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Accounting for Prevention: Underwriting, Annual Contracts, and the Financing of Long-Term Risk Reduction

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ABSTRACT

Insurance underwriting already recognizes many forms of prevention. When a mitigation measure is observable, durable, actuarially credible, and privately financed, it can enter expected-loss estimates and support a lower premium. The harder cases arise before the safer risk exists. Some investments require substantial upfront funding, produce benefits beyond the annual policy period, and reduce losses for future insurers, neighboring properties, public programs, or entire communities. In such cases, accurate underwriting may recognize the improvement once it has been made without giving any private actor enough incentive to finance it. This article develops a simple framework that separates social, insurer, and policyholder value, then applies it to wildfire mitigation in California, wind mitigation and public grants in Florida, and federal hazard-mitigation programs. The comparison shows that rate regulation, certification, and public finance perform distinct functions. The resulting agenda is deliberately limited: preserve adequate rates, require actuarial support for mitigation credits, make credible certifications portable where useful, finance liquidity constraints and public benefits outside the insurance rate, and collect targeted data for publicly supported or mandated programs. The aim is not to capitalize on avoided losses, weaken solvency standards, or turn insurers into general-purpose risk managers. It is to assign each prevention problem to the institution best equipped to address it.

EXECUTIVE SUMMARY

IMPORTANCE

Insurance underwriting can recognize prevention once a mitigation measure has been implemented, verified, and shown to have a credible effect on expected losses. The harder problem comes earlier. Some investments require substantial upfront funding, produce benefits over several years, or protect future insurers, neighboring properties, public programs, and communities, as well as the current policyholder. In these cases, accurate risk-based pricing may recognize a safer risk after the fact without creating enough incentive or financing to produce that safer risk in the first place.

OBJECTIVES

This article develops a diagnostic framework for five distinct barriers to preventive investment: actuarial recognition, verification, upfront financing, the investor's ability to retain future benefits, and benefits that fall outside the insurance contract. Its central rule is simple: identify the binding barrier and assign it to the policy instrument and institution best equipped to address it.

EVIDENCE

The analysis combines a simple economic model with U.S. examples from California wildfire regulation, Florida wind-mitigation requirements, the My Safe Florida Home program, and federal hazard-mitigation programs. These cases illustrate different institutional roles: insurance rates can recognize verified reductions in insured losses; certification can reduce verification costs; grants and other financing can address upfront costs; and public programs can support benefits that extend beyond an individual insurance contract.

FINDINGS

When mitigation is observable, durable, privately financed, and supported by credible evidence, ordinary underwriting and actuarially supported premium credits can generally recognize the resulting reduction in insured losses. Other barriers require different tools. Certification and recertification can make reliable information easier to use across insurers. Grants, low-cost loans, and property-linked financing can address liquidity constraints. Community and public programs are more appropriate when benefits extend to infrastructure, neighboring properties, or public services.

The economic framework explains why socially valuable prevention may still fail to generate a privately financeable transaction. Annual contracts, policyholder mobility, the sharing of loss savings through premiums, borrowing costs, and external benefits can create a gap between social value and the value captured by an insurer or policyholder. The paper also distinguishes actuarial recognition from financial-statement recognition and regulatory learning: mitigation may affect expected losses without becoming an accounting asset, while targeted reporting can help evaluate publicly supported or mandatory programs. The same logic extends, with different institutions and evidence, to health, cyber, and industrial risks.

EXECUTIVE SUMMARY CONT.

CONCLUSIONS AND RELEVANCE

Prevention policy should respond to the specific friction rather than expand the role of insurers by default. Regulators should preserve adequate rates, require actuarial support for mitigation credits, recognize credible certifications where they improve verification and portability, and keep public financing transparent when the problem is affordability, liquidity, or broader social benefit. This distinction also matters for equity: households unable to finance mitigation should not be left facing both higher physical risk and higher premiums simply because they lack upfront capital.

The broader lesson is institutional. A rate credit should not be asked to finance a retrofit, a grant should not substitute for an adequate rate, and an annual insurance contract should not be expected to finance a public good. Avoided claims should not be capitalized as assets. The objective is to separate recognition, verification, financing, and collective risk reduction, and assign each function to the institution best able to perform it.

1. INTRODUCTION: THE PROBLEM BEGINS WHERE UNDERWRITING ENDS

Insurance does more than pay claims. Through underwriting, pricing, inspections, deductibles, policy conditions, and loss-control services, it can also encourage reductions in the frequency and severity of future losses. That role matters increasingly in markets exposed to wildfire, flood, hurricane, cyber, health, and industrial risks. As losses rise, the sustainability of insurance depends not only on capital and reinsurance, but also on whether the underlying risk can be reduced.

The analysis should begin by recognizing what insurance already does. Prevention is not generally invisible to insurers, actuaries, or regulators. If a FORTIFIED roof, an elevation certificate, a sprinkler system, or a cybersecurity control credibly reduces expected loss, an underwriter can recognize the feature, and a rate filing can reflect it. The effect may appear in rating variables, catastrophe-model output, engineering judgment, or loss-cost relativities. In this benchmark case, prevention is already part of ordinary actuarial analysis.

Rate adequacy is, therefore, a prerequisite for meaningful prevention-oriented pricing. A mitigation discount must represent the difference between otherwise adequate rates for risks with and without the relevant feature. If the base rate is inadequate, or if a discount is unsupported by expected loss, the price signal weakens, and costs may shift to other policyholders or residual markets.

