Who Decides Who Is Insurable? Data Governance of Flood Insurance Underwriting in Ireland

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***Abstract*—About one in twenty buildings in Ireland has limited or no access to flood insurance, and the gap is expected to widen as climate change brings heavier rainfall and more frequent storms. Whether a home can be insured is not decided by public flood maps but by insurers' own data, address- and property-level geocoding and private flood models, which homeowners cannot see or challenge. These decisions can affect the value of a home, its owner's ability to recover from a flood, and possibly access to mortgage credit. This paper examines how the data behind flood insurance underwriting in Ireland is governed. We map the data lifecycle from collection to cover decision and find that governance is strongest where data is public and weakest where decisions are made: no binding rule requires insurers to use, disclose or explain their flood models, the Central Bank has no remit over pricing, and the EU AI Act does not class property insurance as high-risk. We then analyse the privacy questions raised under the GDPR, including whether a model-driven refusal is an automated decision after the CJEU's SCHUFA ruling, and the ethical tension between risk-based pricing and solidarity, including the risk that location variables act as proxies for income. We propose six measures: a public flood-risk data platform, a right to an explanation and appeal, fairness audits, flood-risk certificates, two-way data sharing, and transparency conditions on any state-backed fund. Each is linked to Sustainable Development Goal targets 13.1, 11.5, 1.5, 10.3, 16.6 and 17.18.**

***Index Terms*—flood insurance, data governance, protection gap, GDPR, automated decision-making, algorithmic fairness, climate adaptation, Sustainable Development Goals**

I. Introduction

In January 2025, Storm Éowyn became the most expensive weather event in the history of Irish insurance [1], [2]. Again, a year later, Storm Chandra pushed the River Slaney over its banks and flooded the centre of Enniscorthy [3]. Events like these are expected to happen more frequently, and each one raises the same question for people whose homes are affected: will my house still be insurable next year?

The answer is decided by data. In Ireland, insurers integrate their own claims histories with address- and property-level geocoding data, commercial property information, and proprietary flood models to determine, on an address-by-address basis, whether to extend flood coverage to a given property and at what premium it should be offered [4], [7]. According to the Central Bank of Ireland, roughly one in twenty buildings (around 5%) can obtain only restricted flood cover, or none at all [8], [10]. For the households concerned, the consequences are beyond insurance. Homes in mapped flood zones sell at a discount [11], uninsured owners must pay for repairs from savings or new borrowing [11], and international evidence shows that higher premiums are linked to more mortgage arrears [12].

Even though so much is at risk, the data and models that insurers use to make flood insurance decisions are kept almost completely private. Insurance companies have told the Oireachtas that they rely on their own internal modelling tools instead of the national flood maps produced by the Office of Public Works (OPW) [5], [6]. Brokers and residents have long complained that whole areas were refused cover even though they had no history of flooding [7], [13], [14]. In 2017 a study conducted by the LSE Grantham Research Institute and University College Cork called for a "fundamental review" of how flood-risk data is collected and shared [15], [16]. Almost a decade later, a government working group was set up to investigate the protection gap. The insurance industry put forward a proposal for a levy that would cover high-risk homes, and the EU has also been developing a broader framework focused on climate insurance and resilience. Yet none of these efforts, so far, have had much to say about the underlying data.

This paper asks a single question: **how is the data that decides who can get flood insurance in Ireland governed, and how should it be?** This study has four aims. First, it traces how flood data moves through underwriting and who is responsible at each step. Second, it examines the data protection problems that arise once environmental data is tied to named homes and owners. Third, it considers the ethical, legal and social consequences of letting data decide insurability. Fourth, it puts forward practical governance measures and connects them to the UN Sustainable Development Goals (SDGs).

The rest of the paper is organised as follows. Section II reviews the background and earlier research, and Section III examines the governance and regulatory landscape. Section IV deals with privacy and data protection, and Section V discusses the ethical, legal and social questions. Section VI sets out our proposals and links them to the SDGs, and Section VII concludes.

II. Background and Literature Review

A. The Scale of the Flood Protection Gap

A protection gap is the share of economic losses from a hazard that isn't covered by insurance. The Central Bank of Ireland's 2024 report on the flood protection gap highlights some notable findings. Around 5% of buildings have little to no access to flood insurance, and the problem is mainly concentrated in specific regions, including Dublin, Cork, Kildare, Clare, and Louth.
The report also notes that inland flooding costs Ireland around €101 million each year [8], [9]. Since 2000, insured flood losses have totalled nearly €2 billion, and since 2009 the government has paid out more than €40 million in humanitarian aid to households and businesses that had no insurance cover.

The Central Bank's 2026 staff analysis offers a useful look at how households may be affected going forward. At present,

around 50,000 households are situated in areas with a high risk of flooding. That figure is predicted to rise to around 78,000 by 2100 under a moderate climate scenario, and to roughly 101,000 under a more severe one. Between 6,450 and 36,700 mortgaged households, which work out to somewhere between 1.2% and 6.9% of the total, sit within these high-risk zones, with the best central estimate putting that number at about 19,500. Around 290,000 buildings face some level of flood risk. The researchers also show how risk builds up over a loan: a property with a 1% yearly flood chance has about a one-in-four chance of flooding at least once during a 30-year mortgage [11]. These numbers matter for governance because they show that flood insurability is not a small problem limited to a few homes near rivers; it directly affects the mortgage market and the broader housing sector.

B. How Insurers Decide: Private Data and Models

Ireland's official flood maps are created by the OPW through the Catchment Flood Risk Assessment and Management (CFRAM) programme and are available to view on floodinfo.ie, in line with the EU Floods Directive [26]. However, repeated answers to parliamentary questions confirm that insurers do not actually rely on these maps. Back in 2016, Insurance Ireland described a process where insurers combined geocoding, their own claims data, flood modelling data, and other secondary data to assess coverage on a case-by-case basis [4]. In 2017 and again in 2022 Ministers told the Dáil that the industry uses its own flood modelling tools and methodologies, not the OPW maps [5], [6], and in 2023 that the OPW's data-sharing arrangement with Insurance Ireland does not guarantee cover [27].

