrale de Réassurance (CCR) that provides reinsurance to private insurance companies when a flood takes place.

In the UK insurers can reinsure the flood risk portion of eligible policies to Flood Re, paying a fixed premium based on the council tax band of the property rather than its exposure to flooding. FloodRe is financed through a levy on each sold home insurance policy, paid for by insurers and passed on to customers regardless of flood risk exposure.

To structure the comparison, we present these insurance systems, following Surminski (2018), across five key dimensions: the role of the public and private sectors, take-up rates of flood insurance, distribution of the costs of catastrophes, technical risk cost modelling, and risk communication, as well as incentives for risk reduction.

Role of public and private sectors
The French CatNat system relies on the CCR, a reinsurance company fully owned by the French government. It is the sole provider of unlimited insurance coverage against the risks of droughts, floods, earthquakes, and terrorism in France. The CCR collects an additional 20% premium on home insurance and a 12% premium on car insurance contracts. It then offers reinsurance to private companies, covering around 50% of the claim when a disaster occurs.

In the UK flood insurance together with insurance against other natural hazards is part of standard property (building and content) insurance policies and not available on a stand-alone basis. Property insurance is provided by the private market in the UK and different products with different levels of coverage and excess are available to consumers. Buildings insurance only covers damages to the structure of the building. To insure the contents of a building, an additional home contents insurance is required. For buildings in areas at high risk of flooding, flood insurance might be excluded from both buildings and home contents insurance or is only offered with a high excess in case of a damage. The private insurance market in the UK is regulated by the Prudential Regulatory Authority (PRA), which is part of the Bank of the England, UK's central bank. To avoid uninsurability of buildings in high flood risk areas built before 2009, the Flood Re pool offers subsidised flood reinsurance regardless of flood risk or loss history. Flood Re was created by government statute and is owned and managed by the insurance industry, while directly accountable to parliament by law and overseen by the Secretary of State (Surminski and Eldridge 2017).

Take-up rates of flood insurance
In France, insurance against natural disasters is a mandatory component of both home and car insurance policies. Therefore, individuals who opt for standard home insurance (*assurance multirisque habitation*) automatically receive coverage against natural disasters. Additionally, renters are required to have home insurance. Thanks to the CatNat system, insurance premiums remain relatively affordable in flood risk areas, resulting in a high coverage rate of 99% in Metropolitan France. However, in overseas departments, the coverage rate is lower, standing at only 50% (Grislain-Letremy, 2018).

In the UK, both buildings and home insurance (including insurance against natural hazards such as floods) are voluntary. However, banks require evidence of building insurance cover before granting a mortgage, which leads to relatively high penetration rates of between 95% and 98% (estimated) for building insurance, 75% for contents insurance (homeowners) and 50% for tenants (Surminski,

Mehryar & Golnaraghi, 2020).There is currently limited evidence to what degree the exclusion of new builds from subsidised flood insurance via FloodRe is affecting insurance penetration rate, but a survey conducted among owners of post-2008 homes by insurer Aviva[7] revealed that 8% of new homes are located in flood zones and 13% of respondents have reported that their new build has already been affected by flooding, which may negatively affect their future insurability.

Distribution of the costs of catastrophes across income groups
In France, the current CatNat additional premium amount to around 50 euros per dwelling annually on average. Bézy, 2025 showed that the CatNat contributions are regressive with income so that these additional premiums weigh four times more on the budget of the bottom 10% as compared to the top 10% of the income distribution.

With such subsidized insurance, households in safe locations subsidize the victims of natural disasters, which can result in income transfers across income groups. The CatNat system overall is likely to redistribute resources from high-to low-income areas, as overseas departments benefit a lot from the system. However, a growing part of CatNat expenses is also expected to benefit wealthier households: As sea level rise becomes a greater threat with climate change, wealthier households become more and more exposed to flooding through the coastal properties they own, in particular through the overexposure of second homes, also covered by the scheme (Charpentier et al., 2022; Bézy, 2025).