Recognition, however, comes after the investment. A premium discount can reward a homeowner who has replaced a roof, elevated a structure, or hardened a property against wildfire, but it does not necessarily provide the cash required to do so. Nor does it ensure that an insurer advancing the funds can recover its cost if the

policyholder changes carriers at renewal. An individual premium credit also reflects only the insured risk; it does not automatically incorporate benefits to neighbors, emergency services, future owners, other insurers, or public disaster programs.

These differences are often obscured by the broad label of prevention. Five distinct questions are involved. Can the underwriter observe and value the measure? Can the relevant feature be verified and carried across contracts at a reasonable cost? Can the policyholder finance the upfront cost? Can the actor paying for the measure retain sufficient future benefit to justify the investment? And how much of the benefit falls outside the insurance contract? Ordinary underwriting can answer much of the first question, but not necessarily the other four.

The article concentrates on these remaining frictions. Regulation is not always the binding constraint, and many preventive goods fall under building regulation, public infrastructure, land-use policy, public health, private finance, or private investment rather than insurance regulation. The contribution is a decision rule for institutional design: identify the missing link—recognition, verification, upfront finance, intertemporal appropriation, or collective benefit—and assign it to the policy instrument and institution able to address it. Here, “policy instrument” means the concrete mechanism used to address the friction, for example, an actuarially supported rate credit, a certification standard, a grant or financing arrangement, a targeted data call, a residual-market condition, or a public mitigation program. The framework also identifies recurring category errors: asking for a rate credit to finance a retrofit, a grant to correct an inadequate rate, or an annual insurance contract to provide a public good.

The argument proceeds in five stages. Section 2 describes the benchmark case in which adequate rates and ordinary underwriting are sufficient. Section 3 separates the social, insurer, and policyholder value of prevention. Section 4 examines U.S. programs in which pricing, verification, and financing are already divided across institutions. Section 5 distinguishes actuarial recognition, financial-statement recognition, and targeted regulatory reporting. Sections 6 and 7 then set out a matched toolkit and the safeguards needed to keep actuarial credits separate from public subsidies.

The claim is modest but consequential. When a preventive measure is private, observable, durable, affordable, and actuarially credible, adequate rates and evidence-based credits should be allowed to work. When one of those conditions fails, the response should address the specific failure rather than expand the insurer’s role by default. Upfront capital calls for finance; external benefits call for transparent collective funding; durable features may benefit from shared certification; and publicly supported programs may require data on take-up, persistence, affordability, and losses. The central question is not whether prevention is desirable, but whether its costs and benefits are assigned to institutions capable of carrying them over time.

2. WHEN ORDINARY UNDERWRITING IS ENOUGH

The distinction between insurance and prevention remains useful, but it should not obscure the role of underwriting. Insurance reallocates the financial consequences of loss. Self-protection reduces the probability of loss, while self-insurance reduces its severity (Ehrlich & Becker, 1972). Both can be private or collective: a household retrofit mainly protects one property, whereas a fire service, drainage system, or community fuel break reduces losses for many actors at once (Schmidt et al., 2007). Insurers often combine these functions by pricing risk, imposing conditions, inspecting properties, recommending controls, and providing loss-control services. The relevant question is, therefore, not whether prevention belongs inside or outside insurance, but when its value can be represented through the ordinary insurance contract.

Ordinary underwriting is most effective when five conditions hold. The measure primarily reduces the insured's expected loss rather than producing broad community benefits. It can be observed or certified at a reasonable cost. Its effect on frequency, severity, or tail risk is supported by actuarial, engineering, clinical, or technical evidence. The effect is durable over the rating period, subject to maintenance or recertification where necessary. Finally, the insured can finance the investment without relying on the insurer to advance the cost.

Under these conditions, the insurer can compare otherwise similar risks with and without the measure and reflect a credible loss-cost difference in the rating plan. Regulation then has a familiar role: to ensure that the rate is adequate, not excessive, or unfairly discriminatory, and that the mitigation variable is supported by evidence. No new accounting asset, public subsidy, or long-term contract is needed.

The benchmark also separates an actuarial credit from a subsidy. A mitigation credit reflects a lower expected insured loss and must be supported within an adequate rating plan. U.S. property and casualty (P/C) rating law commonly requires rates not to be excessive, inadequate, or unfairly discriminatory (NAIC, 2010). A reduction beyond the supported private loss effect is not an actuarial mitigation credit. Any additional support justified by wider public benefits requires its own legal and financial basis rather than being hidden in the insurance rate.

The benchmark weakens when the feature cannot be observed reliably. A roof may conceal important construction details; defensible space may deteriorate; cyber controls may exist on paper but fail in practice; and safety culture resists reduction to a single rating factor. Inspection standards, third-party certification, recertification, and model governance can lower these information costs. The actuarial principle remains the same: the price effect must correspond to a credible change in expected insured loss.

A second limit appears when the investment has not yet been made. Premium discounts generally reward completed mitigation. They may improve their return, but they do not eliminate the upfront cost. A household can face a positive long-run net present value and still be unable to borrow; a small business may prefer liquidity today to uncertain premium savings over several renewals; and a competitor may offer a lower current premium by declining to finance the intervention. These are financing and capital-cost problems, not failures to observe risk.

Annual contracts create a third limit. Suppose an insurer pays for a durable intervention. Once the property is safer, a competing carrier can price the improved risk without having contributed to the cost. The first insurer may, therefore, prefer to select or reprice the risk rather than transform it. Boyer and Gobert (2001) formalize a related hold-up problem when long-term commitment is unavailable. The difficulty is not that future underwriters overlook prevention, but that they can recognize it and compete for the improved risk.