The practical effect is that a homeowner's insurability depends on a private model they cannot inspect. A Dublin Inquirer investigation in Ringsend and Irishtown found residents still unable to obtain flood cover years after a major flood, with Aviva explaining that a prediction model determined cover address by address [7]. The same insurer had earlier funded what GeoDirectory describes as Ireland's first privately funded flood mapping project, built on geocoded address data and geographic information systems [28]. In October 2026 Aviva announced that an updated, more granular property-level map allowed it to extend flood cover to about 13,000 additional properties [29]. This announcement really captures both sides of what data-driven underwriting looks like in practice: having better data can open doors for more people, but the call on who gets approved and who gets turned away still comes down to a model that nobody publishes or lets you push back on.

Modern flood underwriting generally draws on four types of data. Hazard data covers where floodwater is likely to travel, pulling from river and coastal flood models, historical rainfall records, and elevation information. Exposure data focuses on what sits in the path of that water, including the location, type, age, and floor level of each building, which is typically sourced from address databases and commercial property datasets [28]. *Vulnerability and claims* data show how buildings have been held up in past events, based on each insurer's own claims history [4]. *Mitigation data* covers the defences and resilience measures that are already in place, such as flood relief schemes that have been completed [30], [31]. These datasets are connected through geocoding, a process that assigns exact coordinates to each address, and are now more commonly analysed using machine learning and geospatial tools [32]. Every link in this chain can introduce error. A property can shift from insurable to uninsurable for surprisingly simple reasons. For example, a map coordinate pinned to the middle of a large rural townland instead of the actual building, or an outdated model that has not registered a recently completed flood defence, can be enough to change the outcome entirely. Because the chain is private, these errors are difficult for anyone outside the insurer to detect.

The Irish market adds a further dimension. Storm Eowyn showed how a single event can sharply reduce insurers' profits [2], and the Central Bank has identified climate change as an increasingly significant threat to financial stability [33]. Insurers therefore face real commercial pressure to price flood risk more precisely or to withdraw from the highest-risk locations. The issue is not with precision itself, but rather with the fact that it transfers a greater share of climate risk costs onto individual households while simultaneously making the quality and governance of the underlying data far more consequential.

C. A Long-Running Data Controversy

Concerns about the data have a long history. In 2013 brokers complained that insurers' geocoding had left "vast swathes of townlands uninsurable, despite no history of flooding" [13], and evidence given to an Oireachtas committee suggested that up to 50,000 homes might be without flood cover [14]. These were complaints rather than verified findings, but they show that the problem was visible to intermediaries more than a decade ago.

The most detailed analysis remains Surminski's 2017 study for the LSE Grantham Research Institute and UCC, funded by the Environmental Protection Agency [15], [34]. It described a "data controversy" in which public bodies, insurers and households held different and incompatible pictures of flood risk and argued that the use of flood data by insurers was not transparent. It called for a fundamental review of how flood-risk data is collected and shared and for a shared public data platform [15], [16]. Our paper revisits these recommendations in the light of new developments, including the GDPR, the AI Act and the 2026 working group.

D. Research on Risk-Based Pricing, Fairness and Exclusion

International research helps explain why the governance of underwriting data matters. In the US, moving the National Flood Insurance Program to fully risk-based pricing cut policy uptake most in lower-income areas [35]. US mortgage data also shows that higher premiums increase delinquency and worsen wider credit outcomes [12]. Legal scholarship warns of an "uninsurable future" in which insurers leave whole regions, harming housing finance and local economies [36]. Work on the insurance industry's role in tackling climate change argues that pricing can send useful risk signals but must be paired with resilience investment [37], [38], and recent studies of flood insurance arrangements find that they can widen inequality in recovery outcomes [39].

Similar literature examines fairness in data-driven pricing. Williamson and Fröhlich show that insurance has long wrestled with the tension between *actuarial fairness*, where each person pays for their own risk, and *solidarity*, where risk is pooled, and that these debates anticipate current arguments about fair machine learning [40]. Lindholm *et al.* demonstrate that variables such as postal code can act as proxies for protected characteristics in insurance pricing, and propose methods to measure and remove such proxy effects [41], [42]. Zhang et al. demonstrate how pricing can be made free of discrimination even when sensitive attributes are only available in a privatised

form, establishing a connection between fairness and privacy [43].

Taken together, the existing research leaves three gaps, which this paper tries to fill. First, Irish studies of the data controversy predate both the GDPR and the AI Act. Second, the fairness literature has rarely been applied to location-based catastrophe underwriting. Third, current Irish policy debate focuses on funding the gap rather than on governing the data that creates it.

E. Research Approach

This study uses qualitative document analysis. We reviewed four groups of public sources: (i) Irish official and regulatory material, including Central Bank of Ireland reports [8], [11], OPW publications and datasets [25], [30], [31] and Government announcements [44]; (ii) the parliamentary record, in particular answers to Dáil questions on how insurers assess flood risk [4]–[6], [27], [45]; (iii) EU legislation and supervisory guidance [26], [32], [46], [47]; and (iv) academic and conference literature on insurance, fairness and climate risk [12], [35], [36], [40], [42]. And, where we could, we double-checked recent news reports against primary sources to make sure everything lines up with what's going on right now.

We analysed these sources using a data-lifecycle framework, tracing flood-risk data from the point of collection through to decision-making and sharing. At each stage we assessed governance against four criteria commonly used in data governance: whether the governing rule is *binding*; whether the process is *transparent* to affected people; whether someone is *accountable* for errors; and whether decisions are *contestable*. The main limitation of this approach is that insurers' models and internal decision data are not public. We therefore assess the governance framework around the models rather than the models themselves, and we distinguish clearly between verified findings and complaints or claims reported in the media.

