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Reflections on the current debate on how to link flood insurance and disaster risk reduction in the European Union

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Reflections on the current debate on how to link flood insurance and disaster risk reduction in the European Union

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Abstract

Flood insurance differs widely in scope and form across Europe. Against the backdrop of rising flood losses a debate about the role of EU policy in shaping the future of this compensation mechanism is led by policy makers and industry. In this paper we investigate if and how current EU policies influence flood insurance. While the question of supply and demand is at the core of the debate, we argue that another key dimension is often overlooked: how to use insurance as a lever for risk reduction and prevention efforts. We investigate if and how current EU policies interplay with these two dimensions and then reflect on the national policy level. We illustrate two conflicting cases of flood insurance: the United Kingdom (UK), where flood insurance provision is widely available, but subject to current reform, and the Netherlands, where efforts to introduce a broad flood insurance coverage have only recently failed. In analysing the current positions on the role of the EU in shaping flood insurance we conclude that there is wide agreement that a complete harmonisation of flood insurance offering across the EU is unlikely to be effective. We determine that there is clear scope for the EU to play a greater role in linking risk transfer and prevention, beyond existing channels, to ensure an integrated approach to flood risk management across the EU.

Keywords: flood insurance; flood risk management, disaster risk reduction; Europe

1. Introduction

Recent flood events across Europe have resulted in human tragedy and disruption to homes, communities and business processes. Over the period of 2000 – 2012 average annual flood

losses were €4.2 billion (Jongman et al. 2014). How these losses are financed differs widely across the EU – insurance, state compensation schemes and liability being the most common approaches. These mechanisms follow different principles, ranging from ex-ante to ex-post funding, applying a solidarity based or market driven approach, and are based on varying degrees of public-private partnership[1] (Bouwer et al. 2007; Schwarze et al. 2011; Paudel et al. 2012).

This existing patchwork has arisen for historic and cultural reasons, with different perceptions and customs when it comes to dealing with flood risk (von Ungern-Sternberg 2004). Public awareness in their operation is usually highest after a significant flood event (Cowan 2014), when those affected are looking for compensation. Beyond these reactive responses to financial flood losses there is also a more forward looking dimension emerging. This has triggered growing concerns about future risk levels in the wake of improved probabilistic forecasting and flood risk mapping tools, for example, awareness raised with the UK's Flood Maps (Wheater 2006). Latest projections show that flood risk is likely to increase in certain regions– due to socio-economic developments and to climate change (IPCC 2012). As an illustration, Jongman et al. (2014) show that by 2050 the predicted annual damage in Europe will have risen to €23.5 billion an increase on the figure of €4 billion predicted in 2010.

These trends are likely to pose a significant challenge for financial compensation mechanisms (e.g. Paudel et al. 2015), unless more risk reducing measures are applied, such as flood defences, stricter building codes and/or land use (zoning) policies. Effective prevention is expected to play a significant role for affordability and availability of loss compensation mechanisms (Kunreuther 1996), but it is far from clear how these two approaches interact, and where the scope for future reform is. We argue that until today efforts to reform flood compensation mechanisms in Europe are exclusively focused on dealing with the financial losses, without considering the implications of these mechanisms for managing and reducing the underlying flood risks.

Amending existing compensation mechanisms or developing new ones requires political will and stakeholder buy-in at different levels and over varying time-scales. The ad-hoc payments after a flood are usually decided very quickly, often nationally, while changes to the legal system are far more complex and require detailed preparation and elaboration. Reforming insurance systems sits somewhere in the middle –but, , this process can also take very long, with unclear outcomes, as recent national experiences in the Netherlands and the UK show.

The case of insurance also illustrates the complexities of existing governance arrangements. Technical design of insurance products and demand and supply are amongst the factors that determine how flood insurance works. Jurisdiction for this rests with Member States (MS),

[1] Public-private partnerships (PPP) are schemes that are undertaken with a contractual agreement between a public body and a private sector company. The private sector company then assumes a specific role to achieve a particular outcome, while the public body offers the degree of support as defined in the contract. PPPs can cover aspects such as risk information sharing –see HORA in Austria- as well as other aspects, including land-use arrangements (ClimateWise, 2012).

and even at sub-national level, for example in Germany, where the Länder[2] play a key role (Schwarze and Wagner 2007). At the same time many policies relevant to insurability of flood risk are guided by EU Directives – ranging from risk information and mapping, prevention measures and compensation arrangements. This political and regulatory infrastructure does have implicationsfor the feasibility of flood insurance by potentially reducing the underlying flood risk and making flood insurance more viable.

In this paper we investigate if and how the questions of compensation and prevention are linked, and how this can be supported or hampered by public policy. There is ample evidence that insurance, or risk transfer in general, can boost resilience to natural hazards more effectively than ex-post disaster aid (e.g. Ranger et al. 2011). Insurance can reduce financial burdens and uncertainty (Ghesquiere and Mahul 2007; Melecky and Raddatz 2011), and assists economies in dealing with the negative long run impacts of natural hazards such as flooding (von Peter et al. 2012). Risk pricing may encourage the reduction of exposure and lead to lower damage costs (Kunreuther 1996; Bozzola 2014). Yet on the other hand poorly designed insurance products and ill-structured insurance markets can drive economic inefficiency and maladaptation to future risks (Michel-Kerjan 2010; Surminski 2013). Reforming insurance is not simply a question of penetration rates; it also touches on effective design and operational issues.

We analyze this for flood insurance, where the European Commission (EC) has instigated a debate on what the role of the EU should be in the context of disaster insurance in Europe. The EU Green Paper (GP) on disaster insurance, published in summer 2013 (EC 2013a), builds upon existing evidence to produce insights that can guide potential actions by regulators, industry or policy makers at a European level to increase market penetration. Possible options discussed in the GP include mandatory insurance, product bundling and public reinsurance or disaster pools.

The GP reflects on the concerns about rising risk levels and how this can be accommodated through new and existing flood insurance schemes. The consultation document frames insurance in two ways: the question of availability and affordability, and the potential to use flood insurance as a lever for flood prevention and flood damage mitigation. We investigate if and how current EU policies interplay with these two dimensions. While at first they appear separate, at least in terms of their governance structure, we argue that the two dimensions are interwoven: flood prevention impacts the costs of an insurance policy, while at least in theory, flood insurance could send signals leading to more preventative or mitigative actions by those insured or the government (see, for example, Kunreuther 1996, Botzen et al. 2009; Shilling et al. 1989; Treby et al. 2006). However, recent studies highlight a lack of integration of prevention and risk transfer within existing insurance schemes, and there appears to be lack of progress regarding the establishment of stronger insurance/risk transfer links (e.g. Surminski and Eldridge 2015).

Taking the GP as a starting point, we explore these two dimensions of flood insurance. We first consider affordability and availability, and risk reduction linkages in an EU context

[2] Länder refers to the 16 federal states in Germany.

(sections 2 and 3), and then gather insights from two very different cases of insurance reform efforts at the national level in the Netherlands and the UK (section 4). This is followed by an analysis of how EU policy could help address the challenges at member state level (section 5). We conclude by outlining the need for further research in section 6. Our investigation is based on analysis of written and oral evidence, gathered through a detailed assessment of responses to the GP on disaster insurance as well as discussions with stakeholders at a recent workshop hosted by the authors. This workshop reflected on successes, gaps and actions needed for flood insurance in Europe.

2. Current flood insurance arrangements in the European Union

Flood insurance is one option within the toolbox of flood risk management instruments. It allows risk to be transferred financially, with a premium paid by the policyholder to the insurer, effectively allowing those in at risk areas to continue to live and work with low financial impact after a flood event. Public liability policies and compensation programs co-design the regulatory environment for damage compensation in which insurance is to operate (Bozzola 2014; Crichton 2008; Paudel et al. 2012). Flood insurance is deemed most effective as part of a comprehensive Disaster Risk Reduction (DRR) strategy that includes risk assessment and awareness, prevention policies and other damage compensation instruments among others (Warner et al. 2009). The interplay of the above instruments varies within and across countries. This is often the result of multiple and conflicting views as to what extent the public responses to flood risk should draw on principles of affordability, equity and solidarity (Sugarman 2006). Local customs and traditions, as well as risk perception and attitudes (e.g. Schwarze and Wagner 2007) also play an important role in determining the extent of the underwriting of flood insurance products.