Underwriting also operates at the level of the insured contract, whereas some prevention works at a broader scale. Wildfire hardening can reduce the risk of ignition and transmission to neighboring homes. Flood protection depends partly on drainage, wetlands, levees, and land use. Cybersecurity investments may reduce contagion through vendors and supply chains. Kunreuther et al. (2023) show that wildfire mitigation can generate interdependent benefits and threshold effects that cannot be assessed on a property-by-property basis. Samuelson's (1954) account of public goods and Olson's (1965) analysis of collective action describe the general problem: private actors compare private costs with private benefits, leaving socially valuable spillovers outside the decision.

The question, then, is not whether regulators should simply give greater weight to prevention in pricing or regulation. It is which wedge separates social value from the incentives facing the insurer and the policyholder. That wedge determines the appropriate policy instrument.

3. A SIMPLE ECONOMICS OF PREVENTION UNDER ANNUAL CONTRACTS

A simple model makes these wedges explicit. Consider a preventive investment made at time 0 at cost C . Let ΔL_t denote the reduction in expected insured losses in year t . Let H_t denote benefits retained directly by the policyholder but not fully captured by the insured claim, such as lower deductibles, less disruption, or avoided uninsured damage. Let E_t denote benefits to other parties, including neighbors, future owners, other insurers, emergency services, and public programs. Let r_s denote the social discount rate. The social value of the investment is:

$$V_s = -C + \sum_{t=1}^T (\Delta L_t + H_t + E_t)/(1 + r_s)^t.$$

The investment is socially worthwhile when V_s is positive. The expression does not imply that insurance should finance every estimated benefit; it simply identifies the full set of consequences relevant to social value.

Suppose instead that the insurer advances the full cost. Let q_t be the probability that the policy remains with that insurer through year t , and let a_t be the share of the expected-loss reduction passed to the policyholder through a lower premium or improved terms. With a constant annual retention probability p , $q_t = p^t$. Let r_i denote the insurer's discount rate. The insurer retains only the remaining share while the policy stays in its portfolio, giving the approximate private value:

$$V_i = -C + \sum_{t=1}^T q_t(1 - a_t)\Delta L_t / (1 + r_i)^t.$$

The equation shows why accurate underwriting need not create an incentive to finance mitigation. When competition and rate regulation pass most of the expected-loss reduction to the policyholder, a_t is high. When annual renewal and switching make q_t fall quickly, the insurer captures even less. The safer risk may be priced correctly, while the insurer that funded the improvement remains unable to recover its cost.

If the policyholder finances the investment, the calculation changes. The policyholder receives the premium saving $a_t\Delta L_t$ and the direct benefit H_t , but may face a higher borrowing rate, limited access to credit, or a binding liquidity constraint. Let r_h denote the policyholder's effective discount rate. Its private value is:

$$V_h = -C + \sum_{t=1}^T (a_t\Delta L_t + H_t) / (1 + r_h)^t.$$

Let M denote the policyholder's liquid resources and borrowing capacity at time 0. The investment is feasible only if:

$$M \geq C.$$

When $M < C$, the investment cannot proceed even if V_h is positive. This is a financing constraint rather than a pricing error, and it calls for liquidity or credit, not a larger actuarial discount.

Thus, V_s may be positive while V_i and V_h are negative, or while the separate feasibility condition $M \geq C$ fails. The insurer may lose the policy or pass most of the savings through in the rate. The household may heavily discount future benefits, lack collateral, or be unable to borrow. Neither captures E_t . Social value can therefore exceed cost without producing a transaction that is privately financeable.

A numerical example illustrates the mechanism rather than calibrating a particular market. Suppose $C = \$10,000$, $\Delta L_t = \$1,800$ for each of 10 years, $r_s = r_i = 3\%$, $r_h = 12\%$, $a_t = 0.70$, and the annual retention probability is $p = 0.80$, so $q_t = 0.80^t$. The discount rates are illustrative. Setting $r_s = r_i$ deliberately abstracts from differences between social and insurer discounting so that the example isolates the effects of retention and premium pass-through. The higher household rate, $r_h = 12\%$, represents a substantially higher effective hurdle rate that may arise from borrowing costs, liquidity constraints, or strong discounting of uncertain future premium savings. The qualitative result does not depend on these exact values. Set $H_t = E_t = 0$ to isolate the contractual problem. The present value of the insured-loss reduction is about \$15,354, yielding V_s of approximately \$5,354. The insurer retains expected savings worth only about \$1,728, so V_i is approximately -\$8,272. The household receives premium savings worth about \$7,119, giving V_h of approximately -\$2,881. If $M < \$10,000$, the investment is infeasible even if additional household benefits would eventually make V_h positive.

The conclusion is not driven by the assumed 70% pass-through. With the same retention pattern, even $a_t = 0$ leaves the insurer with a present value of only about \$5,761, still below the \$10,000 cost. With $H_t = 0$, the household would need roughly 98% of the loss reduction passed through to break even at a 12% discount rate. The assumed annual premium saving of \$1,260 is also of the same order as the approximately \$1,000 average saving reported by My Safe Florida Home participants, although that reported figure is not a causal estimate of the program's loss-reduction effect (Florida Department of Financial Services, 2024b). The numbers remain illustrative, but they show that correct pricing and positive social value can coexist with the absence of a privately financeable transaction.