III. Governance and Regulatory Frameworks

A. A Data-Lifecycle View of Governance

To assess governance systematically, we follow flood-risk data through five stages: *collection* of hazard, claims and property data; *geocoding*, which links each address or property to a location; *modelling*, which turns location and hazard data into a risk score; the *cover decision*, in which the insurer accepts, prices, excludes flood or refuses; and *sharing*, the flow of data between insurers, the State and households. For each stage we ask who governs it and whether the governing rule is binding. Fig. 1 summarises the result, and Table I gives more detail.

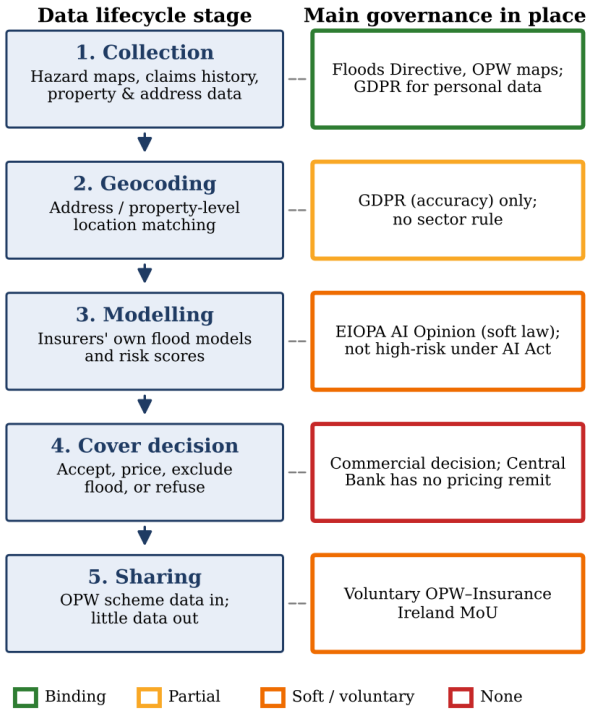


Fig. 1. Governance of flood insurance data across the underwriting lifecycle in Ireland. Governance is strongest where data is public and weakest at the point of decision.

The pattern is clear: governance is strongest at the start of the lifecycle, where data is public and produced under EU law, and weakest at the point where decisions are made about individual homes. The following subsections examine each framework in turn.

TABLE I
Governance of Flood Underwriting Data by Lifecycle Stage

Stage	Main data and actors	Governing framework	Key gap
Collection	OPW hazard maps; insurers' claims data; commercial property data	Floods Directive [26]; OPW CFRAM [25]; GDPR [47]	Insurers not required to use public maps [5], [6]
Geocoding	Address- and property-level matching by insurers and data vendors [4], [28]	GDPR accuracy principle [47]	No standard for location accuracy; errors hard to detect [13]
Modelling	Insurers' private flood models and risk scores [5], [7]	EIOPA AI Opinion (soft law) [32]; Nat Cat review [48]	Not high-risk under AI Act [46]; no fairness testing
Cover decision	Accept, price, exclude flood or refuse	Commercial decision; GDPR Art. 22 [47], [49]	No pricing remit for Central Bank [45]; no explanation or appeal
Sharing	OPW scheme data to Insurance Ireland [30]	Voluntary MoU [27], [30]	One-way flow; no data on refusals returned to State

B. Public Flood Risk Data: The Floods Directive and the OPW

The EU Floods Directive requires Member States to carry out preliminary flood risk assessments, publish flood hazard and risk maps, and adopt flood risk management plans, reviewed in six-year cycles [26]. In Ireland, the OPW meets these duties through the CFRAM programme and floodinfo.ie [25]. This is the best-governed part of the lifecycle: the data is produced under a legal mandate, the methods are documented, and the maps are public. The Directive, however, governs *public* planning and risk management. It places no obligation on insurers to use the maps, and the maps were not designed

for property-level underwriting. The result is two parallel views of risk: a public one that is transparent but coarse, and a private one that is more granular but opaque.

Other EU instruments strengthen the public side of the lifecycle. The INSPIRE Directive created an EU spatial data infrastructure and lists *natural risk zones*, including flood zones, among the spatial data themes that public authorities must make available in interoperable form [50]. The Open Data Directive and its implementing act on high-value datasets require public bodies to publish certain geospatial, earth observation and environmental datasets free of charge and in machine-readable form [51], [52]. Together, these laws mean that Ireland already has a legal basis and technical standards for publishing flood-risk data. What they do not provide is any mechanism to bring *private* risk data, or the outcomes of private decisions, into the same public infrastructure.

C. Voluntary Data Sharing: The OPW–Insurance Ireland MoU

The main link between public flood data and private underwriting is a Memorandum of Understanding (MoU) between the OPW and Insurance Ireland. Under it, the OPW gives participating insurers details of completed flood relief schemes, such as how they were designed, the area they cover and the level of protection they provide. Insurers can then reflect these works in their flood-risk assessments [30]. Part of the scheme data is also published as an open dataset [31]. The memorandum of understanding represents constructive development, though it is subject to three notable limitations. It is voluntary and contains no enforcement mechanism. It encompasses only those areas safeguarded by completed engineered flood defence schemes and does not account for property-level resilience measures such as flood doors or non-return valves. The flow of data here runs in one direction only: the State shares its data with insurers, but insurers do not reciprocate by sharing their risk assessments or the results of their decisions back with the State. Ministers have confirmed that the memorandum of understanding does not guarantee coverage and that pricing remains subject to commercial decision-making [27].

Chapter V of the EU Data Act (Regulation (EU) 2023/2854), applicable since 12 September 2025, gives public authorities a legal route to request data held by private firms. They must show an exceptional need and meet the conditions set by the Act [53], [54]. Personal data may be requested exclusively during a public emergency and only in circumstances where non-personal data proves insufficient, while companies are strongly encouraged to anonymise or pseudonymise data prior to any disclosure [54]. Following a major flood, the Data Act could ease access to claims and exposure data for insurers. It is not intended to support the routine and continuous data sharing that flood-risk planning demands, given that the exceptional need it addresses must be both unforeseeable and time-limited in nature [54]. Routine sharing would need a specific national arrangement.