It is not surprising hence that the existing flood insurance products across Europe differ widely in scope and reach (Bouwer et al. 2007; Schwarze et al. 2011). In France, the state-supported CatNat system covers flood risk (among others), offers low-priced (re)insurance, and channels part of the resources into a state-managed fund for natural risk prevention. The CatNat scheme is offered through private intermediaries and funded through a flat rate surcharge (i.e. 12% on building and contents insurance) over existent policies against property damages (Poussin et al. 2013). The flat rate is deemed to be affordable and the compulsory coverage is seen as a tool to prevent adverse selection. There is also a link to risk reduction by means of a risk prevention plan. These plans encompass community level actions such as banning construction in areas with high flood risk or encouraging and mandating that households employ certain flood damage mitigation measures The insurance aims to provide an incentive to apply for such a plan by increasing deductibles for households in communities that are regularly flooded and do not have adequate plans in place (Poussin et al. 2013)..

Moreover, other alternatives to develop flood insurance in a solidarity context are in practice. For example, the Spanish Insurance Compensation Consortium (CCS) scheme provides flood insurance on a subsidiary basis if flood damages are not covered by private insurance. Similarly to CatNat the CCS is funded via a flat rate surcharge. In order to promote private

insurance, a deductible over public compensations applies and private insurance is offered in a bundled system (ICC 2014). Bundling makes flood insurance compulsory if someone insures against some selected risks (e.g., earthquake, storms), and because of the bundled contract the premium automatically includes flood coverage. This system increases market penetration, reduces adverse selection and encourages DRR through risk based pricing. Yet, it may result in inequitable and even unaffordable premiums that increase the burden on the public CCS (Sugarman 2006).
In Sweden, Portugal and Ireland flood insurance is voluntary and policies are issued and managed by private companies. The State does not offer insurance itself nor financially backs the insurers. Portugal and Ireland apply risk-based pricing, with a certain degree of cross-subsidization in Ireland. On the other hand, the location of the asset does not influence the premium to be paid in Sweden (Maccaferri et al. 2012). However, penetration rates appear to be mostly driven by factors other than pricing. In Sweden and Ireland, mortgage lenders require borrowers to insure buildings, resulting in penetration rates above 90% (Maccaferri et al. 2012). In Portugal, where this condition does not apply, penetration rates are much lower (50%) and insurers are required to constitute a (tax-exempt) equalisation reserve to prevent cash-flow depletion in the event of a significant unforeseen catastrophe.

For the detailed analysis of different flood insurance approaches this paper considers the situation in two countries: the Netherlands, where a broad flood insurance coverage is not available beyond some commercial policies (section 4.1). And in the UK, where flood insurance is provided by private insurers on a bundled basis, reaching high penetration rates due to mortgage requirements, while the roles and responsibilities of public and private players are currently being reviewed as part of the proposed introduction of Flood Re (section 4.2). Both country examples were chosen because they recently underwent discussions about new approaches to flood insurance, which led to very different outcomes and the understanding of their undergoing changes in relation to policy, DRR and insurance design.

How the roles of public and private agents are split differs also widely across the spectrum. In the case of genuine private insurance markets, the role of the state can be limited to preserving fair competition and financial viability of the insurer. When the pre-conditions for private markets are not fulfilled, or the potential positive externalities of insurance are not internalised, state interventions may boost insurance markets. This can either be by financially backing up the private insurers, e.g. government lead reinsurance, by investing in preventative measures, or by imposing regulatory measuresBalancing the trade-off between insurance affordability and the solvency of an insurer may in some situations demand public support. By imposing mandatory flood insurance governments resort to solidarity which, in justified cases, may create conditions of equitable sharing of the burden. In addition there is the aspect of flood risk management – which is widely regarded as a public function, although budgetary constraints may change this approach, as seen in the UK, where there is a quest for private flood investment and individual risk management action.

3. The current EU flood policy context and the interplay with flood insurance

The decision if and how flood insurance is designed reflects country specific risk features andloss experience.EU policies can influence this to some extent – in Table 1 we summarize how the existing EU policy instruments interact with the provision of insurance. These policy tools can be grouped into three large categories: those explicitly aimed at the regulation of insurance market (Solvency I and II and other insurance market regulations); those implicitly affecting insurance provision through flood risk assessment and management; and those implicitly affecting insurance provision through compensation arrangements outside insurance.

Table 1: EU legislative instruments and their relationship to insurance provision

Policy	**Relevance for flood insurance**	**Impact on flood insurance**
Solvency I (Directive 73/239/EEC and others) and Solvency II (Directive 2009/138/EC)	Explicit	Insurance systems will have to accommodate the remit of Solvency II ensuring that schemes are economically risk secure. Solvency II determines the risk appetite as well as the internal risk portfolio decisions of insurance companies. It demands a structured risk-based approach to assess the solvency risks faced by insurance and reinsurance companies, including flood insurance (EC 2009). It also regulates the assessment and validation of the methods being used to do so. If validated, evidence that these methods are actually followed should be provided (EC 2009). Finally, it imposes an upper limit on the probability that the annual losses exceed company's operating capital (EC 2009).
Competition rules, state aid	Implicit	Competition law can influence how public and private sectors may collaborate through *public-private* partnerships (PPP). State aid regulation controls public recovery aid to economic undertakings without distorting the internal market. Recently, Commission Regulation 651/2014 exempted aid to make good damage caused by natural disasters from the obligation to notify the state aid, pursuant to the specific conditions.
Environmental liability directive (ELD, Directive 2004/35/EC)	Implicit	ELD imposes an obligation of preventing or remedying of environmental damage at source and by the polluter, in accordance with the Article 191(2) of the Treaty on the Functioning of the European Union (TFEU). It distinguishes strict and fault-based liability but stops short of imposing financial guarantees in case of insolvency; rather it leaves it for the discretion to the MS to develop financial security instruments and markets.

Water Framework Directive (Directive 2000/60/EC)	Implicit	Establishes River Basin Management Plans (RBMPs) based on a better understanding of pressures, impacts and economic analysis. The WFD stressed the role of economic instruments in achieving a 'good ecological status' (EC, 2000). Although it specifically referred to water pricing, this has resulted in practice in a much wider diversity of economic instruments, including insurance. The 'good ecological status' should contribute to 'mitigating the effects of floods' (EC 2000).
Floods Directive (Directive 2007/60/EC)	Implicit	Flooding risk maps (EC, 2007, chap. III) and assessments are instrumental for a sound determination of risk premiums. The FD is expected to lead to a reduction in exposure and vulnerability, and increase risk awareness. The flood risk management plans produced under the FD will specify and prioritise interventions for flood risk reduction.
European Union Solidarity Fund (EUSF)	Implicit	EUSF provides assistance to MS for coping with major natural and/or extraordinary regional disasters[3]. Solidarity Fund aid can be mobilized up to a maximum annual total of 500 million EUR (in 2011 prices). The EUSF contributions are meant for essential public emergency and recovery operations only but may unbound public resources for recovery aid to households and private enterprises. The 2014 EUSF reform places emphasis on the MS's compliance with the Union legislation on disaster risk prevention and management, as well as prevention policies to avoid similar disasters in the future.
EU legislation on disaster risk prevention and management	Implicit	The Union Civil Protection Mechanism facilitates cooperation and coordination in the field of civil protection, through systematic risk assessments and risk management planning among others. The Decision 1313/2013/EU on a Union Civil Protection Mechanism requires that, starting from 2015, an integrated threat and risk assessment report is compiled by Member States and submitted to the Commission. Article 122 of the TFEU empowers the Council to grant additional financial assistance, in spirit of solidarity, in the wake of extraordinary disasters.

Table 1 indicates that there are various ways through which the EU policies influence coverage and uptake of insurance; mainly through an implicit, indirect channel rather than through explicit regulatory measures.