The model yields four distinct cases. When ΔL_t is credible, and the policyholder can finance C , an actuarial credit within an adequate rate is the natural instrument. When the investment is privately valuable, but C cannot be financed, the barrier is liquidity or the cost of capital. When q_t is low because the benefit outlives the carrier relationship, portability or property-linked finance may help. When E_t is large, the individual rate is the wrong instrument because much of the benefit lies outside the insured risk.

Government support is, therefore, justified by a specific friction, not by the abstract desirability of prevention. The strongest cases involve a documented external benefit, a severe financing constraint, or a public responsibility such as infrastructure or land-use management. The private expected-loss reduction should remain in the insurance price; the public component should be funded and evaluated as public policy.

4. EXISTING PROGRAMS: RECOGNITION, VERIFICATION, AND FINANCE

Existing U.S. programs already implement much of this division of labor. California focuses primarily on recognizing ΔL_t in rates. Florida combines recognition and verification with assistance toward the upfront cost C . Federal mitigation programs finance projects whose benefits largely appear in E_t because they accrue across properties, communities, and public systems. The examples do not show that prevention has been ignored. They show different institutions addressing different parts of the same problem.

California's Safer from Wildfires framework requires insurers to incorporate specified mitigation actions into rating plans and submit the resulting discounts through the rate-filing process (California Department of Insurance, 2023). Updated guidance also requires wildfire risk models and rating plans to account for mitigation at the property and community levels, subject to actuarial review (California Department of Insurance, 2025). The state defines recognizable actions, insurers estimate their rate effects, and the regulator reviews the filings. The framework improves recognition and transparency, but it does not pay for roof replacement, vegetation management, or other capital-intensive work.

Florida separates the functions even more clearly. The Office of Insurance Regulation requires property insurers to offer wind-mitigation discounts and uses a Uniform Mitigation Verification Inspection Form to document qualifying construction features (Florida Office of Insurance Regulation, n.d.-a; n.d.-b). The expected wind-loss effect is reflected in the insurance rate. Separately, the My Safe Florida Home program provides free inspections and grants for eligible improvements. Current program materials advertise grants of up to \$10,000, and a 2024 legislative update added \$200 million in program funding (Florida Department of Financial Services, 2024a; 2026). The rate recognizes the safer home after inspection; public funding helps create it beforehand.

Federal hazard-mitigation programs serve a different purpose. The Federal Emergency Management Agency (FEMA) announced \$1 billion for the combined fiscal-year 2024–2025 Building Resilient Infrastructure and Communities competition and up to \$600 million for fiscal-year 2024 Flood Mitigation Assistance (FEMA, 2026a; 2026b). The programs fund projects undertaken by states, local governments, territories, and tribal nations, including infrastructure, floodplain management, community resilience, and repetitive-loss properties. Their benefits extend well beyond a single insurer-policyholder relationship. Institutional continuity is not guaranteed: FEMA terminated Building Resilient Infrastructure and Communities (BRIC) and canceled pending fiscal-year 2020–2023 applications in April 2025, then reopened a combined fiscal-year 2024–2025 opportunity in March 2026 (FEMA, 2025; 2026a). The episode illustrates that collective financing can be politically contingent even when recognition of completed mitigation remains embedded in state rating systems.

Benefit-cost studies reinforce the distinction between social and insurer value. The National Institute of Building Sciences (NIBS) estimated that federal mitigation grants generate, on average, about \$6 in societal benefits for each \$1 invested, although the ratio varies by hazard and intervention (NIBS, 2019). The estimate includes avoided deaths, injuries, property damage, business interruption, and other social consequences. It does not imply that a property insurer can recover six dollars for every dollar it spends. The gap between social return and recoverable claim savings is the allocation problem described in Section 3.

Table 1 sets out this institutional division of labor. Much of the architecture already exists in partial form. The policy question is not whether to invent mitigation credits, certification, or public grants, but how to connect them without confusing their purposes.

Program or mechanism	Primary function	Who finances the intervention?	How risk reduction is recognized	Remaining limitation
California Safer from Wildfires	Recognize property- and community-level wildfire mitigation in rates	Mainly the policyholder or separate public programs	Insurer rating plans and catastrophe-model treatment reviewed by the department	Does not generally address the upfront financing problem
Florida wind-mitigation discounts	Recognize and verify wind-resistant construction features	Policyholder	Required discounts supported by inspections and rating evidence	The discount follows completed mitigation; the initial cost may remain prohibitive
My Safe Florida Home	Provide inspections and capital support for eligible household improvements	State grants, plus a homeowner contribution, where applicable	Post-work inspection can support insurance discounts	Budget limits, eligibility rules, and administrative capacity
FEMA BRIC and FMA	Reduce community, infrastructure, and flood risk	Federal and non-federal public funding	Not primarily an individual insurance-rate mechanism	Project selection, cost sharing, and long implementation horizons

Table 1. Existing programs separate actuarial recognition, verification, and financing. Sources: California Department of Insurance (2023, 2025); Florida Office of Insurance Regulation (n.d.-a, n.d.-b); Florida Department of Financial Services (2024a, 2024b, 2026); FEMA (2025, 2026a, 2026b).

These examples establish institutional separation rather than program effectiveness. A mandated credit may recognize completed mitigation without inducing new investment; a grant may reach households that would have invested anyway; and a community project may have high modeled social benefits while producing effects that remain difficult to identify in aggregate loss data. The framework is, therefore, also evaluative: it asks whether each instrument actually addresses the friction that justifies its use.