In the UK, flood insurance premiums charged by insurers are determined by risk levels, market conditions and loss profile, while Flood. Re's premium levels depend only on the size and value of a property, as per its council tax band. Private insurers adjust premiums both geographically, over time and in response to large and expensive damage events such as storms or floods[8]. On average exposure to flooding is higher in disadvantaged areas of the UK (Sayers, Penning-Rowsell & Horritt, 2018). To overcome issues of affordability and availability of flood insurance in areas at high risk of flooding, FloodRe provides subsidised flood insurance with non-risk-based premiums linked to the council tax band. While this makes FloodRe premiums progressive in theory, with higher value properties at risk being charged higher premiums, various distortions tend to favour high-income urban areas. First, council tax is among the most regressive taxes in the UK, with the bottom 10% households being charged close to 10% of their gross income while it is 2% for the top 10% earners[9]. Second, FloodRe is financed through a levy of GBP10.5 per household charged on each buildings insurance policy including low income households not at risk of flooding (Surminski, Mehryar & Golnaraghi, 2020). Third, Garbarino et al., (2022) found that FloodRe increased relative property values in at risk areas by 1.5% with a weak effect on lower-income areas and a high effect on higher income areas. In contrast, new build properties neither profit from the direct effects of subsidised insurance (lower premiums) nor from the indirect effects (property value uplift) and in the most extreme cases might lead to severe losses in property values once flood insurance becomes unavailable and a home cannot be bought with a mortgage.

Technical risk cost modelling and risk communication
In France, there is no need for risk modeling with the CatNat system, as all households pay the same rate of additional premium. There is no flood hazard map that would define differential rates with this system.

In the UK, private insurers use both in house and third-party catastrophe models to estimate flood risk of properties to price insurance as well as to decide which properties are passed on to FloodRe. Private catastrophe modelling companies have grown significantly since they started to emerge in the 1980s and now form a multi-billion-pound global industry. The lack of transparency of private 'black-box' catastrophe models is frequently criticized as it requires insurance catastrophe analysts to use several costly catastrophe models to blend their results and develop their 'own view of risk'.

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[7] https://www.aviva.com/newsroom/news-releases/2024/01/one-in-thirteen-new-homes-built-in-flood-zone/

[8] https://www.abi.org.uk/news/news-articles/2024/2/the-cost-of-home-insurance-rises-as-insurers-support-customers-and-battle-cost-pressures/

[9] https://www.economist.com/britain/2024/01/25/britains-council-tax-is-arbitrary-regressive-and-needs-fixing

(Cabantous & Dupont-Courtade, 2015). For new builds at risk of flooding and who are not covered by subsidised flood insurance, insurers use catastrophe models to decide if flood insurance can be underwritten for that property.

Incentives for risk reduction,
In France, the CatNat system does not provide any incentive for private adaptation to flooding or any other risk. There are no differential rates depending on private adaptation. Private insurance companies can choose to adjust their baseline premiums based on private adaptation, but they have limited incentives to do so since they only bear part of the risk of natural disasters (half of the risk being borne by the CCR). The incentives for risk reduction are supposed to come from regulatory plans (Plans de Prévention des Risques Inondations), however, these plans have shown very low efficiency in reducing new construction in flood risk areas (Paul-Venturine, 2024).
In the UK there is limited evidence of flood insurance directly incentivising risk reduction. Flood Re's exclusion of post-2009 buildings is considered as a signal towards more resililent development going forward, but has so far not been effective in preventing new homes being built in at-risk areas, partly due to a disconnect between insurance and the urban planning system (Rözer & Surminski 2021 and also see next chapter). 'Building Back Better', a new scheme launched by FloodRe in 2022 funds property level protection measures for flooded properties up to GBP10,000 on top of the actual damage as part of a resilient repair, but it will likely take several years for the scheme to have any measurable impact on risk reduction[10].

3.2 Urban planning

In France, insurance and urban planning have been structured to complement each other. The goal of the French CatNat system was to provide coverage to all households in the country at an affordable price, whereas the risk prevention plans (PPR) were designed to provide incentives to reduce new development in risky locations. It is up to municipalities whether they want to order a PPR. However, if there are repeated floods in a given municipality and no PPR is ordered, the insurance deductible might increase. The objective of this measure was to give incentives to mayors to order a PPR if they were located in an area exposed to flooding.
These plans first provide objective information about risks, and then converts the risk assessment into land use restrictions. A PPR provides a classification of the risk in 3 modalities: areas where there is no risk and new construction can continue, areas where construction is allowed but subject to protective measures and areas where construction is forbidden. Paul-Venturine (2024) showed that providing information through a PPR on flood risk without forbidding new construction, does not have any sizeable effect on reducing new development in these zones. Bézy (2025) also provides evidence that the construction rate in flood risk areas remained stable in France since 1980, suggesting that the efficiency of these PPR was limited. The French CatNat system thus managed to provide insurance at an affordable price to all households, but somehow failed to substantially reduce new construction in flood-prone areas.