[3] The Council Regulation (EC) No 2012/2002, amended in 2014, specifies major natural disasters as those having caused direct damage above 3 billion EUR (in 2011 prices) or 0.6 per cent of Gross National Income (GNI) of the country affected. Extraordinary regional disasters are those having caused damage above 1.5 per cent of the GDP at regional (NUTS2) level.

The objective of the EU regulation on insurance and reinsurance is to impose an upper limit on the probability that the annual losses exceed company's operating capital (EC 2009). This is aimed at enforcing insurance contracts and ensuring that insurers are solvent and pay what they owe in the case of an insured loss. In addition there are EU policies on competition and market operations, which drive private sector operations. Beyond this most rules are set nationally - such as insurance scheme licensing and taxation, as the UK and the Netherlands examples show (see section 4). In addition, states typically create guaranty funds, that provide at least limited benefits for claimants whose insurers have financially collapsed, either through public (e.g., Spain, France) or private (e.g., UK) reinsurance. This regulatory framework reduces uncertainty and provides a sound background for higher market penetration. Noteworthy, though, demanding legal frameworks may make the insurance against infrequent disasters with long accumulation processes non-attractive to insurers and reinsurers (Sugarman 2006). This may be aggravated by some national tax law rules that discourage premium collection without pay-outs (Paudel et al. 2012). Finally, even if insurable (e.g., solvency laws are properly balanced and tax exemptions are provided), premiums may be unaffordable or inequitable.

Policies in support of flood risk prevention can indirectly influence flood insurance, particularly those measures that succeed in reducing risk levels, improving data quality/availability and clarifying roles and responsibilities of stakeholders. The Water Framework Directive (WFD) and the Floods Directive (FD) are examples, credited with improved mapping of all water related risks, and holistic water management at the river basin (district) level. The WFD and FD contribute to a better appreciation of multiple risks, and a more effective coordination and management, such as upstream-downstream interactions and transnational cooperation in river basin authorities. Traditionally, flood risk management placed an emphasis on structural protection, although there is a growing awareness that this (alone) is not enough. Investing in, for example, flood protection infrastructure shows positive and increasing marginal costs, since more exposed areas are increasingly expensive to protect (Crichton 2008). In spite of this, engineering works have been previously implemented on the grounds of their significantly lower transaction costs (Garrick et al. 2013). However, recent climate projections indicate that flood hazard is on the rise in some regions (IPCC 2012; UNISDR 2012) at a moment when budgetary constraints have increased the opportunity costs (i.e., foregone benefits) of hard engineering in some countries. In addition, water protection- and retention infrastructure can lower risk perception and has resulted in a number of cases with concentrated populations, wealth and property values in highly exposed areas (EC, 2007), which often hold some comparative advantages (e.g., aesthetic values, better soils, strategic locations near ports). The EU Floods Directive is cautious about the negative downstream impacts that may arise in highly engineered rivers and encourages long term developments based on soft engineering, such as sustainable land use practices (EC, 2007) taking into account the entire river basin.

As a part of the *State Aid Modernisation* initiative (EC 2012), the Commission has revised and simplified both *de minimis aid* regulation and the *general block exemption regulation* (GBER). The reform of de minimis aid (EC 2013b) maintained the ceiling of €200,000 for each single

undertaking over a period of three fiscal years[4] irrespective of the form of aid and expressed as *net present value* if granted through periodic instalments. If granted in other than direct grant, such as soft loan or guarantee, the gross grant equivalent of the aid needs to be estimated. A subsidised loan up to €1,000,000 over a period of 5 years is possible under the revised de minimis aid rules if the loan is secured by collateral covering to the level of at least 50 percent of the loan. The Commission Regulation 651/2014 (EC 2014) exempted aid to make good damage caused by natural disasters from the obligation to notify the state aid, pursuant to the following conditions. *First*, the regulation declared 'earthquakes, landslides, floods (in particular floods brought about by waters overflowing river banks or lake shores), avalanches, tornadoes, hurricanes, volcanic eruptions and wildfires of natural origin' (*ibid*, recital 69 and Article 50(1)) as events constituting a natural disaster, while excluding damage arising from adverse weather conditions (frost, hail, ice, rain or drought). *Second*, the damaging event has to be recognized by competent authorities as a natural disaster, and a clear causal link needs to be established between the disaster and damage suffered. The total payments for making good the damage, including the payments under insurance policy, may not exceed 100 per cent of eligible damage costs. *Third*, the aid scheme has to be introduced within three years, and any aid granted within four years after the disaster. *Fourth*, the eligible damage costs include material damage incurred as a result of disaster and loss of income resulting from suspension of activity for a period of six months after the disaster event occurred. The damage assessment based on repair cost or economic value of the affected asset before the disaster should be certified by accredited experts or insurance undertaking.

The EU also offers direct assistance to MS in the wake of extraordinary natural disasters, including floods. The EUSF budget of €500 million(in 2001 prices), , down from one billion[5] under the previous regulation (EU Council, 2002), is limited to non-insurable damages and essential emergency and recovery operations[6]. The EUSF is not the only instrument available. The EU Union Civil Protection Mechanism (EC, 2013c) provides additional resources that can be mobilized for an extended cooperation across the MS in the field of prevention, protection and response to the natural hazard risk. Furthermore, the article 122 of the TFEU empowers the Council to grant additional financial assistance, in spirit of solidarity, to the MS '*threatened with severe difficulties caused by natural disasters or exceptional occurrences beyond its control*'.

Public compensation funds can create disincentives for risk reduction and transfer, as we show in the example of the Netherlands (see section 4), via a phenomenon known as 'charity hazard' (Browne and Hoyt 2000; Raschky, 2007). The provision of State Aid as a tool to compensate for flood losses can play a key role in terms of expectation by those at flood risk and willingness to buy of insurance. In the UK reliance on insurance is important to

[4] Except the road freight transport sector for which the ceiling is €100,000

5 The initial ceiling (1 billion Euro) up to which the EUSF can be mobilized was stipulated in nominal values, whereas under the 2014-2020 Multiannual Financial Framework (MFF) the ceiling (500 million Euro) is expressed in 2011 prices, and amounts to 541 million in current/2015 prices.

[6] Including infrastructure restoration in the fields of energy, water and waste water, telecommunications, transport, health and education; temporary accommodation and rescue services; preventive infrastructure and measures of protection of cultural heritage; and cleaning up disaster-stricken areas, including natural zones.

minimise damage and loss. In a historical context the possibility of the Government introducing a 'National Disaster Fund' in the early 1960s spurred on the industry to provide a private industry solution, a response to the worry that it would lead to a reduction in demand for catastrophe cover on the private market (Bek 2013).

In principle, State Aid to economic undertakings should be limited to the residual uncertainty, i.e. the flood risk that can not be effectively transferred or managed. Given the low probability of these events, insurance provision and DRR would not be affected by State Aid. In reality, though, the barriers to State Aid tend to fade after a crisis. This may be due to insufficient prevention, deficient insurance regulation, market penetration and even flaws in tort law design. In this case the State assumes the costs, sometimes using allotment mechanisms that may hinder competency (e.g., tax exemptions, debit write-offs, reduction of social security contributions) (OJ 2012). Since 2007, 34 ad hoc compensation schemes for flood damage were notified and approved by the EC for a total value amounting to €1,700 million (EC 2014). Although aiding communities can be morally laudable on the grounds of altruism and solidarity, this is neither equitable, because only a relatively small share of the EU is truly at risk, nor sustainable. The reason is that discouraged DRR coupled with climate change will likely increase in the future the already large impacts of natural disasters on the public budget.

Finally, competition law also shapes flood insurance. The proposed new Flood Re scheme is subject to EU rules as the proposed levy on insurance customers is seen as a de-facto tax, which is passed into the Flood-Re Pool (Defra, 2013). At the end of January 2015, the EC decided not to raise an objection against the scheme The EU rules on competition state that 'aid to make good the damage caused by natural disasters' is compatible with the requirements of the internal market (EC 2008) and as such State Aid designation for Flood Re can be expected to be reviewed by the EC on this basis.

What remains unclear is if and how the European policies outlined above influence design and implementation of flood insurance and how this in turn could drive a linkage of compensation and prevention.

