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10. The role of risk transfer and spatial planning for enhancing the flood resilience of cities

Paul Hudson and Lenka Slavíková

10.1 INTRODUCTION

How urban areas are designed will become an increasingly important topic in flood risk management (Raška et al., 2020; see also Chapter 9 in this volume). For example, planning regulations (see Box 10.1) can aim to lower flood risk or prevent the creation of flood risk. This is known as risk-sensitive, or strategic, planning. This can be achieved by requiring building owners to employ property-level measures that minimize flood risk (e.g. elevating buildings above expected flood depths), while neighbourhoods can be designed around green infrastructure (see Chapter 8 in this volume), or ensuring that development only takes place if there is a sufficiently low flooding probability (Hudson and Botzen, 2019). However, urban planning is not the only potential instrument for urban risk management. Another instrument is risk transfer (see Box 10.2). Unlike planning instruments, risk transfer does not aim to lower disaster impacts but rather supports the recovery process. This is by providing the resources needed to kick-start post-disaster recovery. The archetypal examples of risk transfer are, ex-ante, insurance (Hudson et al., 2020), and ex-post, government compensation (Slavíková et al., 2020). Both instruments come at the end of a chain of stakeholders' activities, considerations, and interactions. Risk-sensitive planning manages flooding by balancing competing agendas (Thaler et al., 2020), much like risk transfer (Surminski, 2018), across various interested and/or antagonistic social groups (e.g. property-price changes if the provision of flood information is mandated). Each step of this chain needs to be considered for successful and sustainable flood risk management (Golnaraghi et al., 2017). This similarity creates potential synergies in how these instruments can be used.

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BOX 10.1 SPATIAL PLANNING MECHANISMS

Spatial planning mechanisms vary in different institutional contexts. In principle, they intend to reconcile private interests of developers (or landowners and land users in general) with different types of common interests. In flood risk governance, such common interests are potential flood damage reduction, increased community resilience, and community prosperity.

Spatial planning regulation usually embodied in spatial plans and followed by construction requirements tells people what changes they can (or cannot) adopt on their properties – it has the form of direct regulation without (financially) incentivizing people. In high flood risk areas, new development of properties can be fully prohibited. Renovation of existing properties can be burdened with standard retrofitting requirements. In areas with lower flood risks the development is possible under specific construction conditions. This situation is mainly true for European spatial planning reality within which property rights may be (and are very often) limited with society regulations. However, the complexity of combined flood risk management and spatial planning can create loopholes in this approach. The main regulators are national institutions and local governance authorities responsible for spatial plans development.

Limiting flood impacts via these instruments (risk transfer and urban planning) requires the instruments to be collaboratively integrated into increasingly proactive risk-management paradigms. Proactively limiting flood risk requires all stakeholders to act in accordance with their abilities as successful flood risk management is beyond the scope of a single actor (Rauter et al., 2020; Snel et al., 2020; Suykens et al., 2019). This focus allows both risk transfer and risk-sensitive urban planning to fit within the risk-management paradigm of resilience (Disse et al., 2020; Masnavi et al., 2019). Our conceptualization of resilience uses three core pillars: recovery (the ability to return to the pre-flood state or to minimize the disruption to well-being), resistance (the ability to lower potential flood impacts proactively), and adaptive capacity (the ability to learn and positively transform the system). These pillars have been used in several studies (Hudson et al., 2020; Thieken et al., 2014). It is beyond the scope of this chapter to introduce these pillars in detail. However, they succinctly express the three main areas proactive risk management seeks to act within. In this paradigm of proactive risk management, we must strengthen each pillar as part of the overall system. A systems-thinking approach is required as resilience can be worsened and undermined if there is an overly strong focus on a single resilience pillar or instrument (Cremades et al., 2018;

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Lucas and Booth, 2020). Therefore, for society to be resilient, we must consider multiple instruments, outcomes, and interactions.