D. Prudential Supervision and the Pricing Gap

The Central Bank of Ireland supervises insurers' solvency and conduct, and it has produced much of the evidence on the protection gap [8], [11], [33]. It has also reviewed how insurers use natural catastrophe models for prudential purposes [48]. However, the Minister for Finance confirmed in 2014 that the Central Bank has no remit over the pricing of insurance products or insurers' underwriting decisions [45]. Supervisory interest in flood models therefore focuses on whether an insurer can survive a catastrophe, not on whether the model treats households fairly or accurately. The Government's Action Plan on Insurance Reform 2025–2029 focuses mainly on the cost and availability of insurance more broadly [44]; it does not set out rules for the data used in flood underwriting.

The Central Bank's conduct rules provide a partial counterweight. The revised Consumer Protection Code, whose new protections took effect on 24 March 2026, requires firms to act honestly, fairly and professionally in customers' best interests, to present information that effectively informs customers in plain language, to pay attention to consumers in vulnerable circumstances, and to test digital technology for consistent and objective outcomes [55]. These principles could be used to require clearer communication when flood cover is refused. They do not, however, address the content of underwriting models or give the Central Bank a role in deciding which risks insurers should accept.

E. AI Governance: A Gap for Property Insurance

Insurers' flood models increasingly use machine learning and large geospatial datasets. The EU AI Act (Regulation (EU) 2024/1689) treats only some insurance AI as high-risk. Annex III, point 5(c), covers systems that assess risk and set prices for individuals in life and health insurance [46]. Property and flood insurance fall outside this category. Even where the high-risk rules apply, the Digital Omnibus on AI (published 24 July 2026, in force 27 July 2026) pushed back the Annex III obligations from 2 August 2026 to 2 December 2027 [56], [57].

The main sector-specific guidance is EIOPA's Opinion on AI governance and risk management of August 2025, which expects fairness, sound data governance, record-keeping, transparency and human oversight from insurance AI that is not high-risk [32]. The Opinion is welcome, but it is soft law: it relies on supervisors applying existing principles proportionately and creates no rights that a refused homeowner can invoke. The AI governance framework for property flood underwriting therefore depends almost exclusively on the risk management decisions of individual insurers.

F. Current Policy Responses

Policy activity has increased sharply in 2026. On 11 August the Minister for Finance established a Flood Insurance Protection Gap Working Group, chaired by Jim Breslin and including Government departments, agencies and insurers, to identify practical measures to improve access to cover [17], [18]. Its reported remit focuses on access and resilience and does not explicitly mention data governance, and no reporting date had been published at the time of writing. On 27 August Insurance Ireland proposed a €24 levy on each insured household to fund a "sustainable flood insurance fund" for higher-risk properties, alongside continued investment in flood defences and better sharing of flood-risk information [19], [20]. The proposal was criticised as a cost-of-living burden that would not address legacy problems in specific communities [20], [58]. A survey reported in August found that almost eight in ten people support flood-risk certificates when homes are sold [59].

At EU level, only about a quarter of climate-related economic losses are insured [22], [60]. EIOPA and the European Central Bank have proposed a public–private reinsurance scheme and an EU fund for public disaster financing [61]. On 16 September 2026 Commission President von der Leyen announced a Climate Insurance Alliance bringing together insurers, investors, risk modellers, public

authorities and policyholders [21], [22], and the Commission's first EU Framework for Climate Resilience was presented on 27 October 2026, including a proposed European Climate Resilience Law and new public climate-risk tools such as the European Climate Viewer [23]. These initiatives could shape any Irish scheme, but they too are framed mainly around financing and public resilience planning rather than the governance of underwriting data.

G. Stakeholders and Accountability

Table II summarises the main stakeholders, their role in the data lifecycle and what they are accountable for. The table highlights an asymmetry. The organisations with the most influence over individual outcomes, namely insurers and their data and model providers, face the fewest specific obligations about how flood data is used, while the households most affected have the least information and the fewest formal channels to influence decisions. Brokers, who often see the effect of refusals first, have no formal role in the governance of the data [13].

TABLE II
MAIN STAKEHOLDERS IN FLOOD UNDERWRITING DATA

Stakeholder	Role in the data lifecycle	Accountable for
OPW	Produces national flood maps and scheme data; shares scheme data under the MoU [25], [30]	Floods Directive duties; flood defences
Insurers and Insurance Ireland	Collect claims data; build or buy models; decide cover [4], [5]	Solvency and conduct; GDPR as controllers
Data and model providers	Supply address, property and hazard data and catastrophe models [28]	Contracts with insurers; GDPR as processors or controllers
Central Bank of Ireland	Supervises insurers; researches the gap [8], [11]	Prudential and conduct rules; no pricing remit [45]
Data Protection Commission	Supervises GDPR compliance	Enforcing data subject rights
Department of Finance and working group	Policy on insurance and the protection gap [17], [44]	Recommendations; any future scheme
Households and brokers	Provide application data; experience refusals [7], [13]	No formal governance role

H. International Comparison

The UK's Flood Re offers the closest comparison. It is a reinsurance scheme funded by a levy on insurers that allows them to cede the flood element of high-risk household policies at a capped price. In the year to March 2026 it covered an estimated 353,000 policies and reported a pre-tax profit of £48.8 million [62], [63]. Flood Re is designed to close in 2039, and its next phase focuses on property-level resilience and better-targeted support, including Flood Performance Certificates that recognise resilience investment [62], [64]. The key takeaway for Ireland is that a pooled fund can restore market access in a relatively short period, but it represents a transitional mechanism rather than a lasting solution. Without better data on property-level risk and resilience, a fund can hide risk rather than reduce it

Two other models show different balances between solidarity and risk-based pricing. France's *Catastrophes Naturelles* (CatNat) regime makes natural catastrophe cover a compulsory extension of all property insurance contracts, funded by a single surcharge on premiums that every policyholder pays regardless of individual risk, with unlimited reinsurance available from the State-guaranteed public reinsurer CCR [65]. Rising disaster costs led the surcharge on property contracts to be raised from 12% to 20% from January 2025 [65]. In the United States, the National Flood Insurance Program moved in 2021 towards more fully risk-based pricing, with evidence of larger falls in uptake in lower-income areas [35]. Table III compares these approaches with Ireland's.