4. The national context: the examples of the Netherlands and the UK

The above policy framework indicates how existing EU policies can send signals to influence national flood insurance provision. If and how this shapes the coverage and take-up, as well as the design of insurance is described through the cases of the Netherlands and the UK, both at opposing ends of the spectrum of flood insurance penetration in the EU.

4.1 The Netherlands

Flood risk management in the Netherlands relies strongly on hard engineering which is focused on flood protection infrastructure. This is a historically created situation in which

water managers have developed highly qualified flood protection systems with the highest safety standards in the world. A major storm surge in 1953, which flooded large coastal areas in the Southwest of the Netherlands (about 200,000 hectares), initiated a boost in technical innovations in flood protection measures. The Dutch government stated that a large storm surge flood should not happen again and, therefore, initiated the 'Delta Plan'. This plan led to the construction of the 'Deltaworks', which are comprehensive systems of dams, sluices, dikes, and storm surge barriers constructed between 1958 and 1997. As a result, low-lying flood-prone parts of the Netherlands are divided in 53 areas which have their own closed system of flood protection (so called "dyke-ring areas"). These flood defences are built high enough to prevent overtopping by extreme flood waters that occur on average between 1/10,000 and 1/1,250 years, although several areas near rivers remain unprotected or have lower protection standards.

The current safety standards in the Netherlands have been under discussion because of an increase in properties exposed to floods during the past several decades, which substantially increased potential flood damage (de Moel et al. 2011). Moreover, the projected increase in flood risk as a result of climate change could justify higher safety standards in some areas, or additional measures that limit potential flood damage (Kind, 2013). Although the prevention of floods will always remain the dominant strategy in Dutch water management policy, other measures have received increasing attention since high river discharges in 1993 and 1995 almost resulted in large-scale flooding in the Netherlands. Alternative strategies that are receiving increasing attention are the development of flood insurance, the flood-proofing of houses to limit damage during floods as well as soft engineering and spatial planning measures that limit potential flood damage (Kabat et al. 2005).

Standard home and home contents insurance policies in the Netherlands exclude coverage for damage caused by flooding. Flood damage can be partly compensated by the government via the Calamities and Compensation Act (WTS – *Wet Tegmoetkoming Schade bij Rampen en Zware Ongevallen* in Dutch), which has been in force since 1998. The WTS is an *ad hoc* compensation arrangement for which no funds have been established and, there are no clearly predefined rules about the criteria for which cases, and by how much, flood damage will be compensated. The cabinet needs to give separate approval to compensate damage of saltwater floods which are explicitly excluded from the WTS (Botzen et al. 2010). There is no legal obligation for the government to compensate flood damage, meaning that the government is not officially liable. Thus, it is uncertain whether households in the Netherlands will receive compensation for damage caused by flooding.

Over the last several years there has been debate about the desirability of the introduction of flood insurance. This debate has been motivated by a desire of the government to limit the financing of compensation for natural disaster damage from general taxes (Botzen et al. 2010), consumer demand for more certainty of flood coverage (Botzen and van den Bergh, 2012a,b), potential financial efficiencies of private instead of public compensation schemes (Jongejan and Barrieu 2008), and possibilities to use insurance with risk-based premiums to stimulate policyholders to invest in flood damage mitigation measures (Botzen et al. 2009). The extreme character of flood risk in the Netherlands with the uncertain potential for catastrophically high damages, implies that private flood coverage would be expensive relative to the expected value of flood damage (Paudel et al. 2013). Therefore, flood insurance

may be best offered in the form of a public-private partnership in which the government provides coverage for extreme flood risks, while insurance companies provide coverage for flood damage up to a certain maximum amount (Botzen and van den Bergh 2008; Paudel et al. 2014). The government can provide such coverage as State Aid, or act as a reinsurer meaning that the government receives compensation for this coverage by means of a premium that equals the expected value of flood losses covered. Discussions were ongoing between 2006 and 2010 amongst Dutch insurers and the government about introducing such public-private flood insurance, which were ended by the government. The official reason for this was that levying the premium for this compulsory insurance was regarded as undesirable during times of economic crisis.

In September 2012, a coverholder of Lloyd's introduced a catastrophe insurance policy in the Netherlands, which allows homeowners to purchase insurance coverage for flood damage bundled with earthquake and terrorism risks. From a DRR perspective, interesting features of this insurance are that it aims to raise risk awareness and charges risk based insurance premiums on which policyholders receive premium discounts if they take measure to "flood-proof" their home. Flood risk information is provided on the insurer's website on which individuals can enter their zip code level to access location specific information about flood probabilities, quality of flood defences, potential water levels, and the risk based insurance premium. Four different measures are eligible for a premium discount of 5% each: namely, installing electrical equipment and the central heating installation above the ground floor level, having flood shields available, and having a water-resistant floor on the ground floor level, such as tiles. However, this insurance is unlikely to result in broad insurance coverage of flood risks in the Netherlands, because it is only available for homeowners and not for tenants, its availability per dike ring area is limited, coverage is limited to €75,000 per policy, while the premium is relatively high compared with estimates of homeowner's willingness-to-pay (WTP) for flood insurance (Botzen and van den Bergh 2012a, b). For example, according to the Dutch Consumer Association (2012) the premium of the catastrophe insurance in flood-prone areas is about €200 per month, although the premium varies widely depending on the actual flood risk that the homeowner faces. Estimated demand curves based on the WTP derived from a choice experiment show that only a very small percentage of the households in flood-prone areas who own a house with a ground floor would be interested to purchase the policy for this premium (Botzen and van den Bergh, 2012b). However, this demand could be up to 50% if flood insurance premiums would be priced to the expected value of flood losses.

A broad flood insurance coverage could have been established by a proposal by the Dutch insurance union made in 2013 to introduce a flood insurance pool. All Dutch property insurers would compulsory contribute to this pool and offer flood coverage as part of regular property insurance policies of €250,000 and €25,000, respectively, for property and contents damages. This pool would cover up to a maximum of €5 billion of flood damages, meaning that the government could compensate damages exceeding this amount through the WTS, resulting indirectly in a public-private flood insurance arrangement. This proposal was rejected in June 2013 by the Dutch Authority for Consumer and Market because the compulsory character of the pool could limit competition in the Dutch insurance market (ACM 2013).

In summary, the characteristics of the Dutch flood damage compensation system have been very much influenced by local risk and economic characteristics, meaning that these local challenges are unlikely to be resolved by a European "one size fits all" natural disaster insurance solution. The government focus on flood prevention after the catastrophic 1953 North Sea flood has substantially lowered flood probabilities (Kabat et al. 2005), and created a situation in which the government is regarded as being liable for the compensation of flood damage once flood protection infrastructure fails (Terpstra 2009). Over the last decade the increased interest in introducing flood insurance has been partly complicated by the extreme low-probability/high-impact nature of flood risks in the Netherlands which results in relatively high premiums for limited commercial flood insurance coverage (Paudel et al. 2013) Proposed solutions for compulsory (public-) private flood insurance have been obstructed by concerns about limited competition in the Dutch insurance market and incompatibility with competition law (ACM 2013). European regulations that foster knowledge on flood risks could reduce uncertainty of flood insurance premium estimation and perhaps facilitate the creation of a flood insurance market. Moreover, improved insights on potential damage saving from flood damage mitigation measures and the effectiveness of insurance incentives for implementing such measures could help the design of a flood insurance system that integrates disaster risk reduction.

4.2 Flood risk management and insurance in the UK

Flood insurance in the UK is provided by private insurers as part of the home-insurance bundle. This has led to high insurance penetration rates: 91% for buildings (Defra 2013) and 74.9% for contents (ABI 2012), principally due to the need to have insurance when taking out a mortgage. However there remains a disparity amongst low income households, where only 29% have buildings insurance (Defra 2013). The role of mortgage providers in requiring owner occupiers to hold buildings insurance as part of their mortgage arrangement is another key factor for maintaining this high penetration rate and forms an important element within the arena of insurance provision.