BOX 10.2 RISK TRANSFER MECHANISMS

Risk-transfer mechanisms come in many forms. For example, public/private insurance transfers risk by converting an unknown potentially large disaster loss into a known smaller fixed loss (the premium), with predetermined compensation expectations. This pre-finances losses through a combination of premiums and the insurer's capital reserves. Government compensation schemes on the other hand use post-disaster cash transfers to alleviate a disaster's impact. Often, such schemes have unclear compensation criteria and are financed via taxation, borrowing, or budgetary reallocation. Additionally, we can directly engage with financial markets via insurance-linked securities (ILS), such as catastrophe bonds. Catastrophe bonds are short-term bonds, for which the principal capital does not need to be returned to investors if a disaster occurs and meets pre-agreed conditions (e.g., hurricane category, earthquake magnitude). The capital is used instead for reconstruction or compensation. While different, they share many of the same concerns and core objectives. This is to provide an influx of resources to those impacted to kick-start the recovery process and minimizing the overall well-being loss.

In principle, there are no limits to how these mechanisms can be used. Other than that, the relative risk appetites of the person accepting the risk and the person transferring risk must overlap for a mutually beneficial exchange. The more often and extreme a disaster risk the more resource intensive (i.e., expensive) it becomes to transfer. This can be because, e.g., premiums must grow to maintain solvency or more capital must be kept in reserve, or imposes greater opportunity costs on budgets. Therefore, limitations are often placed on who can access risk-transfer mechanisms, such as excluding new developments in floodplains, floodplains with too high an occurrence probability, or those who do not want to retrofit their property, to create an overall viable mechanism. These accessibility conditions are argued to incentivize risk reduction and compliance with resilience boosting activities. This is because people are rewarded for acting in line with risk management policies.

Key actors and stakeholders are difficult to determine. This is because risk-transfer systems evolve from a series of public policy choices and cultural determinants. This evolutionary process creates different core key actors and stakeholders. For example, in the private sector-led UK the main stakeholders are private actors (citizens or companies), insurance compa-

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nies, Flood Re (a reinsurance pool), international reinsurance companies, and the government as a provider of structural risk reduction. While in the public sector-led France, we see main stakeholders are private actors (citizens or companies), insurance companies (as distribution channels), the public reinsurer, and government as the guarantor of the system and provider of structural risk reduction.

This is appropriate as flooding is a complex problem requiring multiple instruments to address different aspects. In this light, this chapter presents a series of examples of how to boost urban flood resilience by using risk-sensitive urban planning and risk transfer (in general rather than through specific mechanisms). The boost in resilience occurs through the creation of positive synergies if both instruments are considered equally important in flood risk management. This is because the recovery process creates the opportunity to improve both resistance and recovery capabilities (Slavíková et al., 2020). This is done through the potential to transform cities and risk-management approaches through improved adaptive capacity. The scope of this debate is larger than can be contained within a single chapter. We hope that our examples and interconnections spark a wider discussion and consideration on how the two instruments can be proactively interconnected rather than working in parallel.

10.2 URBAN FLOOD RESILIENCE AND RISK MANAGEMENT

The process generating flood risk is complex. Moreover, there is a large range of uncertain potential impacts. For example, higher-occurrence-probability floods are less impactful than those with lower occurrence probabilities. Therefore, to account for this, multiple instruments must be used across the entire risk profile. This leads to risk-layering, segmenting the risk profile for efficient management via targeted activities (see Figure 10.1). The frequency and severity of potential flood events guide the layers into risk prevention and mitigation, risk retention and mitigation, and risk transfer. Moreover, we would argue that each layer is also best served by a different resilience pillar. This is because each pillar focuses on specific activities, where socio-economic instruments can be targeted for a specific goal. One example is the use of planning to disincentivize floodplain development (risk prevention). These resilience pillars interact with the risk layers, creating overlapping segments of and impacts on the risk profile faced. This can lead to positive synergies.