In the UK, urban planning and insurance systems are largely separate. Local planning authorities as a public sector body are independent in setting their local development plans, with the Environment Agency being a statutory consultee for planning permissions in areas at risk of flooding. The EA is supposed to ensure that new property developments in areas at risk of flooding are only permitted if no other options are available, the sustainable benefits out weight the increase in flood risk and that the new property developments are both resilient (i.e. asset-level engineering resilience) and resistant to flooding (Hayes, Barker & Jones, 2014). However, with competing interests such as constrains on building on protected land and pressure to meet housing targets, new buildings are frequently permitted in areas at risk of flooding[11]. While the planning system stipulates that new buildings should only been built in accordance with requirements to ensure their current and future resilience to flooding, there are no nation-wide data sets available to monitor to what degrees these

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[10] https://www.floodre.co.uk/wp-content/uploads/Flood_Re_Transition_Plan_report_2023.pdf
[11] http://www.theccc.org.uk/wp-content/uploads/2019/07/CCC-2019-Progress-in-preparing-for-climate-change.pdf

requirements are met. The private insurance sector is not part of the planning system and remains mostly hands off. While the exclusion of post-2009 properties from FloodRe should at least in theory create an incentive not to plan new developments in areas at risk of flooding, the high demand for new homes leads to limited interest around insurability by developers and planners (Surminski & Thieken, 2017). This is further complicated through different views on risk between private insurers, relying on 'black box' catastrophe models and planning authorities using the publicly available flood maps provided by the EA for their planning decisions.

4. Insights on flood risk trends and exposure of New Build Homes

Our analysis of the evolution of construction in the two countries provides several insights. First, we review historical flood risk trends and future projections. Next, using our dwelling-level data, we determine the annual percentage of new homes exposed to flood risk. Finally, we use socio-economic data to assess whether new construction contributes to the formation of socially deprived high risk area that may struggle accessing insurance.

4.1 Overall flood risk trends

Between 1980 and 2022, floods accounted for nearly 43% of climate-related economic damages in Europe, amounting to 280 billion euros over the period and establishing themselves as the most financially burdensome type of event on the continent (EEA, 2024). In France, floods were the costliest type of extreme weather events, with an annual average of 1 billion euros from 1989 to 2020 (France Assureurs, 2021). Projections indicate that losses should increase by 87% over the 2020-2050 period, reaching approximately 1.8 billion euros annually.

In the UK, flooding is the main environmental hazard identified by the National Risk Register. Flooding and flood risk management costs the UK on average £2.2 billion a year, which includes £800 million per year on flood defences and £1,400 million a year in damages. In case of unchanged flood-management policies and expenditure annual losses from flooding in the UK would increase under every scenario with increases ranging between £1 billion and £27 billion by 2080[12].

In both countries, the largest part of the rise in flood-related costs over time can be attributed to the increasing number and value of properties at risk. In France, 65% of the cost increase can be attributed to the increasing number and value of properties at risk. In the UK, residential properties at risk of flooding are expected to increase by between 73% and 140% by 2080 for a 2°C warming scenario, with climate change alone contributing 40%-points (Sayers et al. 2016). Thus, reducing new construction in flood-prone areas is a first order issue that needs to be tackled to mitigate the costs of flooding.