The current UK flood insurance arrangement, an agreement termed the Statement of Principles (SoP), is based on a partnership approach to address flood risk (evolution of this approach can be seen in Appendix 3). It sets the foundations for flood risk management from government, as well as maintaining wide financial protection and risk transfer from the insurance industry. Despite its innovative nature, this approach was always considered as a temporary solution by the private insurers, as it was seen to distort the market and preventing specialist flood insurance providers to emerge (ABI 2008).

Under the SoP, the Government agreed to invest in flood defences, enhance planning regulation to prevent uncontrolled development in high flood risk areas, and increase transparency through improved flood risk data provision. In exchange the insurance industry committed to offer flood insurance to all homes up to a 1 in 75 year risk level. Pricing and conditions of cover were left to the private sector, which led to growing concerns about affordability of cover within government. Insurers on the other hand were increasingly unconvinced that government was doing enough to reduce flood risk. Particularly in times of public spending cuts, a heated debate about investment in flood risk

management arose - insurers expressed their disappointment to an announcement that government investment in defences was cut when taking into account inflation[7] (ABI 2010). This remains an extremely political issue: the lack of flood defence spending has been highlighted as a concern in the most recent flood event [December 2013- January 2014] (HM Parliament 2014). In addition it is unclear how effective efforts to reform the planning system have been. Some experts state that over the last 10 years still 13% of all new development (21,000 homes and businesses) has been built on floodplains (ASC 2012).

Between 2011 and 2013 industry and government investigated a new approach to the provision of flood insurance. At the outset the Government and the Association of British Insurers (ABI) listed guiding principles for a new insurance solution:

Table 2: Principles guiding flood insurance provision in the UK (Source: Defra 2011).

Principles
1. Insurance cover for flooding should be widely available.
2. Flood insurance premiums and excesses should reflect the risk of flood damage to the property insured, taking into account any resistance or resilience measures.
3. The provision of flood insurance should be equitable.
4. The model should not distort competition between insurance firms.
5. Any new model should be practical and deliverable.
6. Any new model should encourage the take up of flood insurance, especially by low-income households.
7. Where economically viable, affordable and technically possible, investment in flood risk management activity, including resilience and other measures to reduce flood risk, should be encouraged. This includes, but is not limited to, direct Government investment.
8. Any new model should be sustainable in the long run, affordable to the public purse and offer value for money to the taxpayer.

What reads as a wish list, based on expectations that stakeholders have towards flood insurance, it also shows that there are several trade-offs at play. Achieving all of those principles simultaneously appears almost impossible.

After more than two years of negotiations both sides have agreed to create a new flood insurance pool – termed Flood Re (Defra and ABI 2013), due to commence in summer 2015. Flood Re is based on households under low to normal risk issued with standard insurance provision with the free market, and high risk properties under the Flood Re pool. The subsidy for the latter is claimed from a levy taken from all policyholders and is approximately £10.50 per policy. The premiums offered for high risk households are fixed based on council tax banding and cover is offered at a set price, this is based on a particular threshold level for defining high risk, yet to be determined. The government proposal envisages that small businesses would not be covered by the Pool with several other exclusions including leasehold properties over a certain size and Band H properties.

[7] Over the previous four year spending review period (2007/8- 2010/11) the government allocated £2.562bn to flood and coastal defence and in the current spending period (2011/12-2014/15) the government have allocated £2.315bn. These figures are priced in real terms at based on 2012/13 prices.

However this latter is now subject to debate and several other technical aspects remain unclear, including the handling of flood losses beyond a suggested cap of 1 in 200 loss event. As such there remain several key points to operation and delivery of the new scheme that will be subject to agreement between insurers and government.

With regards to risk prevention the industry itself has pointed to the need for policies in support of insurance and risk reduction. This has been highlighted by the ABI's adaptation manifesto - Appendix 2, a call for public policies that aim at reducing climate risks (ABI 2007). This refers to the 'two-way-relationship' of insurance and prevention: Availability of cover, affordability and the role of private and public players and how they could be influenced by rising flood risk. While at the same time insurance could also steer prevention and flood risk reduction efforts by sending risk price signals. Risk reduction is not explicitly considered in the Flood Re scheme – an aspect that has triggered some criticism (Surminski and Eldridge 2015).

Within the UK, the devolved regions have developed their own approaches to transposing EU Directives into UK legislation. Examples of the Acts driving forward flood risk management include the Flood Risk Regulations 2009 and the Flood and Water Management Act 2010. The consequence of this legislation is improved risk management and mapping from all flood sources, including surface water flooding, the latter being initially highlighted by the 2007 flooding- of which two thirds was a result of surface water (Pitt 2008). In fact it was the consequences of this event that spurred action to improving flood risk management in England with the enacting of the Flood and Water Management Act 2010 (EFRA 2009). This is not unusual as a response to flooding, with national flood policy measures often considered somewhat reactive with legislation often brought into play after large flood events.
As flood mapping and modelling improves and becomes increasingly accurate and detailed to the property level, risk differentiation can be made to ensure better understanding of exactly which properties are at risk. This can be expected to continue to progress with an increased availability of data, particularly with a national database of property level risk being made available from the ABI to the government under the proposed new system (Defra and ABI 2013).

5. Perspectives on the way forward for flood insurance in Europe

The above sections have illustrated the existing EU policy framework as well as the national-EU interplay. Through the Netherland and UK cases it is evident that there are key national differences in how to address the existing lack of coverage and low uptake of insurance as well as the design aspects of insurance schemes, particularly for risk reduction. What does this imply for EU policy? In this section we reflect on recent discussions about how EU policy could help address the challenges at member state level. We first consider the debate triggered by the GP at EU-level (5.1), and then outline stakeholder perspectives, derived from a flood-insurance symposium hosted by the authors and attended by industry, policy makers and experts (5.2).

5.1 Reflections at EU level

Examination and scrutiny of flood insurance by EU institutions can be inferred from the EC's GP and the European Parliament's response. At time of writing the EC has not published its formal response to the GP consultation and it remains unclear what, if any decision will be made in this area.

With the publication of the GP in 2013 the EC kicked off the formal discussion. A key aspect considered in the consultation document is the role of EU policy in driving the development and implementation of disaster insurance schemes. The GP describes the lack of insurance as a sign of vulnerability (EC 2013a), and asks if EU-led action is warranted or desired to promote greater penetration rates. The GP outlines the need for maintain affordability and integrating DRR incentives when promoting disaster insurance. Additional features highlighted in the GP are insurance as a tool to minimize recovery time and to smooth income interruptions after disasters. The GP discusses the role of risk based pricing and raises concerns about the potential trade–off, as high risk based insurance premiums prevent low income groups from buying insurance. Mandatory insurance or risk bundling are some of the options considered in the GP as ways to support the development of disaster insurance across the EU.

The discourse triggered by the GP is predominantly focused on the question whether disaster insurance, including flood, should be harmonized across the EU or not. Responding to the GP and reflecting on the results of the public consultation exercise the European Parliament's states that insurance should remain voluntary and the market should remain as flexible as possible so that products can be tailored to local requirements. The European Parliament (EP 2014) took a critical view on the state-mandated insurance scheme hinted at in the GP and concluded that it is not prudent to harmonize disaster insurance. It declined the existence of a market distortion that could be rectified only through EU-wide intervention and rejected a 'one-size-fits-all' solution to low market penetration of flood insurance schemes across Europe. Instead, the EP called for tailor-made insurance products designed according to the type of risk; the country specific prevention and preparedness policies as well as capacity to respond to unfolding hazards should be favoured. Flexible insurance markets and voluntary underwriting are in the view of the EP more suited for insurance companies to develop appropriate products (EP 2014).