For instance, consider the first risk layer. This risk layer is best managed via prevention and risk reduction as these are typically low-severity and

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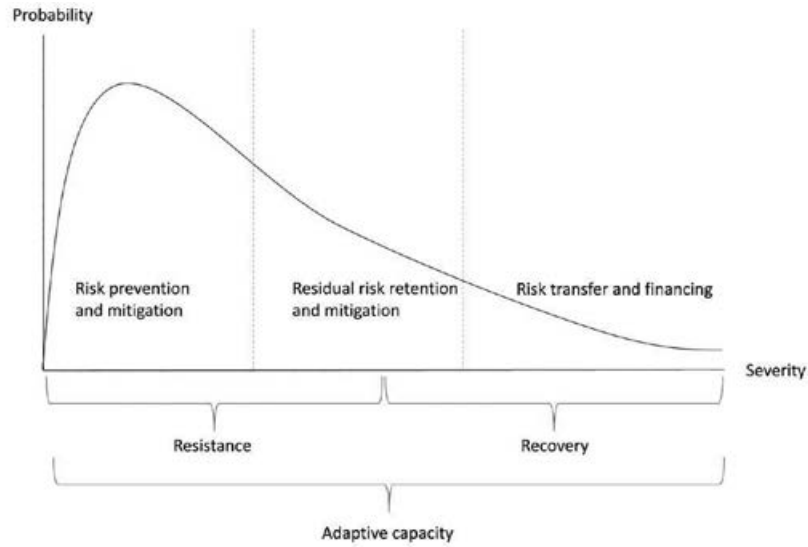

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Figure 10.1 Risk-layering and resilience diagram

high-frequency events that can be cost-effectively reduced and prevented (e.g., via hinterland retention areas as discussed in Chapter 2 in this volume). This layer also includes actively preventing new risks (e.g., development bans in areas with occurrence probabilities of 1 per cent or higher where socially relevant). The residual risk retention and mitigation layer covers lower probability and higher severity risk that can be self-financed as it represents a risk level that is not cost-effective to prevent completely. This layer of risk is within the capacity of a household or company (for example) to limit (e.g., property-level retrofitting with flood barriers or resistance materials; see Chapter 8 in this volume). These are aspects of the resistance resilience pillar for which we aim to limit the impacts that are within our capacity to reasonably do so. We posit that these are activities where planning mechanisms are best suited to act due to their focus on the physical city.

This has the resulting implication that flood risk cannot be eliminated as certain events are not warranted to fully prevent. This is either because they are so rare and we have more socially productive investment opportunities, or they are impossible to prevent. Therefore, there remains risk that must be borne and absorbed if we are to act in a socially responsible manner. This risk layer contains risk retention (e.g., the use of savings or resources at hand to absorb impacts) and risk transfer (e.g., insurance or ILS), which fall under the

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recovery-resilience pillar. The risk-transfer layer consists of events that go beyond the actor's ability to absorb, thereby requiring an influx of resources from specialized institutions, such as insurers.

How the risk layers are split across these two pillars has significant implications. The division in effect draws the line between where risk reduction is deemed possible and where risk must be accepted and absorbed. Where this line is drawn has significant impacts on risk-transfer mechanisms. For example, if the line is drawn early in the risk profile, more risk is transferred, rendering the mechanism more resource intensive (e.g., expensive). This increase in expense can reach the point where individual mechanisms are no longer viable, reducing the ability to recover from events that exceed protection standards. Similarly, if no risk is expected to be transferred (i.e., that all risk must be prevented by the state), we create a paradox whereby preventing risk leads to more risk being created (Haer et al., 2020) and a self-reinforcing unfamiliarity with risk transfer. Therefore, it is clear that to be proactively resilient, a combination must be employed. Flooding must be prevented via protective infrastructure, potential impacts mitigated via protective behaviours (see Chapter 8) or via upstream-downstream agreements (see Chapter 4), and the remaining risk must be transferred.