TABLE III
COMPARISON OF FLOOD INSURANCE ARRANGEMENTS

	Main approach	Data transparency	Equity effect
Ireland	Private, risk-based; voluntary MoU [27], [30]	Low: private models; OPW maps not used [5]	About 1 in 20 buildings with limited cover [8]
UK (Flood Re)	Levy-funded reinsurance pool, ends 2039 [62]	Moving to Flood Performance Certificates [62]	353,000 high-risk policies supported [62]
France (CatNat)	Compulsory cover; flat surcharge; State-backed reinsurer [65]	Not needed for access: solidarity pricing	Broad access; weaker price signal
US (NFIP)	Public programme, risk-based pricing since 2021 [35]	Public flood maps and rating method	Larger drop-outs in low-income areas [35]

The comparison shows that Ireland is unusual in having neither a solidarity-based public scheme nor binding transparency about private pricing. France prioritises solidarity, accepting weaker price signals. The US prioritises risk signals, at a measurable social cost. The UK combines a temporary pool with an explicit plan to move towards resilience. Each model makes its trade-offs visible and subject to public decision; in Ireland, the equivalent trade-offs are made inside private models.

I. Assessment

Our analysis shows that the governance of flood underwriting data in Ireland is **voluntary and fragmented**. Public data is governed by binding EU law, but the decisions that affect households are governed only by commercial discretion, prudential rules that ignore fairness, soft-law guidance on AI and a voluntary MoU. No rule requires insurers to use the public maps, to disclose how their models work, to explain a refusal or to share the results of their decisions. Each new initiative, from the working group to the proposed levy and the EU alliance, focuses on money. We argue that funding the gap without governing the data risks repeating the 2017 data controversy at greater public expense.

IV. DATA PRIVACY AND PROTECTION

A. Where Environmental Data Meets Personal Data

Flood hazard maps, river-level records and rainfall data are environmental data and are not, on their own, personal data. The data protection question arises when this environmental data is linked to an address or property. Under the GDPR, personal data is any information relating to an identified or identifiable natural person [47]. A risk score attached to a specific home that is owned or occupied by a known person, or held in an insurance application, relates to that person and can affect them. We take the view that such a score counts as personal data. Geocoding is therefore the stage at which flood data falls within data protection law, and each later stage, from modelling to decision and sharing, involves processing personal data.

B. Controllers, Processors and Data Flows

Several organisations handle homeowner's data in a single underwriting decision. The insurer is the controller, because it decides the purpose and means of processing. Brokers collect application data and may act as separate controllers. Address and property data providers supply exposure data [28], and

catastrophe model vendors may process data on the insurer's behalf as processors. Each transfer raises questions about purpose limitation and transparency: data collected by a broker to arrange cover, or by an address database to support postal delivery, is reused to assess flood risk. Under the GDPR, such reuse must be compatible with the original purpose or have its own lawful basis, and the individual must be told about it [47]. In practice, households are rarely aware of how many organisations contribute to the decision about their home, which makes it harder to exercise their rights.

C. GDPR Principles and Lawful Basis

Article 5 of the GDPR sets out the core principles: processing must be lawful, fair and transparent, tied to stated purposes, limited to what is necessary, accurate and up to date, and not kept longer than needed. The controller must also be able to show compliance [47]. Several of these principles are directly engaged by flood underwriting. The *accuracy* principle is engaged when geocoding places a property on the wrong side of a river or embankment, or when a model ignores a completed flood relief scheme. The *fairness* principle is engaged when a household is excluded on the basis of an area-level score that does not reflect its own property. *Data minimisation* is engaged when insurers enrich risk models with commercial data that is not necessary to assess flood risk.

Insurers will usually rely on contract necessity (Article 6(1)(b)) or legitimate interests (Article 6(1)(f)) as their lawful basis [47]. The legitimate-interests basis requires a balancing test between the insurer's interest and the rights of the individual. Where a model can determine whether an entire street can be insured, that balance should be documented and should take account of the significant effects on the household.

D. Transparency and the Right of Access

Articles 13 to 15 give individuals the right to be told what data is processed and why, and to access it. Where Article 22 automated decision-making is involved, this includes "meaningful information about the logic involved" and its envisaged consequences [47]. In principle, a homeowner refused flood cover can ask the insurer for the risk score and data used in their case. In practice, the right is little used, the information returned may be minimal, and householders rarely know that a model was involved at all. Clearer, proactive transparency at the point of refusal would make these rights meaningful.

Two further rights are particularly relevant. Under Article 16, individuals can have inaccurate data corrected [47]. If a property is geocoded to the wrong location, or if an insurer's records do not reflect a completed flood relief scheme or resilience works, the homeowner should be able to require correction. This is perhaps the most practical GDPR tool against the kind of error described by brokers in 2013 [13]. Article 21 lets individuals object to processing based on legitimate interests, and the controller must then show compelling grounds to continue [47]. Neither right can force an insurer to offer cover, but both can force a review of the data on which a decision was based.

E. Automated Decisions: Article 22 and the SCHUFA Ruling

Under Article 22, people have the right not to be subject to a decision made only by automated means where it has legal or similarly significant effects. There are exceptions, including where the decision is needed for a contract. Even then, the controller must still offer safeguards: human intervention, the chance to give one's view, and the right to challenge the decision [47].