Three conclusions emerge. Adequate rates and actuarially supported discounts are appropriate when the issue is recognition of private expected-loss reduction. Certification can lower verification costs and make durable features easier to recognize across carriers, but it does not finance the improvement. Grants and public programs are better suited to upfront capital constraints and collective benefits. A coherent framework preserves these distinctions rather than assigning every function to the insurance regulator.

5. ACCOUNTING, ACTUARIAL RECOGNITION, AND THE LIMITS OF AGGREGATE LOSS RATIOS

The accounting claim is narrower than the original framing suggested. Prevention is not absent from actuarial analysis: when mitigation changes expected loss, it can enter a rate filing, underwriting model, catastrophe model, or expected loss ratio. Lower expected losses may therefore affect pricing and prospective financial projections even though no separate prevention asset appears on the balance sheet.

Financial statement recognition raises a different issue. A paid claim produces a recorded liability and a cash payment. An avoided claim produces no directly observable transaction. An insurer-funded program may have future economic value, but the insurer may not control that value, may lose the policyholder, and cannot identify the particular claim that did not occur. Broad capitalization would therefore conflict with prudential conservatism. Prevention expenditures should remain expenses unless they independently satisfy existing recognition and admittance criteria, and avoided losses should not be booked as income or surplus.

What remains is a question of program evaluation. An aggregate loss ratio shows whether premiums and losses are aligned, but not why losses changed. A lower ratio after a mitigation program may reflect the program, favorable weather, portfolio selection, rate increases, deductible changes, or random variation. Conversely, claims inflation, worsening hazard, or adverse portfolio shifts may offset an effective mitigation program, leaving the aggregate loss ratio unchanged or higher. When a regulator or public agency funds, mandates, or formally approves a mitigation program, additional information may be needed to assess that intervention.

That need does not justify a universal Prevention and Risk Reduction Schedule, nor should targeted reporting extend to ordinary underwriting or routine loss-control activity. A proportionate case arises only when the public has a specific reason to evaluate a defined program, such as a grant linked to insurance treatment, a mandated mitigation credit, a residual-market or catastrophe-backstop condition, a material insurer initiative presented as supporting availability, or a time-limited pilot designed to generate evidence.

Suppose a state both finances household retrofits and requires insurers to recognize completed work. Aggregate loss ratios cannot reveal whether the grants induced new mitigation, whether certified measures were maintained, or whether observed losses reflect mitigation rather than milder hazard conditions or portfolio change. A targeted data call can answer these program questions without creating a new accounting asset or duplicating ordinary ratemaking.

The required fields can remain limited and operational: the number of eligible and participating policyholders; intervention cost and funding source; verification method; expected useful life and recertification rule; rate treatment; geographic or income distribution of take-up; retention or renewal outcomes; and relevant loss experience. Reporting should rely, where possible, on existing grant records, certification databases, and rate-filing data, apply a materiality threshold, and expire when the evaluation is complete. These data do not replace actuarial support for the rate. They show whether the program reached the intended risks, whether its effects persisted, and whether it should continue, change, or end. These are questions of program evaluation, not substitutes for ratemaking.

The evidentiary standard should also follow the decision. A mitigation factor used in ratemaking requires credible actuarial support consistent with state law and accepted actuarial practice. A pilot financed outside the rate may begin with engineering evidence, catastrophe modeling, or experience from another jurisdiction, provided that it includes an evaluation plan. The threshold for testing a grant need not be identical to the threshold for permanently changing an insurance rate. Keeping the decisions separate avoids both unsupported discounts and unnecessary rigidity.

The relevant distinction is, therefore, among actuarial recognition, accounting recognition, and regulatory learning. The first occurs when mitigation affects expected loss. The second should remain conservative. The third may require targeted data when public money, mandatory rules, or market-stabilization programs are involved. This formulation preserves the concern with institutional visibility without suggesting that actuarial models ignore prevention.

6. MATCHING REGULATORY INSTRUMENTS TO PREVENTION FRICTIONS

Prevention policy should begin with diagnosis rather than a general instruction to insurers. Table 2 links each friction to the relevant instrument and defines the regulator's limited role.

The sequence matters. Visibility identifies the measure and its expected-loss effect; portability preserves credible information across carrier changes; investability addresses the upfront cost. These functions are complementary, not interchangeable.

Observed friction	Primary instrument	Regulatory or public role	What should be avoided
Observable private loss reduction	Adequate base rates and actuarially supported mitigation credits	Review evidence, rate adequacy, classification, and consumer disclosure	Unsupported mandatory discounts or suppressed base rates
Verification cost or inconsistent recognition	Shared inspection standards, third-party certification, and recertification	Recognize credible standards and permit their use across carriers	Treating a certificate as permanent when the feature can deteriorate
Positive long-run value but high upfront cost	Grants, low-cost loans, property-linked finance, or authorized repayment mechanisms	Target financing by income, hazard, and expected benefit	Requiring insurers to advance capital without a recoverable revenue stream
Benefits to neighbors or public systems	Community mitigation, infrastructure, land-use rules, and transparent public or industry funding	Fund and coordinate the collective component	Embedding social subsidies in an individual actuarial credit
Publicly supported or mandated program	Targeted data collection and evaluation	Measure take-up, persistence, affordability, and loss outcomes	Universal reporting unrelated to a defined regulatory decision

Table 2. The instrument should correspond to the specific reason private underwriting does not produce the desired investment.