Maintaining the ability of the system to act on each risk layer and resilience pillar in an accessible, effective, and sustainable manner can be considered as adaptive capacity. Adaptive capacity is the ability to learn and improve the system, so it produces effective risk management. For example, a system whereby risk is allowed to grow so large that risk transfer becomes prohibitively expensive does not display adaptive capacity as we lose access to the full range of resilience-boosting instruments. However, a system whereby after a flood risk-transfer instruments incentivize and inform on the use of property-level adaptation indicates a higher level of adaptive capacity, for at least one aspect of the system.

10.3 EXAMPLES OF SYNERGIES BETWEEN PLANNING AND RISK TRANSFER

10.3.1 The Recovery Pillar of Resilience

This sub-section presents several examples of how risk-sensitive planning supports risk transfer to build greater resilience.

The first example of synergy within the recovery pillar regards accessible risk-transfer financing. For insurance (or ILS), the premium partially determines its accessibility. The higher the premium, the less accessible it is. For insurance, this is because it is more expensive, or for ILS it represents a riskier product which may not be attractive. A premium or price linked to the underly-

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ing risk creates the strongest incentives for additional risk management. This is because successful policyholder risk management can lower the price charged (Hudson et al., 2020). However, the more expensive the price is, the more it consumes resources. Spending more resources on accessing risk transfer can undermine a household's/business's capacity to achieve other resilience pillars. For example, after paying the premium, they no longer have the resources to employ the risk-reducing measures. Similarly, public compensation must be funded. This can be via taxation, as occurred in the Czech Republic (Slavíková et al., 2020), or resource diversion, e.g., from infrastructure maintenance. In these examples, the greater the potential threat, the greater the potential compensation that must be paid, and the greater these problems become. Planning instruments such as sponge-city developments lower risk (see Chapter 8) thereby reducing the pressure placed on risk transfer and forgoing potential increases in premiums, taxation, or the opportunity cost of changing the use of earmarked monies. Therefore, the synergy created through risk-sensitive urban planning is the production of a suitable marketplace for sustainable and affordable risk-transfer mechanisms.

A related synergy between planning and risk transfer is how urban development in flood-prone areas can be sensitized to who is located there. For example, developing social housing in floodplains has implications for risk-transfer affordability as compared to high-end developments. Moreover, more socially vulnerable households in general may not be as able to absorb disaster impacts due to the subjectively larger impacts they suffer from a disaster, potentially worsening the recovery process and resulting in a potentially higher likelihood for negative mental-health outcomes. The strategic integration of concerns outside of direct monetary losses supports risk-transfer mechanisms in bolstering community resilience. This is because community recovery potential is bolstered by only allowing floodplain development if its residents can handle the consequences of a flood and access risk-transfer measures, making these requirements known.

A further synergy on how planning supports risk-transfer mechanisms is the creation of a larger insurance market. Public/private-led risk-transfer mechanisms must have participants from both high- and low-risk areas. In covering both areas, greater diversification is achieved. This helps the risk-transfer provider to remain solvent or to manage premiums through an implicit cross-subsidy between areas. Planning regulations can require the purchase of insurance. This requirement creates a more stable and larger participant pool. A second planning approach is mandating that all buildings within disaster-prone areas are constructed or retrofitted so that they reach and maintain a sufficiently low level of vulnerability. Therefore, planning instruments and development help to counteract two fundamental problems with risk-transfer mechanism: moral hazard and adverse selection. Moral hazard

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is where individuals protected by risk-transfer instruments employ fewer risk-management behaviours. In turn, this leads to a higher risk level than would otherwise occur. This negative outcome can be mitigated by building requirements that lower risk. Adverse selection is, effectively, where only the highest at-risk demand access to the risk-recovery mechanisms. Mandated coverage expectations reduce this potential as neither high- nor low-risk people can leave, helping the overall pool to be sustainable.