The Court of Justice of the EU's 2023 ruling in SCHUFA (C-634/21) is highly relevant. The CJEU ruled that producing a credit score can itself be an automated decision under Article 22 when a third party relies heavily on that score to decide whether to enter into a contract [49]. By analogy, where a flood model's output effectively determines whether a household is offered flood cover, with little real human assessment, the score may itself fall within Article 22. Being refused home insurance, or offered cover with flood excluded, is arguably a "similarly significant" effect, given its potential consequences for property value and finances [11]. The analogy has not yet been tested in an Irish or EU insurance case, but it suggests that insurers should provide human review and a route to contest model-driven flood refusals.

F. Data Protection Impact Assessments

Article 35 requires a data protection impact assessment (DPIA) where processing is likely to pose a high risk to individuals, for example through large-scale automated evaluation of personal characteristics [47]. Large-scale, address-level flood scoring that determines access to insurance appears to meet this threshold. A DPIA would require insurers to document why the data is needed and proportionate, the risks of inaccuracy and unfair exclusion, and the safeguards in place. DPIAs are not routinely published, but a summary could be shared with supervisors and, in our proposal, with the working group or a future governance body.

G. Privacy by Design for Shared Flood Data

Greater data sharing, which we recommend in Section VI, creates its own privacy risks. Claims records reveal when a household suffered a loss and how much it received; refusal records reveal which homes an insurer considers uninsurable. If such data were published at property level, it could stigmatise homes and their owners and might be linked to other datasets to identify individuals. Sharing should therefore follow privacy-by-design principles. Claims and refusal data should be aggregated to an appropriate spatial unit before publication, small counts should be suppressed, and access to finer-grained data should be limited to accredited public bodies or researchers under data-sharing agreements. Research on discrimination-free pricing with privatised sensitive attributes shows that fairness testing can be carried out without exposing raw sensitive data [43], and similar techniques could allow an auditor to test for proxy effects without the insurer handing over identifiable customer records.

Property-level flood-risk certificates raise a related tension. A certificate makes risk visible to buyers and lenders, which supports informed decisions, but it also attaches a public label to a specific home. The analogy with Building Energy Ratings is helpful: a BER is property information rather than information about the owner's behaviour, and is accepted because everyone faces the same standard. Flood certificates would need a similar common methodology, a right for owners to correct errors and to have resilience works recognised, and clear rules on who may access them.

H. The Central Tension: Transparency Versus Trade Secrets

The main obstacle to transparency is commercial. Insurers regard their flood models and the data behind them as proprietary, and argue that competition on risk assessment drives better pricing [15], [16]. Full disclosure could also allow adverse selection, in which policyholders with private

knowledge of higher risk choose cover more selectively. These are legitimate concerns, but they do not justify complete opacity. The GDPR already requires meaningful information about the logic of automated decisions without demanding disclosure of source code [47]. A layered approach is possible: individuals receive the main factors behind their decision and a route to appeal; a regulator or independent auditor sees the model; and aggregated outcomes are published for public scrutiny. Section VI develops this approach.

V. Ethical, Legal and Social Implications

Data-driven insurability can be evaluated through several ethical lenses. A *consequentialist* view asks whether the overall outcome improves welfare: accurate pricing may reduce cross-subsidies and encourage adaptation, but exclusion can concentrate severe losses on a few households. A *rights-based* view asks whether individuals are treated with respect, including the right to be informed, to be heard and to contest decisions about them. A *justice* view, in the tradition of Rawls, asks whether the arrangement is acceptable to the least advantaged; a system that leaves the poorest flood-exposed households without protection performs badly on this test. We use these lenses below to examine five issues.

A. Actuarial Fairness Versus Solidarity

Insurance has always involved a choice between two ideas of fairness [40]. Under *actuarial fairness*, each policyholder pays a premium that reflects their own expected loss; better data makes prices more accurate, and low-risk households no longer subsidise high-risk ones. Under *solidarity*, risk is pooled across a community, so that those who are unlucky enough to live in a high-risk place are not priced out of protection. Data-driven flood underwriting moves the market strongly towards the first idea. As models become more granular, the pool becomes smaller, and the households with the highest risk face the highest premiums or no offer at all.

Neither principle is wrong on its own. Accurate prices send a signal about where it is unwise to build and reward investment in resilience. But flood risk is largely the result of location, history and public decisions on planning and defences, not of individual behaviour. A household that bought a home before the risk was known, or whose risk has risen because of climate change, has little control over the factor that now decides its insurability. This is why we see the issue as a genuine dilemma: the same data that improves pricing can also remove the pooling that makes insurance a social good.

B. Proxy Discrimination and Location Data

Location variables can carry information about more than flood risk. Lindholm *et al.* show that postal codes and similar variables can act as proxies for protected characteristics, so that a model can discriminate indirectly even if it never sees those characteristics [41], [42]. In flood underwriting, older, cheaper housing in low-lying areas may be home to lower-income households, older people or particular communities. A model that refuses cover in such areas may produce a pattern that correlates with income or other characteristics, even if the intention is purely to price flood risk. Methods exist to measure and remove proxy effects [42], [43], but they are only used if someone checks. At present no Irish rule requires insurers to test flood models for proxy discrimination or to report the results.

C. Legal Limits on Risk Differentiation

Irish equality law offers limited protection in this area. The Equal Status Acts ban discrimination in services on listed grounds, such as age, disability, race and Traveller community membership. However, section 5(2)(d) allows different treatment in insurance and similar risk assessment where it rests on reliable actuarial or statistical data, or other relevant underwriting or commercial factors, and is reasonable [66], [67]. Location is not itself a protected ground, so area-based flood underwriting is generally lawful, and indirect discrimination through proxies would be difficult for an individual to prove without access to the model.