The available tactics are concrete but depend on jurisdiction. Subject to state law and institutional responsibility, an insurance department may set evidentiary expectations for rate filings, recognize third-party certification standards, conduct a targeted data call for a defined program, require documentation of mitigation variables in catastrophe models submitted for review, or impose conditions on a residual-market or public-backstop mechanism that it administers. These are applications of familiar tools, not a claim that every regulator has the same authority or should receive a general mandate over prevention.

Adequate rates come first. A prevention policy cannot rest on rates that fail to cover expected losses and expenses. The requirement that rates be neither excessive nor inadequate nor unfairly discriminatory is, therefore, directly relevant. Adequacy creates room for meaningful distinctions between mitigated and unmitigated risks and prevents mitigation language from becoming a substitute for difficult choices about hazard or market exit. Rate adequacy and affordability are distinct: the first asks whether the rate supports expected losses and expenses; the second asks whether a household can pay it. The second may justify targeted assistance outside the individual actuarial rate, not obscuring the first.

Credible certification is the second instrument. Portability matters when a durable feature remains relevant across annual contracts and can be verified at a reasonable cost. A standardized wind-mitigation inspection, a recognized wildfire-hardening designation, or an engineering certificate can reduce duplicate inspections and give property owners greater confidence that the feature will be considered after a change of carrier. What travels is the verified information, not a guaranteed discount or premium. Each insurer must still incorporate the feature into an adequate rating plan, and certification may require maintenance, depreciation, or renewal.

A workable portability regime requires a designated record custodian, a dated and versioned inspection standard, an expected useful life, maintenance and recertification rules, and a process for correcting or contesting the record. For cyber and health risks, portability should generally focus on a minimal certified indicator rather than the underlying sensitive data. Insurers would remain free to assess the actuarial effect under their approved rating plans.

External finance addresses the upfront cost. When a policyholder cannot fund an investment with a positive expected return, a grant, a low-cost loan, a property assessment, a utility bill mechanism, or another authorized arrangement may be appropriate. The design should distinguish private from public benefits. A household may reasonably contribute toward the portion reflected in lower premiums and reduced uninsured loss, while public funds may address a documented affordability constraint or community spillover. Florida illustrates the separation: the insurance discount remains within the rating system, while the grant is financed through a state program.

Collective risk reduction requires a different instrument. Fuel breaks, drainage systems, wetlands, levees, zoning, building code enforcement, public health campaigns, and supply chain standards cannot be reduced to household-level credits. Insurance can provide information about expected loss and participate in authorized pools or partnerships, but it cannot replace the public institution responsible for the hazard. Kunreuther (2015) similarly argues for public-private arrangements that preserve risk-based premiums while pairing them with loans or targeted assistance for mitigation and affordability. Feinman (2025) frames disaster insurance failures as design questions involving goals, coverage, prices, and public

responsibility. Prevention adds an upstream question: which intervention can reduce the loss distribution before the financing arrangement is chosen?

Public backstops and residual markets may also incorporate conditions related to risk reduction. Catastrophe funds, residual-market capacity, reinsurance support, and post-disaster aid can be necessary for availability, but they may preserve exposure without reducing hazard. Where law and administration permit, support can be linked to building code enforcement, land-use planning, community mitigation, or participation in verified household programs. The condition should attach to the public mechanism itself, not be disguised as an actuarial classification in the voluntary market.

Programs that claim a prevention objective should also include targeted evaluation. Aggregate loss ratios are not enough. Regulators and administrators may need data on take-up, completion, maintenance, coverage availability, premium effects, nonrenewal, geographic distribution, and loss experience conditional on hazard. These are program-evaluation questions, not a second method of ratemaking. Results may take several years and may not yield a single causal estimate, but this uncertainty calls for careful evaluation rather than assuming that every credit induces additional mitigation. Some credits may simply reward investments that would have occurred anyway (Kousky, 2019).

This agenda is narrower than a general prevention mandate. The binding constraint may be an inadequate rate, weak evidence, limited capital, short contractual duration, or an externality, and regulation matters only where it governs the relevant instrument. The framework does not ask regulators to direct insurer capital or resolve every technical issue. It uses familiar tools, such as rate review, certification, grant design, targeted data calls, residual-market conditions, and interagency coordination, and assigns each to a defined problem.

7. SAFEGUARDS AND APPLICATIONS BEYOND PROPERTY INSURANCE

Several safeguards follow from this narrower framework. Actuarial credits and public subsidies must remain separate. A discount supported by the expected loss of the insured risk belongs in the rating plan; additional support for affordability or external benefits requires an independent legal and financial basis. The distinction protects rate adequacy and makes redistribution visible.

Insurers should not be required to finance capital-intensive mitigation without a viable recovery mechanism. Low-cost devices, inspections, and loss-control services may be economical when their claims benefit is near-term. Major retrofits are different. Annual insurers are not natural providers of unsecured long-term household credit, and reporting requirements cannot create a return where none

exists. Public grants, lenders, property-linked instruments, and specialized finance institutions are better suited to that role.

Certification must also remain tied to evidence. A label is useful only when it corresponds to a measurable and maintained feature. Standards should specify inspection requirements, useful life, maintenance obligations, and the circumstances that trigger recertification. Cyber controls may depreciate quickly as threats change; defensible space requires repeated work; and organizational safety cannot be inferred from a policy manual. Model governance and periodic validation remain necessary.