A related issue is the concept of 'buy-outs' or 'planned relocation' relevant for repetitive property loss (Tate et al., 2016). This action increases resistance as there are fewer properties to damage. This reduces the burden placed on the risk-transfer provider as there is a lower geographically concentrated need for compensation. Additionally, as the finance sector is increasingly taking climate change into account, it is possible that there will be places where only those unable to move away remain in disaster-prone areas (de Koning and Filatova, 2020). Buy-outs can address this problem by creating a market which would otherwise not exist. This allows a planning instrument to directly boost resistance, and thereby indirectly support risk transfer.

10.3.2 The Resistance Pillar of Resilience

This sub-section presents several examples of how risk transfer supports risk-sensitive planning to build greater resilience.

Risk-sensitive planning must note that risk is generated by a series of interacting decisions placing externalities upon one another. Therefore, one person's decisions can impact the risk profile for other people, creating a potential ripple effect. For instance, the installation of protective infrastructure can effectively move flood water from one area to another, an outcome often not considered in the decision-making process of an individual. Therefore, alterations in the burden of providing or accessing risk-transfer mechanisms in a socially equitable way can provide an indication of these externalities and their magnitude. Additionally, known troubles in gaining access to risk-transfer mechanisms in specific areas can help redirect activity. This creates a wider space for coping with changes in risk by providing a third-party indication of how risk is changing. This creates a new mechanism that either supports the original planning intent or helps to identify where a problem has been created.

Urban planning must achieve multiple objectives of which flood risk is only one. Therefore, it is possible that the generation of new risk cannot be avoided due to wider social objectives. In this case, risk transfer (especially insurance) can help incentivize vulnerability reduction. For example, in France, communities can be asked to retrofit buildings after a flood to return to laxer public insurance conditions (Poussin et al., 2013). This is to incentivize complying with flood-sensitive building codes. However, in the case of

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France, these measures do not have to be implemented, but merely included in a risk-prevention plan (Poussin et al., 2013). Therefore, it is important that flood risk management is suitably mainstreamed into urban planning in a way that generates tangible, rather than tokenistic, action.

A related issue is the 'betterment' concept. Betterment is where, during the recovery process, funds provided by insurers (for example) can be used to enhance resistance directly rather than returning it to the previous status quo. In Canada, for example, from 2008, mitigation clauses and innovative recovery solutions have been incorporated into the rules of the federal disaster relief distribution provided to affected households. This means that additional financial resources might be provided on top of disaster relief pay-outs to mitigate disaster risk. The introduction of the extra disbursement has been considered as the first step toward sustainable disaster recovery. Critiques pointed out that the limited disbursement reduces the range of choices for mitigation options and that only measures on already damaged property are reflected (Sandink et al., 2016). Similarly, in Australia from 2007, the betterment principle has been incorporated into government-funded disaster relief to provide missing linkage between recovery and mitigation. However, in many justifications, the potential for such investments is currently limited without a reconsideration of the nature of insurance as a tool for a return to the status quo. A relaxing of the resistance against betterments can aid in achieving zoning regulations that require property-vulnerability reduction. For instance, in the case of France, zoning-mandated property-level measures do not need to be implemented if deemed too expensive. However, the post-disaster recovery phase offers the second-best opportunity to retrofit the property in a way that meets the wider disaster-management regulations from risk-sensitive planning.

A further example of synergy comes directly from enhancing the recovery pillar. Unterberger et al. (2019) note that risk-transfer coverage for local governments (e.g., insurance or ILS) can boost fiscal resilience. This is important for cities as budget irregularities can inhibit the repair of physical environment/infrastructure, or other expected services. A city that is unable to provide suitable infrastructure or services weakens the recovery-resilience pillar, increasing indirect economic impacts, e.g., longer business interruption costs (Botzen et al., 2019). The protection offered by integrating risk-transfer mechanisms into infrastructural needs helps planners securely achieve their other social objectives, thereby allowing a city to provide its needed services as soon as possible after a disaster event.

