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Partnerships for disaster risk insurance in the EU

Jaroslav Mysiak[1,2] **and C. Dionisio Pérez-Blanco**[1,2]

[1]Fondazione Eni Enrico Mattei (FEEM), 30124 Venice, Italy
[2]Risk Assessment and Adaptation Strategies Division, Euro-Mediterranean Center on Climate Change (CMCC), 30124 Venice, Italy

Correspondence to: C. Dionisio Pérez-Blanco (dionisio.perez@feem.it)

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Abstract. With increasing costs inflicted by natural hazard perils, and amidst state budget cuts, concerns are mounting about the capacity of governments to design sustainable, equitable and affordable risk management schemes. The participation of the private sector along with the public one through public–private partnerships (PPPs) has gained importance as a means of providing catastrophic natural hazard insurance to address these seemingly conflicting objectives. In 2013 the European Commission launched a wide-ranging consultation about what EU action could be appropriate to improve the performance of insurance markets. Simultaneously, the EU legislator instigated major reforms in the legislation and regulations that pertain to how PPPs are designed or operate. This paper has a dual objective: first, we review and summarize the manifold legal background that influences the provision of insurance against natural catastrophes. Second, we examine how PPPs designed for sharing and transferring risk operate within the European regulatory constraints, illustrated using the example of the UK Flood Reinsurance Scheme (Flood RE) between the state and the Association of British Insurers.

1 Introduction

Measured in terms of economic damage (compensatory) and losses (non-compensatory and uncompensated damages), natural hazard risk in Europe is high and tends to increase (EEA, 2010, 2012). Climate change, increasing population and economic growth are driving an upward trend in disaster losses. Many have argued that while the probability of the distribution of natural hazards is getting progressively more fat-tailed (i.e., catastrophic events are occurring more frequently), insurance markets alone will not be able to keep pace (Botzen and van den Bergh, 2008; Mills et al., 2006; Surminski and Eldridge, 2015). Simultaneously, the financial and economic crises in the European Union (EC, 2009a) and the subsequent sovereign debt crisis (Lane, 2012) in several countries of the Eurozone have sparked further concerns about state ability to finance disaster recovery and compensate damage where insurance is not available (EC, 2013b). The participation of the private sector along with the public one in meeting the great societal challenges has been increasingly advocated not only as an opportunity but as a sheer necessity (EC, 2014c).

Public–private partnerships (PPPs – see Appendix A for a list of the acronyms used in the paper), a term coined to describe the multiple ways in which the public and private sectors collaborate to provide a public service or project, have gained importance across OECD countries, notably in some EU member states (MS) such as the UK and Spain (Bielza et al., 2009; Maccaferri et al., 2012). PPP is a role model for a joint bearing of responsibilities and efficient risk sharing, for the purpose of increasing insurance coverage and penetration and guaranteeing a strong financial backing in view of uncertain tail distributions of risk (Johansen, 2006). PPPs are characterized by a long-lived relationship capable of bringing forth mutually beneficial resources and risk sharing arrangements (EC, 2004). The PPPs discussed in this paper address the provisions of natural hazard insurance for property owners and enterprises located in areas exposed to catastrophic events (low probability–high impact risks). While being in origin a private service, equitable and affordable insurance against low probability–high impact natural disasters may meet the scope of a "service of general economic interest", that is, a public service deemed by public authorities to be of

particular importance to citizens and that could not be supplied, or only under different conditions, except by public intervention.

Insurance offering individual protection against the risk of losses caused by various natural hazard is a part of disaster risk management (Baltensperger et al., 2008); complementary to rather than a substitution for risk prevention and protection. Insurance facilitates post-disaster recovery and helps to curb the economic and social impacts of disasters. To some extent the insurance may incentivize risk reduction (Surminski et al., 2015; Surminski and Oramas-Dorta, 2014) and facilitate the transition towards a resilient and adaptive society. However, commercial insurance does not guarantee affordability and equitable access to insurance (EC, 2013b). The inclusion of affordability and equity issues in the design of insurance against natural catastrophes expands the role of the public sector from regulatory oversight and residual risk management[1] to a combination of ex ante and ex post subsidization, with an active involvement in insurance design. Public intervention may also interfere with market equilibriums and undermine, rather than encourage individual risk reduction (Surminski et al., 2016). Managing the trade-offs between public policy objectives and market mechanisms poses serious technical, operational and coordination challenges (Pérez-Blanco and Gómez, 2014). Reconciling the public and private roles and objectives in the PPPs necessitates a thorough analysis and organization.