A recent opinion of the Advocate General Niilo Jääskinen in a similar although unrelated case (C-525/12, European Commission against Germany) suggests that the European Court of Justice (ECJ), in case of doubt, is more inclined to sustain the discretion of the Member States in choosing an (economic) policy instrument to meet collectively adopted policy targets. In this case, the European Commission referred Germany to the ECJ for a 'too narrow interpretation' of water services under the Water Framework Directive (WFD, 2000/60/EC). In the Commission's view, although the WFD makes it possible for the Member States to choose on which water services to impose the cost recovery requirement and to what degree, Germany has used this discretion to exclude all but two water services

(namely, the supply of water and the treatment of waste water) from the mandatory cost recovery regime. The ECJ (ECJ 2014) described the Commission complaint as ambiguous and underscored the Member States' discretion of choosing an economic or other instrument best suitable for the given purpose. This seems aligned with the position of the EP regarding disaster and flood insurance provision in the EU.
A further concern at EU level, as noted in the European Parliament's response, is the possibility of charity hazard whereby government-sponsored prevention (or compensation) lowers a citizen's incentive to protect themselves (see e.g., Hung 2009).

The European Parliament's response states that expenditure on prevention is more efficient than recovery expenditure. It calls on, member states to invest more in DRR, but also recognizes the need for promoting individual responsibility, for example through, risk pricing and disaster risk reduction incentives.
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The response from the EP is in line with the broader mood reflected in the GP-consultation's response: respondents display little appetite for harmonization of insurance practices, but advocate a stronger role for public-led DRR measures. Several responses to the public consultation support a greater degree of public investment in DRR, such as the Romania government or Aviva and the ABI from the private sector responses. The consultation responses arguing in favour of a greater role for public led DRR investment do not appear to be concerned with what body conducts the investment. Therefore, this offers the opportunity for the EU to undertake a leading role in facilitating investment in various DRR measures.

In the public consultation, the UK treasury responded that disaster insurance harmonisation is unwarranted; echoed by the Dutch, Finnish, Estonian, Czech and Spanish governments or governmental bodies (the majority of responses are from governmental bodies). Moreover, these responses acknowledged the role of insurance as an indirect incentive for DRR. The Spanish view differed slightly, based on its experience with the Spanish catastrophe insurance scheme, which is solidarity based: in its response to the GP the Spanish government argues that DRR is important for providing an affordable compensation mechanism, and establishes responsibility for DRR at the state level rather than for policyholders.

Private sector companies operating in the European insurance market also provided responses to the GP: they too called for a minimum of harmonization as this may stifle innovation in insurance products or not fit the tastes of consumers in specific markets. This stance is because the risk profiles of member states are different and require the free choice of market agents and market incentives to tailor insurance products and coverage to local needs. Not only are the risk profiles different between countries but so are attitudes towards risk and insurance, ranging from risk based (UK) to solidarity based (Spain).Moving from one approach to the other might not be politically acceptable within the local risk culture; for instance in Germany compulsory disaster insurance may not be reconcilable with existing norms. Therefore, the industry and national body responses indicate that the insurance market should have minimal EU interference, so that markets can offer what local customers want.

Taken as a whole the submitted responses to the GP indicate that there is little appetite for the EU to take a top-down approach regarding the provision of insurance because regional risk profiles and cultures are too different. Therefore, the responses indicate that the provision of insurance should remain in the hands of the member states.

At the same time a stronger EU role in terms of flood risk management may be feasible, with the EU facilitating flood risk management across different countries, as directly called for in the Polish government's response. Within the European Parliament's response, for example, it is stated that the best role for the EU is as a facilitator for spreading knowledge and providing better, international comparable and freely accessible data. This belief in the EU as a facilitator is an, almost, uniform statement in the public consultation responses. For example, the Czech government's response argues for a pan-EU platform for sharing risk information and personal experiences with flood risk management either in terms of direct access to this information or greater co-operation between stakeholders. Another common statement echoed across the responses, e.g. by ABI, ANIA, Aviva, Finland, Estonia, is that the various stakeholders should be encouraged to collect and share data on flood risk in a format that is easy to share across regions.Greater and more detailed information is seen as a key component of the insurance process. Another commonly called for role of the EU in flood risk management is research and risk modelling, as is reflected in the responses from Poland, Estonia, Finland. Here the focus is ona better understanding of the level of risks within the industry and governments, and an increased level of awareness of the general public.

5.2 Reflections from the Munich Workshop

The workshop organized by the authors brought together representatives from the insurance industry and academia and the EC (see Appendix 1). The overall view expressed echoed the perception that there is no one size fits all solution regarding insurance provision. Regional differences and cultures mean that a single style of insurance provision that is suitable across all regions of Europe may be impossible to find. Therefore, the responsibility should be left to national regulators and/or competitive forces to tailor insurance provision to local needs. Furthermore, the representatives present at the workshop agreed that DRR is key and should play a central role regarding both insurance and risk management.

Participants were asked to outline successes and failures in current efforts to promote flood insurance and to achieve a closer integration of DRR and insurance. Below is a summary of the responses. These should be considered as illustrative opinions – obviously skewed by regional expertise and information, as well as by the sample of workshop participants. Despite several efforts the workshop organizers did not succeed in involving national or regional decision-makers in the event. This is reflected in the discussion of proposed next steps (section 6). Several prominent topics of the workshop's discussion and their relative successes and failures are summarized in table 3.

Table 3: Areas identified as successes or failures regarding connecting insurance and DRR during the workshop

	Prominent topics of the workshop's discussion			
	Multi-stakeholder co-operation	**Risk management information**	**Disaster Risk Reduction**	**Risk awareness**

Success	Partnerships between the government and the insurance industry are moving beyond only risk transfer mechanisms. New elements to these partnerships include data sharing, climate change adaptation policies, spatial planning policy among others. There was a sense that a greater proportion of the dialogue between stakeholders is becoming more balanced and evidence based, with a degree of public scrutiny.	Better flood risk databases and risk simulation models are being developed across the various stakeholders. There also has been an improvement in data sharing across stakeholders.	Insurance has been effective at promoting risk in an industrial and commercial context. Insurance has also been playing a role in risk reduction investments in Hungary and Switzerland. There has also been significant increases in flood prevention investment in some areas.	There have been successful partnerships aimed at developing risk maps that are accessible to the public at risk. Examples of such partnerships are HORA in Austria and Zürs in Germany. HORA for instance creates and maintains up to date digital risk maps that allow individuals to view their own level of risk. HORA is also developing new methods of disseminating this information such as smartphone apps.
Failure	The political will to establish new flood insurance partnerships seems to be lacking (e.g. Austria and the Netherlands). There is a grace period after major events to act, but there is a lack of social capital to act upon. There is also a degree of short-termism in thinking, amongst stakeholders.	There is limited evidence on DRR incentives. There is also a lack of data on the cost-benefits of DRR measures. Moreover, the databases of insurers are not widely accessible to the general public	The lack of ownership over flood risk, and especially low probability-high impact events limits investment. There are often limits to the improvement of policyholder resilience due to using better construction materials/structural designs.	There has been a wide range of risk awareness campaigns before and after events. However, there is still a limited degree of risk awareness amongst the stakeholders at risk.

Following on from this initial outline of successes and failures the workshop focused on how to improve the linkages between DRR and insurance. Four key barriers were identified:

1. Challenge of multi-stakeholder co-operation: The first observation from the workshop's discussion was that it appears that it is hard for different insurance or DRR stakeholders to work together. For example, uncertainty over the roles that the various stakeholders would play combined with concern over the potential for mismatched incentives between the stakeholders are relevant in the Dutch example. Workshop attendees acknowledged that the Austrian HORA partnership could be seen as successful[8]. However, the discussion around HORA in part indicated a belief that the 'right people, at the right time' came together to make HORA successful. Such a belief limits the ability of the stakeholders to work together as it creates a sense of inevitability that new partnerships will not be formed. This view of inevitability was echoed several times by the participants. A final example from the workshop was the response to the Floods Directive, the submissions and the resultant lacklustre response. It was argued that general perceptions of flood risk might not be high enough to create a strong enough sense of urgency to act upon it. Beyond the immediate aftermath of a flood it appeared far too common to relegate flood risk management to a low priority. combined with the time that it takes to change behaviours, this creates a degree of institutional deadlock that prevents countries from altering their disaster insurance systems. Some workshop participants argued that the problems which impede the creation of new partnerships, such as public-private partnership insurance provision, are often compounded by the lack of clear responsibility and ownership: no one "owns" flood risk, and a wide range of bodies share responsibilities for different aspects of flood risk management, creating coordination problems and leading to inertia within current systems. There is generally not one governmental office that has responsibility for disaster risk management (or its aftermath) and so different aspects of risk management are allocated between different offices. For example, in England and Wales there are at least 7 bodies involved in risk management, while in Sweden there are 21 regional bodies which have flood risk management responsibilities integrated with planning policy potentially producing co-ordination problems for catchment areas that cross regional borders. The lack of a central coordinator for the various stakeholders involved in flood risk management strengthens the various barriers currently preventing better management of the problem. Moreover, the instability of political preferences about forming flood insurance partnerships also adds to deadlock. For example, in the Netherlands it was initially the government who took the initiative for discussions with the insurance sector to promote the insurability of flood risks (Botzen et al. 2010). However, later this was reversed with the government blocking public-private flood insurance. While there may be little appetite for the EU to aid directly in the creation of partnerships there may be room for the EU to assist indirectly. An example solution from the workshop is that if governmental responsibility for natural disaster risk was transferred to a single government office

[8] This is also considered to be the case outside of the workshop see, for example EXCIMAP (2007), ClimateWise (2012).