EU law shows that actuarial justification has limits. In *Test-Achats* (C-236/09), the CJEU held that using sex as a pricing factor in insurance breached equal treatment, even though the actuarial evidence supported it [68]. The ruling did not concern location, but it establishes that accurate statistics do not automatically justify differential treatment when fundamental rights are engaged. Combined with the GDPR rights in Section IV and the Consumer Protection Code's best-interests principle [55], it provides a legal foundation for requiring insurers to show that location-based decisions are accurate, proportionate and free of unjustified proxy effects.

D. Who Loses Out

The burden of exclusion is not evenly spread. US evidence shows that risk-based pricing reduces flood insurance uptake most in lower-income areas [35], and that higher premiums are associated with more mortgage arrears [12]. In Ireland, homes in mapped flood zones sold at a discount of about 4% after the national flood maps were published, and uninsured owners must draw on savings or borrowing after a flood [11]. We found no source showing that Irish lenders refuse mortgages on homes without flood cover, so we treat the mortgage channel as a possible rather than proven effect; but the Central Bank's figures show that thousands of mortgaged homes are in high-likelihood flood zones [11], [69]. The households most likely to lose cover are often those least able to fund repairs or to move, and inequality in recovery outcomes can widen after each event [39]. The protection gap is also geographically concentrated, so whole towns and neighbourhoods can be affected together [8].

E. Accountability When Models Are Wrong

When a model is wrong, who is responsible? The complaints of 2013, that whole townlands were refused cover despite no flooding history [13], [14], and the experience of residents in Ringsend and Irishtown [7], illustrate the problem. If geocoding misplaces a property or a model fails to recognise a flood relief scheme, the household bears the cost, but there is no clear route to identify the error, correct it or obtain redress. The insurer can point to the model, the model vendor to the data, and the State to the commercial nature of the decision. This diffusion of responsibility is a classic accountability gap in data-driven decision-making. The GDPR rights discussed in Section IV offer a partial route, but they depend on the individual knowing that a model was involved and having the resources to pursue a complaint.

There are also social costs that are harder to measure. When a household is refused cover without explanation, trust in insurers and in public flood defences is damaged, particularly where the State has invested in a flood relief scheme that insurers do not appear to recognise [7], [27]. Communities may feel that decisions about their future are made elsewhere, by models they cannot see. Proposals for a levy on all insured

households [19] add a further dimension: if every policyholder is asked to contribute, the public can reasonably expect to understand how the money is used and how risk is assessed.

F. Sustainability: Signal or Stranding?

From a sustainability perspective, insurance withdrawal is double-edged. On one hand, a refusal or high premium sends a market signal about climate risk that can discourage building in flood-prone areas and encourage adaptation [37], [38]. On the other hand, households already living in those areas cannot easily respond to the signal. If cover disappears, property values fall, communities can be left stranded, and the costs are shifted to the State through humanitarian payments and to households through uninsured losses [24], [36]. The aim of good governance should therefore be to keep the signal while preventing stranding: to make risk visible, reward resilience investment and support those who cannot adapt alone.

VI. Proposed Solutions

Building on the analysis above, we propose six measures. They are designed to work together and to be compatible with competitive private insurance. Each targets a specific gap identified in Sections III–V.

P1. A public flood-risk data platform. Following the LSE/UCC recommendation [15], [16], the State should host a shared platform combining OPW hazard maps, flood relief scheme data, property-level resilience measures and anonymised, aggregated claims data contributed by insurers. Insurers would remain free to build their own models on top of it, but all parties would start from a common, documented evidence base. This addresses the collection and sharing stages of the lifecycle and would help resolve the long-standing data controversy. The platform can be built on existing legal and technical foundations, namely floodinfo.ie, the INSPIRE spatial data standards and the high-value datasets rules [25], [50], [52], and should follow the privacy-by-design safeguards described in Section IV, with claims data aggregated before publication.

P2. A right to an explanation and an appeal. When flood cover is refused or excluded, the insurer should tell the household that a flood model was used, give the main reasons in plain language and offer a route to submit evidence, such as a property survey, a completed scheme or resilience works, and obtain human review. This puts into practice the GDPR rights in Articles 13–15 and 22 and the logic of the *SCHUFA* ruling [47], [49]. A short statutory code or a Central Bank conduct requirement, building on the Consumer Protection Code's requirement to inform customers effectively [55], would make it consistent across the market. Where a household submits new evidence, the insurer should respond within a fixed period and record the outcome, so that the volume and results of appeals can be reported in aggregate.

P3. Fairness audits of underwriting models. Insurers should periodically test their flood models for proxy effects related to income and other characteristics, using established methods [41], [42], and report the results to the Central Bank or an independent auditor. This would give practical effect to EIOPA's fairness expectations [32] in an area the AI Act does not cover. Audits could use privacy-preserving techniques so that sensitive attributes are not exposed [43], and the Central Bank could publish an anonymised market-wide summary each year.

P4. Flood-risk certificates. A standard flood-risk certificate should be provided when homes are sold, as supported by almost 80% of respondents in a recent survey [59], drawing on the public platform. Like Building Energy Ratings, certificates would give buyers, lenders and insurers the same information, and they could recognise resilience measures in the way Flood Re's Flood Performance Certificates are intended to do [62].

P5. Two-way data sharing between the OPW and insurers. The existing MoU [30] should be extended, ideally on a statutory footing, so that insurers report back, in aggregated form, where they refuse or restrict cover and why. This would let the State see where the protection gap lies, check whether flood defences are being recognised and target investment and would make the open data [31] more useful. After major flood events, the Data Act's exceptional-need mechanism provides an additional legal route for public bodies to obtain claims data [53], [54].

P6. Transparency conditions on any state-backed fund. If the Government adopts a levy-funded scheme such as that proposed by Insurance Ireland [19], [20], or a Flood Re-style pool [63], [64], participation should be conditional on insurers meeting P2, P3 and P5. Public money and compulsory levies should buy not only access to cover but also transparency about how risk is assessed. The scheme should also include affordability safeguards for low-income households and a clear transition plan, learning from Flood Re's 2039 end date [62].