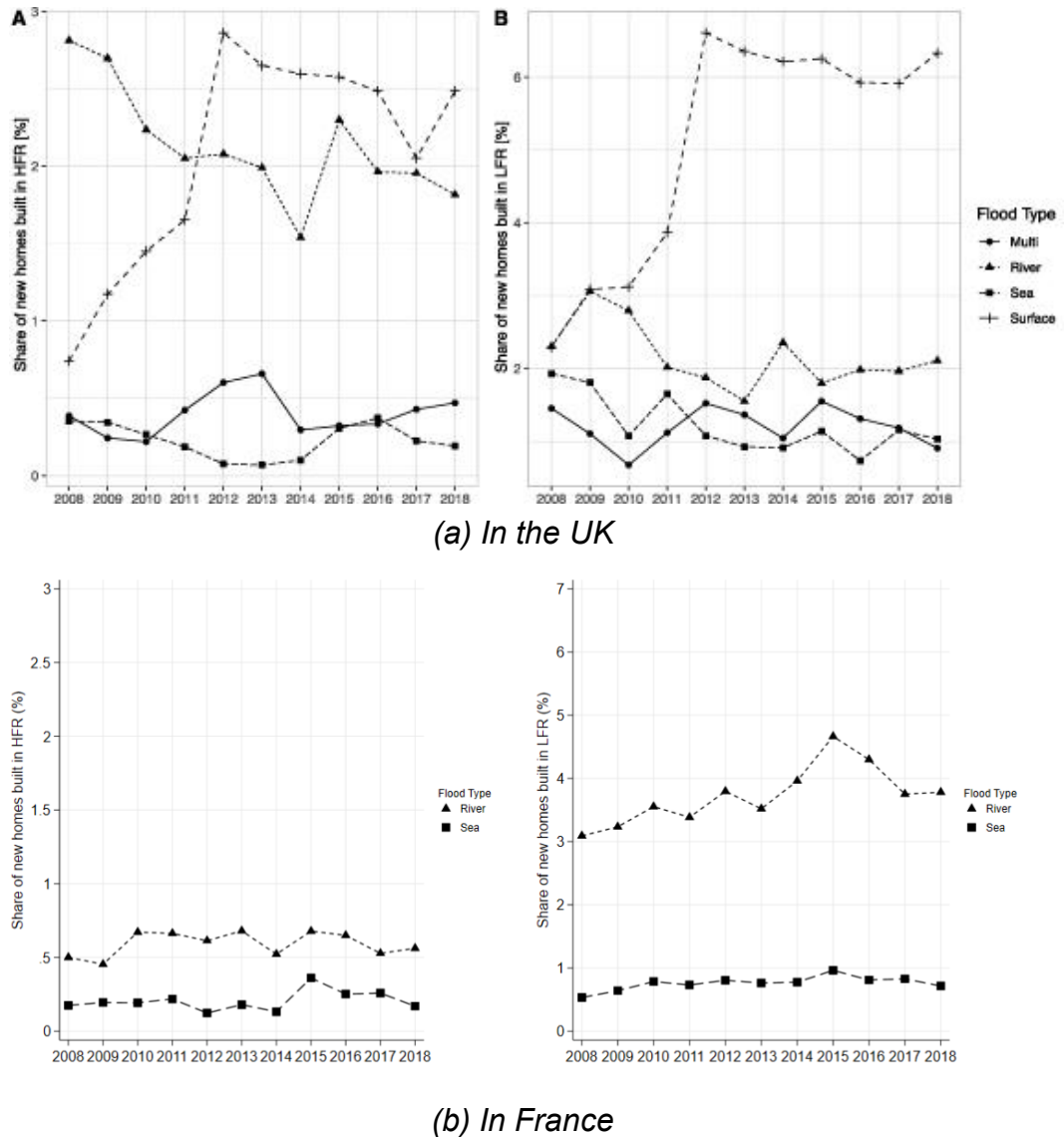### 4.2. Share of Homes Exposed

We now investigate trends in exposure to flood risk of the overall housing stock. Figure 1 illustrates the annual rates of new residential construction based on flood type, categorized into HFR and LFR areas. In the UK, the construction rate in areas vulnerable to river flooding witnessed a small decline over time, while the ratio remained relatively constant for sea flooding. We also find that the rate of new homes built in areas at risk from surface water flooding has almost tripled between 2008 and 2012 and remains at a high level after reaching a peak in 2012.

Conversely, in France, both river and sea flooding trends appear relatively stable, with a slight upward trajectory observed for river flooding in LFR areas. The magnitudes are lower in Frances, but this difference is most likely driven by the definition of flood risk areas that differs across the two countries.

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[12] https://assets.publishing.service.gov.uk/media/5a74c78de5274a3f93b48beb/04-947-flooding-summary.pdf

These findings highlight that new construction in flood risk areas seems to be relatively stable overall, both in France and in the UK. There does not seem to be any large drop in construction in flood risk areas, at least since 2012, indicating a lack of efficient policies to address this issue in both countries.