(e.g. chief risk officers) there would be a natural locus for the various stakeholders to converge upon.. However, whether granting 'ownership' to a single government agency would be successful at managing flood risk and potential partnerships was not touched upon during the workshop discussion. It is difficult to identify best practises of this h ownership because such centralisation is rare[9]. A body focusing on flood risk management may require a degree of independence from the political process to achieve a clear and transparent target regarding flood risk. This independence should allow the body to alter the nature of its tools fast enough to adapt to changing circumstances. Moreover, it may require a degree of authority over planning issues to control exposure growth since planning is an important source of changing risk (see de Moel et al., 2011; Rojas et al. 2013). Furthermore, the European Parliament's preferred role of the EU as a facilitator for information dissemination could also be useful by sharing information regarding best practice on how to bring together stakeholders and to prevent discussions from stagnating or by providing a neutral arbitrator.

2. Access to information: The second observation that the workshop identified as holding back insurance and DRR is information availability. The insurers present stated that they had a good foundation and improved technical understanding of risk but they were missing information on the socio-economic drivers of disaster risk. The differing accessibility of risk information across regions makes it hard to integrate data. . In addition, information on exactly how effective DDR measures are is often lacking making this difficult to reflect on when setting insurance premiums. The information the insurers, governments and other stakeholders require is an area that the EU could facilitate. For instance, the workshop proposed that the EU could promote a common way of investigating or mapping risk so that the information provided by the various member state bodies could be integrated. For example, the EU Floods Directive aims, in part, to produce such information, and the view of the workshop was that such regulations are very useful. Not only for providing information but for also forcing various stakeholders to work together to help overcome institutional deadlock.

3. DRR as a public good: Insurers at the workshop stated that while insurance can promote DRR indirectly via risk based premiums, DRR remains the role of the state. The provision of large scale DRR projects lowers risk and allows insurance to be affordable; potentially creating a virtuous-circle for DRR. During the workshop it was

[9] One example is FEMA in the USA. FEMA aims to oversee flood risk management via the National Flood Insurance Program (NFIP). Participation in the NFIP requires a community to undertake a minimum level of floodplain management, which contributes to DRR. The NFIP's mitigation activities have been able to reduce the losses suffered on average by a household (Leichenko 2011). However the actual uptake of insurance is rather low as was the ability of FEMA to restrain development in floodplains, while FEMA has limited resources to improve flood risk management in the entire USA (Michel-Kerjan, 2010; Michel-Kerjan et al. 2014). Moreover, improving sustainability of the NFIP in the light of increasing flood losses may be difficult due to the need to involve political action. Recent attempts to promote DRR by better differentiating flood insurance premiums according to risk, in part, have been rejected for political rather than risk management reasons relating to a potentially large increase in premiums

argued that the state should provide large scale DRR projects because the state can take into account the whole area at risk, the relevant planning rules, and access to finance.. Overall, DRR projects could generate side effects, such as lower premiums or shifting risk downstream. A single planning authority might be able to internalise the direct and indirect effects of DRR projects to maximise societal welfare. Moreover, the insurers present stated the opinion that their role is to provide incentives for DRR rather than actual investment in such projects. Therefore, there may be room for a potential planner to work with insurers to signal the areas where investment is most needed, i.e. areas with high premiums or limited coverage. The example of Swedish local governments was mentioned, highlighting the potential or integrated planning policy.. The EU may be able to facilitate member states with investing in DRR by helping to share information between member states regarding best practice and the relative merits of different DRR projects. A further way that the EU could facilitate DRR investment was discussed during the workshop and involved changing the role of the European Solidarity Fund (EUSF). Currently the EUSF can dispense aid if a country is affected by a disaster causing 0.6% of Gross National Income or €3 billion in damage. Participants argued that EUSF funding could reduce the financial pressure that disasters place on governments, which in turn can reduce the incentive of governments to invest in DRR projects. If the EUSF was converted to a mechanism for subsidizing investment in DRR activities it would provide an incentive for states to invest in DRR thanks to a movement away from an ex-post mechanism towards and ex-ante mechanism.

4. Risk based pricing: The final perceived barrier that the workshop discussed was the use of risk based pricing.Participants agreed that the use of risk based pricing is a required, but not a sufficient, condition for preventing moral hazard and incentivizing DRR. The participants noted that different approaches towards risk based pricing exist across Europe, often driven by concerns about affordability. Facilitating the spread of information regarding the benefits or weaknesses of insurance systems, based on different degrees of risk pricing, was seen as an important step for future work, providing member states and insurers more information about the mechanics of different insurance systems.

The workshop concluded with a discussion on the priorities for moving the flood insurance debate forward. There were several aspects of the discussion that featured prominently, some of which echoed the GP consultation responses. The first prominent aspect was a call for more information but with a more explicitly focus on the understanding of the economics of flood prevention, e.g. the costs and benefits of various risk reduction measures. Next, was a related priority in that any improved understanding of the economics of flood prevention should be presented in such a way that it is accessible to those outside of academia or research communities. This was seen as a tool to mobilize political support for investments or the creation of partnerships, which could help increase the viability or affordability of insurance. Moreover, when political support for funding an action is acquired these funds should be used for paying for preventive or damage mitigation measures rather than subsiding insurance premiums. The final priority for moving forward regards the difficulty of the various stakeholders in reaching an agreement. To overcome this barrier the

participants noted that a greater degree of openness regarding the potential costs and limitations of an agreement as well as the roles and responsibilities that each stakeholder is both willing and able to take on. This greater level of openness should be combined with a greater clarity of vision allowing the stakeholders to have an improved understanding of what the aims are and how to reach them.

6. Conclusion and reflection on next steps needed

In this paper we show how flood insurance differs widely in scope and form across Europe. Recent flood losses and the publication of the GP in 2013 have revived the debate about the future of flood insurance in Europe. While the question of supply and demand is at the core of the public discourse, we argue that another key dimension is often overlooked: how to use insurance as a lever for risk reduction and flood prevention efforts.

The current patchwork of public and private schemes is influenced by public policy – directly through regulation such as mandating cover or instigating the development of new schemes. And indirectly by providing the enabling infrastructure and environment, for example through a broad risk reduction framework, including building codes and better flood risk data provisions. The policy signals come from the EU, national and in some cases regional level – usually aimed at demand and supply of flood insurance, with affordability and the question of insurability as the key pillars of the debate.

However, the design and implementation of insurance schemes remains a national concern. Reflecting on the current debate about the future of flood insurance in the EU we find little appetite for harmonization of flood insurance arrangements across the EU. The wide variety of existing insurance schemes, as well as different supply and demand patterns, show that there is no 'one size fits all' solution. This is clear from the Netherlands and UK cases where recent developments in insurability of flood risk have been very different in part due to varying local risk, flood risk management practices, legal frameworks and political preferences.