These measures are deliberately incremental. They do not require insurers to disclose source code or to abandon risk-based pricing; they require that the data be shared, the decisions be explainable and contestable, and the outcomes be checked. The Flood Insurance Protection Gap Working Group and the forthcoming EU resilience framework provide immediate opportunities to adopt them [17], [23].

A. Implementation and Evaluation

Table IV sets out who would lead each proposal, the legal or policy instrument required, an indicative timeline and how progress could be measured. The short-term measures (P2 and P5) can be introduced through existing instruments, namely Central Bank conduct rules and an amended MoU. The medium-term measures (P1, P3 and P6) require legislation or the design of a new scheme and could be recommended by the working group. Flood-risk certificates (P4) depend on the public platform and would follow.

TABLE IV
Implementation Roadmap for the Proposals

Proposal	**Lead**	Instrument and timing	Indicator of progress
P2 Explanation and appeal	Central Bank; DPC	Conduct rule; short term (1 year)	Share of refusals with reasons given; appeal outcomes
P5 Two-way sharing	OPW; Insurance Ireland	Revised MoU, then statute; short term	Aggregated refusal data received by OPW each year
P1 Public data platform	OPW; Dept. of Finance	Legislation and funding; medium term (2–3 years)	Datasets published; insurer contributions
P3 Fairness audits	Central Bank	Supervisory requirement; medium term	Annual market-wide audit summary
P6 Conditional fund	Dept. of Finance; working group	Scheme design; medium term	Transparency conditions in scheme rules
P4 Flood-risk certificates	Dept. of Housing; OPW	Legislation after P1; longer term	Share of sales with a certificate

The proposals also carry risks. A public platform requires sustained funding and technical capacity, and insurers may be reluctant to contribute claims data without assurances on confidentiality. Explanation and appeal rights could increase administrative costs, which may be passed on to policyholders.

Fairness audits depend on access to data on protected characteristics, which insurers often do not hold. Certificates could reduce the value of high-risk homes further if they are introduced without support for resilience works. These risks argue for phased introduction, starting with the lowest-cost measures, and for linking certificates and the fund to grants for property-level resilience, as Flood Re's Build Back Better approach suggests [62].

B. How We Address the SDGs

The problem examined in this paper sits at the intersection of climate adaptation, disaster risk reduction, poverty, inequality and institutional accountability. Table V links each relevant SDG target to the Irish problem and to our proposals [70] .The project also connects to the Sendai Framework for Disaster Risk Reduction, whose aim of cutting disaster losses lines up with SDGs 1, 11 and 13 [71]. Progress can be monitored with existing indicators: SDG indicators 1.5.2 and 11.5.2 capture the direct economic cost of disasters, and Ireland could add the share of buildings lacking adequate flood cover that the Central Bank already estimates [8], [70].

TABLE V
MAPPING OF SDG TARGETS TO THE PROBLEM AND OUR PROPOSALS

SDG target	Problem in Ireland	Our response
13.1 Climate resilience and adaptation	Around 5% of buildings cannot get adequate flood cover; households cannot see the scores used to judge them [8], [11]	P1 public data platform; P4 flood-risk certificates recognising resilience measures
11.5 Fewer disaster losses and people affected	Almost €2bn insured losses since 2000; State pays for uninsured losses; gap concentrated geographically [8], [24]	P6 conditional public–private fund; track progress with indicator 11.5.2
1.5 Resilience of the poor and vulnerable	Risk-based pricing pushes low-income households out of cover; arrears and price discounts [11], [12], [35]	P2 explanation and appeal; P6 affordability safeguards
10.3 Equal opportunity, no discriminatory practices	Location variables can stand in for income or protected traits [41], [42]	P3 fairness audits reported to the regulator
16.6 / 16.7 / 16.10 Accountable, transparent institutions; access to information	Private models; voluntary MoU; no pricing remit; working group remit silent on data [6], [17], [45]	P2, P5 two-way data sharing; governance body including homeowners and brokers
17.18 Availability of high-quality, reliable data	Flood-risk data split between OPW and insurers with little sharing [15]	P1 and P5, following LSE/UCC recommendations [16]

Ireland's experience is part of a wider pattern. In the European Union, only approximately 25% of climate-related losses are insured. [22], [60], the UK is planning the end of Flood Re [62], and US evidence shows how risk-based pricing can exclude lower-income households [12], [35]. Data governance of the kind we propose is therefore relevant well beyond Ireland and could inform the EU Climate Insurance Alliance [21].

VII. CONCLUSIONS AND FUTURE WORK

This paper has shown that, in Ireland, the question of who can get flood insurance is answered by private data and models that are governed far less than the public flood data they sit alongside. Our lifecycle analysis found binding governance at the point of public data collection, but only commercial discretion, soft law and voluntary agreements where decisions about individual homes are made. We identified the GDPR, including Article 22 as interpreted in *SCHUFA*, as the most promising existing route to individual transparency, but noted that it is rarely used in this context. We also showed that the move to granular, risk-based underwriting raises genuine ethical tensions between accuracy and solidarity, risks proxy discrimination, and places the heaviest burden on those least able to adapt.

Our six proposals aim to keep the benefits of accurate risk data while making the system transparent, contestable and fair. The main limitation of this study is that insurers' models and decision data are not public, so our analysis relies on public sources, parliamentary records and published research, and cannot measure the accuracy or fairness of any specific model. Future work could involve testing these proposals with insurers, brokers, and affected communities, as well as analysing the OPW's open flood relief scheme data [31] alongside reported refusals of cover. Researchers could also evaluate the report of the Flood Insurance Protection Gap Working Group once it becomes available; and assess how the EU climate resilience framework and Climate Insurance Alliance shape national schemes [21], [23].

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