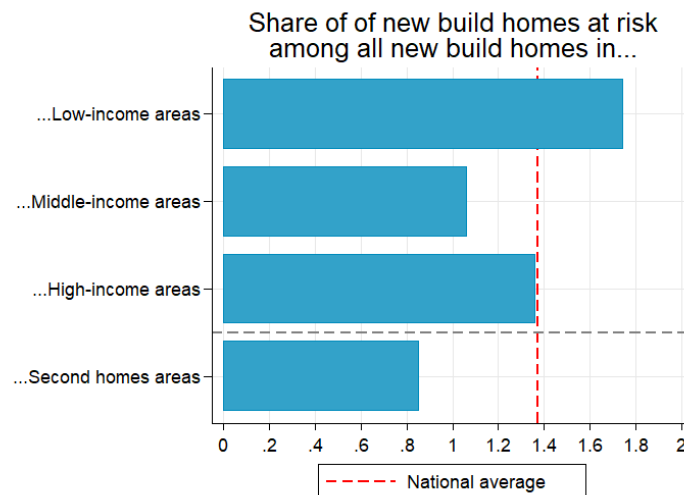*(a) In the UK*

(b) In France

Figure 1: share of new construction in flood risk areas

The figure shows the proportion of new dwellings constructed in areas at risk of flooding. High Flood Risk (HFR) and Low Flood Risk (LFR) are defined based on different annual probabilities of flooding. In the UK, HFR corresponds to areas with a flooding probability greater than 1%, while LFR represents areas with a probability between 0.1% and 1%. In France, HFR applies to areas with a flooding probability exceeding 3.3%, and LFR covers areas with a probability between 0.3% and 1%.
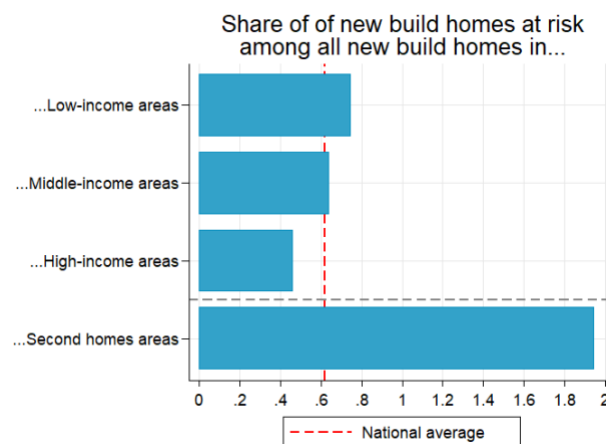
4.3. Exposure by socio-economic characteristics

In this section, we document how the proportion of new build homes in flood risk areas varies by neighbourhood characteristic. The objective is to determine whether new construction may foster the emergence of 'flood ghettos' or whether new construction mostly takes place in high-income and less vulnerable locations.

First, we categorize neighbourhoods into three categories based on income: low-, middle-, and high-income areas, where the area's average income falls respectively below the 34th, between the 34th and 66th, and above the 66th percentiles. Additionally, we consider areas where the share of second homes is above the 9th decile, in order to investigate whether construction also takes place in touristic locations. The scale of analysis is the municipality in France and the Lower Layer Super Output Level in the UK.

Share of of new build homes at risk
among all new build homes in...

(a) In the UK

Share of of new build homes at risk
among all new build homes in...

(b) In France

Figure 2: Deviation of new build homes in HFR by neighbourhood type

The figure compares the share of newly built homes in HFR across different areas of the country to the national average. Areas are categorized into three income groups: low-, middle-, and high-income areas, based on average income levels. Specifically, low-income areas are those where the average income falls below the 34th percentile, middle-income areas fall between the 34th and 66th percentiles, and high-income areas are above the 66th percentile. Additionally, we examine areas where the share of second homes exceeds the 90th percentile to explore whether construction is concentrated in touristic locations. The scale of analysis is the municipality level in France and the Lower Layer Super Output Area in the UK.

Figure 2 shows the share of new build homes in flood prone areas by neighbourhood characteristic comparing these shares to the national average. We observe that in low-income neighbourhoods, the share of new build homes in flood prone areas is higher than the national average in both countries. As income increases, the share of new build homes in flood prone areas decreases.