Affordability requires separate attention. Prevention incentives can be regressive: households with greater resources obtain both safer homes and lower premiums, while lower-income households remain exposed to high rates because they cannot afford the initial cost. The answer is not to weaken the actuarial signal, but to target financing through grant priority, income-tested support, subsidized credit, or community programs. Access can be improved without asking other policyholders to fund an undisclosed subsidy through the rate. Devarajan and Jack (2007) make the broader point that public spending on risk reduction and public insurance or redistribution perform different functions when income and risk are heterogeneous.

Regulatory authority, finally, varies across states and lines. Some insurance departments can require data calls, approve rating variables, or administer residual markets; others have narrower mandates. Building codes, taxation, housing finance, land use, and public infrastructure usually lie elsewhere. The practical agenda, therefore, depends on coordination rather than on an assumption that the insurance regulator can compel every recommended action.

Reinsurance can redistribute the private value of mitigation and transmit prevention standards across portfolios, but it does not by itself eliminate the financing, retention, or externality wedges analyzed here.

The same framework applies beyond property insurance, although the relevant institutions change. In health insurance, preventive care and chronic disease management may yield benefits after members switch plans or enroll in public programs. Longer-horizon risk adjustment can reduce this incentive problem without requiring a permanent insurer relationship (Reif et al., 2025). The evidence and privacy safeguards differ from property certification, and many interventions remain public-health functions rather than insurance products.

Cyber insurance presents a different combination of frictions. Underwriting can recognize multifactor authentication, backup protocols, endpoint security, and other controls, but verification is difficult, controls depreciate quickly, and losses are interdependent through vendors and cloud providers. Certification and recertification can reduce information costs, while the rate effect still requires

credible evidence. Spillovers beyond the insured firm may require industry standards or public cyber policy.

Industrial insurance shows why prevention cannot always be reduced to a device or a credit. Process safety depends on maintenance, reporting, training, and organizational incentives. Hopkins (2008) and Dekker (2011) show how favorable indicators can coexist with deeper system risk. Risk engineering and process indicators can improve underwriting, but workplace and industrial safety regulation remains a separate public function.

Across these applications, the sequence is the same. Start with the private insured-loss effect and ask whether it is observable and rateable. Then identify the upfront financing constraint and any benefits that fall outside the contract. The components can then be assigned to underwriting, finance, or public policy. This discipline avoids both assuming that ordinary pricing solves every prevention problem and treating insurance regulation as the solution to every public-risk problem.

8. CONCLUSION

Insurance regulation should continue to begin with solvency, claims payment, adequate rates, and fair treatment. Prevention does not replace those objectives, but rising hazards make each of them harder to sustain. A market can reprice, restrict, or transfer risk for a time; long-run availability ultimately depends on the loss distribution itself.

Policy should, therefore, begin from what underwriting already does well. Actuarial analysis can incorporate mitigation into expected losses, rating variables, and catastrophe models. When a measure is observable, durable, privately financed, and supported by evidence, adequate rates and actuarial credits are usually the appropriate mechanism.

The harder problem precedes recognition. The safer property must be created first. A policyholder may face a binding financing constraint even when the investment has positive long-run value. An insurer may not retain the policy long enough to recover an advance, and competition may pass most of the loss reduction to the customer. Neighbors and public programs may also receive part of the benefit. Accurate underwriting can, therefore, recognize the benefits of prevention without creating sufficient incentives to finance the underlying investment.

A workable framework separates these functions. Insurance rates recognize private expected-loss differences. Certification lowers verification costs and carries durable information across annual contracts. Public or specialized finance addresses upfront capital and affordability. Community and infrastructure programs address external benefits. Targeted reporting evaluates programs involving public money, mandatory

rules, or market-stabilization mechanisms. Statutory accounting remains conservative, and avoided claims do not become assets.

California, Florida, and federal mitigation programs already display this division of labor. The contribution is not to present their instruments as new, but to turn that division into a decision rule: diagnose the missing link, match the instrument, and reject category errors. A regulator or program administrator should, therefore, ask not simply whether a measure is preventive, but whether the unresolved problem is recognition, verification, finance, appropriation, or collective benefit. Prevention policy is most credible when it does not ask a rate credit to perform the work of a grant, a grant to substitute for an adequate rate, or an insurer to finance a public good without compensation.

A paid claim is observable, but credible evidence can also support recognition of a lower expected loss. The remaining task is to finance the investments that create that lower loss and allocate their benefits among the actors who receive them. That is where underwriting ends and institutional design begins.

REFERENCES

- Barker, R., & Penman, S.H. (2020). Moving the conceptual framework forward: Accounting for uncertainty. *Contemporary Accounting Research*. 37(1), 322-357. <https://doi.org/10.1111/1911-3846.12585>.
- Boyer, M.M., & Gobert, K. (2001). *Dynamic prevention in short-term insurance contracts*. (CIRANO Scientific Series No. 2001s-69).
- California Department of Insurance. (2023). *FAQ: Safer from Wildfires regulation* (April 2023). <https://www.insurance.ca.gov/01-consumers/105-type/95-guides/03-res/upload/FAQ-Safer-from-Wildfire-Regulation.pdf>
- California Department of Insurance. (2025). *FAQ: Mitigation in rating plans and wildfire risk models regulation* (Rev. April 10, 2025). <https://www.insurance.ca.gov/0250-insurers/0800-rate-filings/0200-prior-approval-factors/upload/FAQ-Mitigation-in-Rating-Plans-and-Wildfire-Risk-Models-Regulation-2.pdf>
- Cochrane, J. H. (1995). Time-consistent health insurance. *Journal of Political Economy*, 103(3), 445-473. <https://doi.org/10.1086/261991>
- Corrado, C., Hulten, C., & Sichel, D. (2009). Intangible capital and U.S. economic growth. *Review of Income and Wealth*, 55(3), 661-685. <https://doi.org/10.1111/j.1475-4991.2009.00343.x>
- Dekker, S. (2011). *Drift into failure: from hunting broken components to understanding complex systems*. Ashgate.