In 2013 and as part of the EU Climate Adaptation Strategy package (EC, 2013a), the European Commission (EC) launched a wide-ranging consultation (EC, 2013b) about what EU action could be appropriate to improve the performance of insurance markets. The responses received cautioned against uniformizing the regulation on natural hazard insurance across the EU (EC, 2014c). Both the uneven-distribution of hazard risk and the diversity of economic standing and requirements of the customers have been brought up by the UK government, and echoed by others, as reasons against an EU intervention (HM Treasury, 2013). Consequently, uniform regulations could harm innovation and competition in insurance products. The Dutch government emphasized that a concerted EU action in this policy area was neither warranted nor in line with the subsidiarity principle of EU governance (Netherlands Government, 2013). The European Parliament (EP) expressed an analogous opinion (EP, 2013) while underlining that flexible markets should operate in a non-mandatory framework and that no one-size-fits-all solution would serve the magnitude of different risk and economic conditions in Europe. At the same time, though, the EU legislation and regulations pertaining to the operation of PPPs not only for (catastrophic) natural hazard insurance was reformed. Some of the reforms were explicitly designed to improve the provision of insurance, such as the Solvency II Directive. Other reforms revisited the overarching set of norms on competitiveness within the EU, such as the reform of public procurement and concessions, and state aid regulation. Coincident with responses to the EC consultation, these reforms do not seek to uniformize the regulation on natural hazard insurance across the EU, but they do define a common regulatory background and a common set of alternatives to choose from.

Illustrated by the example of the UK Flood Reinsurance Scheme (Flood RE) we explore how PPPs designed for sharing and transferring risk operate within the European regulatory constraints. Flood RE enables access to eligible households to affordable insurance in areas prone to high flood risk. It embodies an innovative example of sensible trade-offs between the market insurance mechanism and public policy objectives (equity, affordability), expected to provide support to some 350 000 households (Jongman et al., 2014; Surminski and Eldridge, 2015).

This paper has a dual objective. First, we review and synthesize the EU regulatory framework that influences the provision for insurance against natural catastrophes (Sect. 2). We concentrate on the regulations regarding public procurement and concessions, state aid, solvency, solidarity and civil liability. Second, we explore a recent example of public–private partnership for disaster insurance provision (Flood RE) and examine how the EU regulatory framework shaped the design of the scheme (Sect. 3).

2 EU regulations shaping the public–private partnerships for disaster insurance

This section reviews the EU legal background that governs the framework in which PPPs for (catastrophic) natural hazard insurance develop, including the recent regulatory changes. Table 1 provides an overview of the EU regulations that influence the provision of (catastrophic) natural hazard insurance. These regulations, along with the instruments that accompany and underpin policy implementation (such as consultation documents, EC policy statements or communications), are discussed in detail in Sects. 2.1–2.5. In Sect. 2.1 we address EU policies behind public procurements and concessions; in Sect. 2.2 we discuss the EU state aid regulation and recent changes of de minimis aid and General Block Exemption Regulation for making good the damage caused by natural disasters; Sect. 2.3 is dedicated to solvency regulations; followed by a review of the EU transnational solidarity provisions for extraordinary natural disasters, including the solidarity clause in Sect. 2.4; and an overview of liability regimes in Sect. 2.5.

[1] Residual risk falls in the tail end risk; it is the uninsurable risk with very small though unpredictable likelihood and potentially high though unpredictable damage. This uncertainty may be too high for private insurance markets to develop without public support, and it lies in the origin of PPPs for insurance provision.

Table 1. European Union legislative and regulatory framework for (catastrophic) natural hazard insurance. Regulations listed below can be consulted through the links provided in the reference list.