10.3.3 The Adaptive Capacity Pillar of Resilience

Creating synergistic outcomes is adaptive capacity as such interactions create a more productive outcome. For example, when recovery is supported by

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more proactive risk-sensitive planning, risk-transfer mechanisms are more affordable and sustainable, freeing cognitive and financial resources for other resilience boosting activities or insights. One example comes from the synergy generated by both instruments requiring in-depth local knowledge. The entire set of required knowledge is beyond the capacity of a single actor to know or generate, thus creating a movement towards detailed data sharing and modelling (Surminski et al., 2015) in order to generate new insights from closer collaboration. For instance, insurers and city planners in Copenhagen have come together to understand better how flood water and damage occur after pluvial flood events. This is achieved by using the urban planners' more detailed knowledge of the city at an engineering level and insurers' detailed knowledge of what, where, and how damage was incurred (Hudson et al., 2020). Additionally, coordination among jurisdictions is also necessary as a large number of stakeholders are needed to share information and coordinate action while ensuring accountability (Jha et al., 2013). This is due to the nature of flood risk as an externality. However, creating the national platforms and governance structures required to facilitate this generates transaction costs. The problem of transaction costs is discussed in Chapter 4 in this volume.

Addressing social justice or equality concerns helps to build a resilient city as both risk transfer and risk-sensitive planning interaction is another aspect of adaptive capacity. The distribution of flood risk is inherently unfair, but there are mechanisms in place to support social equity and deliver fair flood risk management in terms of the distribution of resources and that without careful consideration development may create or preserve inequalities. Failing to account for social justice concerns can lead to conflicts and mistrust (see, for example, Wamsler and Lawson, 2011), which can be overcome through inclusive collaborative environments that go beyond consultation. Forming these inclusive collaborative environments can lead to more community-led actions and more productive activities now and in the future (Slavíková et al., 2020).

Finally, including risk-transfer-specific stakeholders at all stages of the planning process boosts adaptive capacity because it is a group whose primary concern is limiting flood risk to remain sustainable instruments. This creates an implicit pressure group to maintain flood risk standards and not to generate unprotectable or unabsorbable risks. This is through the expertise they acquire through interaction with individual loss claims. For instance, Flood Re in the UK aims to provide affordable insurance but will not insure any newly constructed buildings. Rather, the users of these buildings must instead buy insurance directly off the private market rather than the subsidized pool. The potentially high premiums can prevent access to insurance which is often a requirement for being able to gain a mortgage (for example). This creates a tangible incentive for planners to consider flood risk because if a property cannot be sold or financed, the development cannot offer a net benefit to

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society. This thereby helps to enforce bans on developing in floodplains. Moreover, for regulation to be effective, it requires enforcement or the creation of other incentives that encourage people to act in line with the regulations (e.g., zoning regulations), which is an increasing focus of flood risk management even if this movement needs to be communicated better (Snel et al., 2020). Achieving this movement creates reinforcing expectations between the needs for risk reduction and recovery mechanisms. Similarly, planning stakeholders can and should be involved in the chain developing risk-transfer mechanisms so that risk-transfer providers remain sensitive to the social implications of their services.

10.3.4 Barriers to Synergies

However, despite many examples of positive synergies between planning and risk transfer, several hurdles remain to be overcome. These predominantly relate to stakeholder expectations and perspectives (see, e.g., Thaler et al., 2020). The above sections indicate that the synergies between planning and risk transfer come from the observations that fundamentally all instruments within disaster-risk management play into the following considerations for a resilient society: coverage or protection exclusions; minimum protective standards; limitations of what can be compensated; and retrofitting buildings after a disaster (Slavíková et al., 2020). However, these considerations need to be mainstreamed into decision-making as important and actionable outcomes (Golnaraghi et al., 2020). This is because, while there are many different risk-transfer styles and objectives, e.g., private sector insurance (e.g. Germany), public sector insurers (e.g. Spain), or by public compensation funds (e.g. Austria), disaster risks are often poorly considered in urban planning (Golnaraghi et al., 2020). This means that, while many countries have rules against floodplain development, there are often multiple exemptions due to disasters receiving lower priorities as compared to more tangible issues. Moreover, approaches must be proactive ex-ante strategies rather than more politically attractive ad hoc solutions. For example, in the V4 countries there is a low willingness to commit to ex-ante integrated arrangements due to the perceptions of how stakeholders are expected to behave within the system. This can also be seen in the approaches of the Netherlands and Germany. The Netherlands takes a risk-based approach indicating that the resistance measures can fail, while in Germany the predominant perspective is that of safety (Bormann et al., 2020). This perspective difference implies that in safety-oriented approaches recovery mechanisms are not actively considered as measures that should not fail. No instrument will provide certain outcomes. Additionally, ignoring the experiences of stakeholders specialized in other instruments presents a foregone opportunity for improving resilience.