- Devarajan, S., & Jack, W. (2007). Protecting the vulnerable: The tradeoff between risk reduction and public insurance. *World Bank Economic Review*, 21(1), 73-91. <https://doi.org/10.1093/wber/lhl007>
- Ehrlich, I., & Becker, G. S. (1972). Market insurance, self-insurance, and self-protection. *Journal of Political Economy*, 80(4), 623-648.
- Federal Emergency Management Agency. (2025). *FEMA ends Building Resilient Infrastructure and Communities grant program*. <https://www.fema.gov/press-release/20250404/fema-ends-wasteful-politicized-grant-program-returning-agency-core-mission>
- Federal Emergency Management Agency. (2026a). *Building Resilient Infrastructure and Communities: Fiscal years 2024-2025 funding opportunity and fact sheet*. <https://www.fema.gov/grants/mitigation/learn/building-resilient-infrastructure-communities>
- Federal Emergency Management Agency. (2026b). *Flood Mitigation Assistance Grant Program: Fiscal year 2024 funding information*. <https://www.fema.gov/grants/mitigation/learn/flood-mitigation-assistance>
- Feinman, J. M. (2025). Designing public solutions for disaster insurance market failures. *Journal of Insurance Regulation*, 44(2). <https://doi.org/10.52227/26934.2025>
- Florida Department of Financial Services. (2024a). *My Safe Florida Home Program changes effective July 1, 2024*. <https://www.myfloridacfo.com/division/ica/propertyinsurancechanges>
- Florida Department of Financial Services. (2024b). *CFO Patronis highlights big wins for Floridians and the Florida Department of Financial Services in 2024*. <https://www.myfloridacfo.com/news/pressreleases/press-release-details/2025/01/02/cfo-patronis-highlights-big-wins-for-floridians-and-the-fldfs-in-2024>
- Florida Department of Financial Services. (2026). *My Safe Florida Home Program*. <https://mysafehome.com/>
- Florida Office of Insurance Regulation. (n.d.-a). *Premium Discounts for Hurricane Loss Mitigation*. <https://floir.gov/property-casualty/premium-discounts-for-hurricane-loss-mitigation>
- Florida Office of Insurance Regulation. (n.d.-b). *Uniform mitigation verification inspection form, OIR-B1-1802 (Rev. January 2012)*. <https://floir.gov/docs-sf/default-source/property-and-casualty/oir-b1-1802.pdf>
- Hopkins, A. (2008). *Failure to learn: The BP Texas City refinery disaster*. CCH Australia.
- Kousky, C. (2019). The role of natural disaster insurance in recovery and risk reduction. *Annual Review of Resource Economics*, 11, 399-418. <https://doi.org/10.1146/annurev-resource-100518-094028>
- Kunreuther, H. (2015). The role of insurance in reducing losses from extreme events: The need for public-private partnerships. *The Geneva Papers on Risk and Insurance - Issues and Practice*, 40, 741-762. <https://doi.org/10.1057/gpp.2015.14>

- Kunreuther, H., Demidov, A., Pauly, M., Turcic, M., & Wilson, M. (2023). Externalities in the wildland-urban interface: Private decisions, collective action, and results from wildfire simulation models for California. *Risk Analysis*, 43(5), 886-895. <https://doi.org/10.1111/risa.14135>
- Masters, R., Anwar, E., Collins, B., Cookson, R., & Capewell, S. (2017). Return on investment of public health interventions: A systematic review. *Journal of Epidemiology & Community Health*, 71(8), 827-834. <https://doi.org/10.1136/jech-2016-208141>
- National Association of Insurance Commissioners. (2010). *Property and casualty model rating law (file and use version) (Model 1775)*. <https://content.naic.org/sites/default/files/GL1775.pdf>
- National Institute of Building Sciences. (2019). *Natural hazard mitigation saves: 2019 report*. Multi-Hazard Mitigation Council. <https://nibs.org/projects/natural-hazard-mitigation-saves-2019-report/>
- Olson, M. (1965). *The logic of collective action: Public goods and the theory of groups*. Harvard University Press.
- Pauly, M. V., Kunreuther, H., & Hirth, R. (1995). Guaranteed renewability in insurance. *Journal of Risk and Uncertainty*, 10(2), 143-156. <https://doi.org/10.1007/BF01083557>
- Reif, S., Schubert, S., & Wambach, A. (2025). Setting incentives right with long-term risk adjustment. *European Journal of Health Economics*, 26, 147-151. <https://doi.org/10.1007/s10198-024-01751-6>
- Samuelson, P. A. (1954). The pure theory of public expenditure. *Review of Economics and Statistics*, 36(4), 387-389.
- Schmidt, U., Robledo, J. R., & Lohse, T. (2007). *Self-insurance and self-protection as public goods*. (Economics Working Paper No. 2007-16). Kiel University, Department of Economics. <https://hdl.handle.net/10419/22032>
- Sutter, D. (2008). *The market for hurricane mitigation: Regulatory or market failure?* (Mercatus Center Working Paper No. 08-05). Mercatus Center.
- Woolf, S. H. (2008). The power of prevention and what it requires. *JAMA*, 299(20), 2437-2439. <https://doi.org/10.1001/jama.299.20.2437>