6.1 What does this imply for EU policy?

In line with the reactions to the GP there seems to be little intention at the EU to embrace a top-down regulatory effort to harmonize insurance, and we conclude that this is not desirable either. However there is significant potential for a greater role of the EU in facilitating DRR or developing platforms for sharing and developing risk models, information and best flood risk management practices. We notice the need for enhancing the indirect influence that EU policy can have, for example through policies to improve flood risk information sharing and flood risk assessment. In fact there are some regulations already in place that open the door for other possibilities (and realities, in some cases). One is the introduction of economic instruments for DRR. There are many examples of this. Ungvári et al. (2013) and Mysiak et al. (2013) for example focused on controlled flood schemes under

which flood easement or servitude is designed as a compensable service to society. This combination of soft engineering and economic instruments is considered to outperform traditional policy making. In particular, it would avoid further river engineering with potentially negative impacts on downstream areas. This instrument departs from EU directives and initiatives, namely the WFD and more recent other texts (Flood Directive, Blueprint, etc.). So indirectly, EU actions are also promoting DRR through other means apart from conventional investments in flood protection infrastructures.

In addition, the EU is already using financial tools to promote the uptake of certain insurance policies. For example, in the new common agricultural policy 2014-2020, the EU supports the adoption of income insurance through a subsidy for these insurance policies. A similar approach could be used to support risk based pricing for flood insurance, as long as it respects the principles of affordability and equity. Such an approach is for example proposed by Kunreuther et al. (2011) to take the form of a flood insurance voucher program that helps affordability of risk based premiums for low income households.

The subsidy of income insurance in agriculture is justified because it saves money from other item lines, such as ex-post compensations that were common in the former CAP. Analogously, it could be argued that risk based pricing promotes DRR and therefore reduces potential expenses. For example, lower flood damage from DRR would reduce expenditures from the Union Civil Protection Mechanism or other relief efforts in line with the article 122 of the TFEU, meaning that contributions to these funds can decline. The economic rationale for this requires further study, but it is something within the reach of EU capacity.

In general there appears to be a preference against one-size fits all solution being imposed on member states by the EU. Rather the EU can act in a way that promotes an overarching objective but allows for a decentralised approach. This could in turn play a role in the design of new or reformed flood insurance schemes. Currently, the scale of flood risk and expected future risk trends are referenced, but do not seem to influence the design of schemes. However it is less clear which instruments could be used to achieve linking DRR with flood insurance and how this could be interwoven with efforts to maintain insurance affordability and availability.

The UK and the Netherlands cases both show that risk reduction and insurance are not closely integrated. Although the recently introduced catastrophe insurance policy in the Netherlands provides premium discounts for policyholders who take measures that mitigate flood risk, such links with DRR were not included in the national flood insurance solutions that were under discussion during the last decade. Reflecting on evidence emerging from other European and international flood insurance schemes, we notice that this is not an exception, but rather the norm. This reflection can be further supported by the observation from the Munich workshop in that the insurers did not see it as their role to directly provide DRR actions. The potential to use flood insurance as a lever for flood prevention is far from being exhausted. This is surprising, as flood prevention is likely to play a much stronger part in securing insurability and affordability of cover. Risk transfer alone, without consideration of risk reduction efforts, is not a sustainable solution going forward, particularly in the context of a changing climate.

6.2 How can further collaboration between academia, industry and policy-makers help?

The FP 7 ENHANCE project (www.enhanceproject.eu) aims at developing and analysing new ways to enhance society's resilience to catastrophic natural hazard impacts. It creates analyses and develops new multi-sector partnerships (MSPs) between public and private sectors, with emphasis on the financial sector. MSPs are understood as voluntary but enforceable commitments between partners from different sectors (public authorities, private services/enterprise and civil society), which can be temporary or long-lasting. They are founded on sharing the same goal in order to gain mutual benefit, reduce risk and increase resilience.

Flood risk management, DRR and Risk transfer is a focus research area of the ENHANCE project. Different case across EU member states provide suggestions of how to develop MSPS by, for example, improving risk information and novel risk management measures. The project also reflects on EU policies and the design of the Post 2015 Hyogo Framework for Action of UNISDR.

Progress in the area of DRR, flood insurance and MSPs, will depend on a mix of increased evidence and understanding of underlying risk issues, better collaboration of stakeholders and openness about limitations and costs. The issue spans many dimensions, which makes innovation and reform challenging for political decision makers and private companies. In order to improve the link with flood insurance and disaster risk reduction in the EU, future research should provide insight into several issues. Namely: local flood risk estimations and their implications for the differentiation of premiums according to local risks, the costs and benefits (avoided flood damage) of flood risk mitigation measures that can be implemented by policyholders and the performance of such measures under a variety of flooding conditions. In addition the effectiveness of insurance incentives, such as premium discounts, in stimulating policyholders to adopt flood risk mitigation measures including possible moral hazard effects of insurance coverage, and barriers for insurance companies to proactively stimulate policyholders to limit risks. For incentives to be successful they need to target those who can take action: While stakeholders have only limited direct control over the occurrence of a natural disaster, their actions determine the extent of losses during and after the event. Therefore moral hazard can occur at government level, where the existence of an insurance scheme may reduce the urgency to prevent and reduce risks, or at the insured level, where the purchase of insurance may lead to a false sense of security. In theory, risk-based pricing should help prevent moral hazard at the policyholder level and promote risk reduction behaviour. Evidence of how this works in practice is limited. Due to affordability concerns this may have to be linked to public financial support measures at least on a temporary basis.

The workshop discussion also highlights that there are several cases where information on the costs and benefits of flood risk management is missing. Therefore, there is scope for continued research, academic or otherwise, into the cost effectiveness of different flood risk management strategies, including an investigation of how responsive the various

stakeholders are to incentives. Once this research is carried out the findings should be presented in such a way that it is easily accessible.

Our stakeholder discussions show that there is evidence of a range of further activities conducted by the insurance industry to foster flood risk management efforts, but it remains unclear to what extent this is effective at household level and to what extent they could be scaled up if deemed a success. Other stakeholders may be needed to reflect on the risk reduction potential, such as property developers, home-builders and mortgage providers in the context of property insurance.

One other aspect deserving further consideration is the suitability of insurance as opposed to other mechanisms. It is important to recognise that insurance is not a solution for all flood risks, and it should always be considered in conjunction with other mechanisms that reduce disaster risks. For instance the tax system would offer a route to address some of these aspects, but this is often not deemed politically acceptable. Until today we know very little about the interplay between different compensation mechanisms and economic instruments for risk reduction.

The failure of attempts to involve several policymakers in the discussion at the Munich workshop is a direct example of the struggle to engage with national decision makers in this debate.. It may be expected that governments would benefit from more explicitly linking insurance with disaster risk reduction, because then insurance could act as a complement to existing government flood risk management policies. This is especially important given limited government budgets for investments to limit projected increases in flood risks as a result of climate change (e.g. Aerts and Botzen, 2011). However, experience shows that government involvement in this debate has not been very active. For example, in the Netherlands the flood insurance programs discussed between insurers and the government focussed on the complex issue of insurability of flood risks in the Dutch context, while the linking of flood insurance with (incentives for) risk reduction was not at the forefront of that debate.

6.3 Outlook

While our investigation focused on the rather narrow field of flood insurance, we believe that there are a range of parallels to other disaster risks, particularly in the context of climate change. The debate about flood insurance in Europe highlights the key challenges of managing current risks and preparing for future climate risks: At the core lies the issue of collective versus individual responsibility, and solidarity versus market based approaches. At EU level there is also the question of subsidiarity versus harmonization – is EU intervention needed to change the way flood insurance is provided across Europe? Flood insurance and DRR need to be closely linked and integrated. This is where the biggest potential for EU-led action lies – in the facilitation of DRR and adaptation, which will determine risk levels and viability of insurance going forward. However, the design and operation of insurance can also play a role in this. As the examples of the UK and the Netherlands show there are significant barriers facing public and private stakeholders. This

requires policy action – at EU and national, even regional level. The key question therefore is how to determine and define the roles of industry and policy-makers, recognizing that this is likely to differ from country to country. This is an area where closer collaboration between academia, industry and government is needed to proceed. This paper as well as the ENHANCE project as a whole are aimed towards this collaboration.

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Appendices

Appendix 1

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