This result might be explained by heterogeneous risk perceptions. First, low-income households may take less flood risk into account in their investment decisions. Bakkensen and Ma (2020) show that in the US, low-income households and minorities are less likely to discount flood risk in property values and more likely to move to flood-prone locations. Because of this higher demand for dwellings at risk in flood prone areas in low-income neighbourhoods, developers might be incentivized to build in these areas where people are less aware of flood risk. This mechanism may explain why new construction disproportionately takes place in low-income areas, leading to the emergence of 'flood ghettos'. This phenomenon creates challenges for insurance: as these new households exposed to flood risk generally have low-income, they are less likely to buy flood insurance, unless it is provided at an affordable price.

Looking at second homes, opposite patterns emerge across the two countries. Newly built second homes are largely over-represented in flood-risk areas in France and under-represented in the UK. Urban development in both touristic and flood-prone locations thus seems to be a problem that is more specific to France. In the UK, despite large housing development of second homes in the country[13], this new development does not seem to be correlated with flood risk exposure. This has very likely to do with the location of second homes in the UK, which have the highest concentration in rural local authority districts in the South West and South East of England, which have a lower share of properties in areas at risk of flooding. On the contrary in France, a large share of second homes are located in touristic locations along the Mediterranean and Atlantic coasts, highly exposed to flooding (INSEE, 2021).

5. Discussion of the interplay between insurance system and planning policy

In both France and the UK, the housing stock in flood-prone areas keeps growing substantially every year, and new construction in flood risk areas has not shown any sizeable sign of slowing down in recent years (Figure 1). While insurance is subsidized in both countries, a key distinction is that new build homes at risk do not benefit from subsidized rates in the UK, whereas they do in France. However, this difference does not appear to substantially deter construction in risky areas in the UK compared to France.

In addition to the increasing exposure of the housing stock to flood risk, these new homes are predominantly built in low-income and vulnerable locations (Figure 2). This phenomenon raises important challenges for insurance. First, low-income households are more likely not to buy insurance if costs are high. As they become increasingly exposed to flood risk, there is thus a growing need to subsidize insurance in order to provide it at an affordable cost.

However, providing subsidized insurance regardless of flood risk levels may lead to higher demand for these locations and increase even more new construction. Simultaneously to helping low-income households in these locations, subsidizing insurance may also worsen the problem and increase the construction rate in flood-prone locations, unless there is more stringent regulation to limit new construction in flood-prone locations. Up to now, in both countries, urban planning regulation does not seem to have played an efficient role in reducing new construction in flood-prone areas.

Ultimately, if insurance remains subsidized and the number of dwellings exposed to flood risk keeps increasing, the total cost of subsidizing insurance in these locations will increase for taxpayers. The question that society needs to answer is whether taxpayers are willing to pay this additional cost to provide coverage to these households at risk, or whether they think these households should be accountable for their choice to live in these flood-prone locations. Currently, the UK has chosen to remove new built homes from FloodRe, whereas the French CatNat system provides subsidized

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[13] https://assets.publishing.service.gov.uk/media/5f044501e90e075c50609e43/2020_EHS_second_homes_factsheet.pdf

insurance to all households, including those buying new build homes. These two different choices might reflect different perceptions and preferences on how taxpayers think people should be accountable for their actions and decisions to locate in flood-prone locations. Each country having their own preferences and value system would agree on different insurance policies.

In France, one potential avenue for insurance would be to target subsidies to households that are most in need more effectively. Second homes are particularly salient regarding that matter, particularly for holiday homes located along the French coast. These homes tend to be occupied only a few weeks during the year and, as they are over-exposed to flood risk (Bézy, 2025), may generate high cost for insurance. One might think about excluding them from the CatNat scheme in certain critical areas, a suggestion also proposed in the Langreney et al. (2023) report commissioned by the French government.

In the UK, the main focus lies on reducing flood risk as a whole to allow for a transition to fully risk based pricing with the planned end of FloodRe in 2039. While it is unclear what will happen once the current pool solution expires, there appears to be growing focus on property level flood resilience measures. One key activity currently supported by the insurance industry are the introduction of property resilience certificates, which are planned to be an equivalent to the already existing building energy certificates providing an easy-to-understand metric about the flood resilience of a property (FloodRe, 2024). When and how quickly these will be adopted remains to be seen. At the same time flood risk levels continue to rise as recent updates to the Nafra flood data show (UK Gov 2025). Maintaining current protection levels is a tall order for the country – and growing pressure on house building targets may well push for more new buildings in risk areas.

Acknowledgements

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