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Therefore, the two instruments must be mainstreamed. This is because the complex problem of flooding generates less resilient risk-management outcomes when approached from only one perspective or need. Siloed approaches occur because of institutional incentives that must be overcome or reorganized into new structures.

A related issue regarding the different perceptions of correct behaviour occurs because the two mechanisms operate at different scales/scopes. Risk transfer operates at the national and international scale, while planning is intensely local even with national guidelines. This creates conflict as different perspectives lead to different priorities and expectations. This is especially relevant if flood risk governance is also fragmented. For example, in Germany, flood risk management is the responsibility of the individual federal states (Thieken et al., 2016) as compared to Lithuania's single authority (Mikša et al., 2021). This increases the cognitive distance between those involved, inhibiting cooperation, and leading to siloed and potentially conflicting approaches. Therefore, while the European Floods Directive calls for greater inclusivity in flood risk management, achieving the required polycentric involvement is difficult due to the 'cultural' differences across stakeholders. Moreover, given that planning occurs at the local to regional level, in this, unlike in risk-transfer schemes, there can be substantial transaction costs or social inertia to overcome as more stakeholders must be involved. However, this might be weakened when we consider a publicly provided mechanism (Seifert-Dähnn, 2018).

However, similar perspectives can also inhibit successful cooperation between the instruments. Glaas et al. (2017) note that in Norway the insurance industry lobbies national/local government to make climate-change-related risks a higher priority. However, they also note that both act upon short time horizons because of politics (governments) or the annual nature of insurance (insurers). This means that while both have an incentive for proactive resilience building, there is a continuing focus on immediate/tangible issues matching their cognitive time horizons. This short-run focus can easily lead to maladaptive outcomes via immediate unconnected incremental changes in the risk-management system. This can be corrected by reducing the unfamiliarity with working along a longer planning horizon, but the incentives to deviate from this must be counteracted. Successful collaboration is required to overcome this barrier because risk transfer itself is not inherently transformative but absorbs risk so other actors can be transformative.

10.4 CONCLUSION

Promoting urban resilience must not only consider how the creation and management of physical assets alters the risk profile of an urban area but also must consider how we can increase the capacity of a range of stakeholders to

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keep both the physical and socio-economic environment suitably robust and resilient. A holistic approach across multiple instruments creating synergies in turn promoting inclusive collaboration across stakeholders is important. These structures should be aimed at proactively coping with the entire risk profile by targeting the layer of risk most suitable while preventing one mechanism from becoming the overall crux of an urban resilience strategy allowing the system to become maladaptive. This is because planning and risk transfer can best operate if they can focus on the resilience pillar that they are most suited to acting upon: resistance in the case of planning and recovery in the case of risk transfer. The opportunity to specialize in these specific roles creates synergies between the two instruments as we see they require many similar underlying features, criteria, and expectations. This thereby creates an environment where one instrument can succeed allowing the other to flourish by creating a supporting environment.

In this chapter we have presented a series of examples where when working together both mechanisms, embracing a systems-thinking approach, create synergies in creating more proactively resilient and risk-limiting cities rather than a system attempting to maintain the status quo. To achieve this, several barriers still need to be overcome to create the required resilience improving partnership. Achieving this requires a systems-thinking approach that involves the active consideration of all the elements discussed in this book.

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