Subsection	Name (in-text citation)	Main influences
2.1. Public procurements and concessions	Treaty of Functioning of European Union (EC, 2005a)	Categorizes PPPs as either public contracts or public concessions.
	Directive 2004/18/EC (OJ, 2004a)	Details a flexible procedure to preserve competition between economic operators but also to make it possible for contracting authorities to open a dialogue to discuss all aspects of the contract with the chosen candidates (competitive dialogue).
	Directive 2014/23/EU (OJ, 2014b)	Defines legal criteria for the participation of private enterprises in PPPs through service concessions.
	Directive 2014/24/EU (OJ, 2014c)	Revises rules for public procurement within the competitive dialogue.
	Directive 2014/25/EU (OJ, 2014d)	Directive 2014/24/EU also introduces the concept of innovation partnership for the development of innovative products, services or labor not already available on the market.
2.2. State aid to make good the damage caused by natural disasters	Council Regulation (EC) no. 659/1999 (OJ, 1999)	State aid to make good the damage caused by natural disasters is admissible, provided there is (i) timely notification and (ii) no objection from the EC.
	Treaty of Functioning of European Union (EC, 2005a)	Selective state aid that can potentially distort free-market competition is incompatible with the EU market. Observes the exceptions in Council Regulation 659/1999.
	Council Regulation (EC) no. 994/98 (OJ, 1998)	Exempts categories or levels of aid from the notification requirement stipulated in Council Regulation 659/1999.
	Council Regulation (EU) no. 733/2013 (OJ, 2013b)	Revises and simplifies both de minimis aid regulation and the General Block Exemption Regulation in the context of the State Aid Modernisation initiative.
	Commission Regulation (EU) no. 651/2014 (OJ, 2014a)	Exempts state aid to make good damage caused by natural disasters from the notification requirement, under some conditions.
2.3. Solvency	Directive 2009/138/EC (Solvency II) (OJ, 2009)	Codifies and uniformizes insurance regulations across the EU and replaces 13 previous EU directives. Primarily focuses on margin requirements to limit the risk of insolvency.
	Directive 2014/51/EU (OJ, 2014e)	The so-called Omnibus II Directive complements the Solvency II Directive by operationalizing the roles of the European Insurance and Occupational Pensions Authority.
	Commission Delegated Regulation (EU) 2015/35 (OJ, 2015a)	Defines and adopts the implementing rules for Solvency II.
	Commission Implementing Regulation (EU) 2015/498 (OJ, 2015e) Commission Implementing Regulation (EU) 2015/499 (OJ, 2015f) Commission Implementing Regulation (EU) 2015/500 (OJ, 2015g) Commission Implementing Regulation (EU) 2015/462 (OJ, 2015d) Commission Implementing Regulation (EU) 2015/460 (OJ, 2015b) Commission Implementing Regulation (EU) 2015/461 (OJ, 2015c).	First set of Solvency II implementing regulations, which lays down implementing technical standards regarding supervisory approval procedures for undertaking specific parameters (OJ, 2015e), ancillary own funds (OJ, 2015f), matching adjustment (OJ, 2015g), special purpose vehicles (OJ, 2015d), internal models (OJ, 2015b) and joint decision on group internal models (OJ, 2015c).
	Commission Delegated Regulation (EU) 2016/467 (OJ, 2016)	Amends regulatory capital requirements in Solvency II for some categories of the assets of insurance and reinsurance companies.
2.4. Solidarity	Treaty on European Union (OJ, 2012)	Considers solidarity among the essential values on which the EU is based.
	Treaty of Functioning of European Union (EC, 2005a)	Invokes solidarity and cooperation between MS in the face of natural and manmade disasters; empowers the council to grant additional financial assistance to MS facing severe difficulties as a result of natural disasters.
	Council regulation (EC) no. 2012/2002 (OJ, 2002a)	Establishes the EU Solidarity Fund, which provides financial support to MS and candidate countries suffering the consequences of natural disasters of large magnitude (and establishes criteria to define under what conditions the fund shall be mobilized).

Table 1. Continued.

Subsection	Name (in-text citation)	Main influences
2.4. Solidarity	Regulation (EU) no. 661/2014 (OJ, 2014g)	Modifies the criteria to mobilize the EU Solidarity Fund to render it more transparent. Reduces the annual budget by 50 %.
	Regulation (EU) no. 513/2014 (OJ, 2014f)	Establishes the instrument for financial support as part of the Internal Security Fund. The fund provides additional resources for extended cooperation across MS in the field of prevention, protection and response to natural hazard risk.
	Decision no. 1313/2013/EU (OJ, 2013c)	The Union Civil Protection Mechanism provides additional resources for extended cooperation across MS in the field of prevention, protection and response to natural hazard risk. Makes it compulsory for MS to report, every 3 years starting from 2015, on risk assessments at the national or appropriate subnational level and risk management capabilities.
2.5. Liability	Regulation (EC) no. 864/2007 (Rome II) (OJ, 2007)	Specifies rules on cross-border contractual, non-contractual and pre-contractual obligations in situations where there is a conflict of law.
	Regulation (EC) no. 593/2008 (Rome I) (OJ, 2008)	
	Directive 2004/35/CE (OJ, 2004b)	Regulates torts that involve environmental damage, under specific conditions.

2.1 Public procurements and concessions

PPPs are not defined directly by EU legislation and regulation. However, in the context of the Treaty of Functioning of European Union (TFEU), PPPs qualify either as public contracts or public concessions (EC, 2005a). While public contracts and partly public work concessions were long regulated by secondary community legislation, until recently the public service concessions were only subject to TFEU rules and principles of transparency, equality of treatment, proportionality and mutual recognition. The "Commission interpretative communication on concessions under Community law" (EC, 2000) provided some clarity of the concept and guidance for public authorities in selecting a concessionaire but did not disperse the legal uncertainty. In 2004, the EC carried out a public consultation on whether a concerted action was needed to uniformize the rules governing PPPs (EC, 2004). Based on the feedback and comments received, the EC decided, among other things, to (i) not pursue a new piece of legislation addressing all contractual PPPs; (ii) explore the scope of a policy filling the regulatory gap with respect to the public service concession (later materialized through Directive 2014/23/EU, see below); and (iii) develop an interpretative communication on IPPPs (EC, 2005a). Directive 2014/23/EU (OJ, 2014b) and the revised rules for public procurement (directives 2014/24/EU and 2014/25/EU) (OJ, 2014c, d) provide greater legal certainty for the participation of private enterprises in PPPs through service concessions. The set of rules rely on the "competitive dialogue" scheme introduced in 2004 (OJ, 2004a). The competitive dialogue enables public authorities to negotiate alternative means of fulfilling its needs and identifies the most appropriate solutions. The major development introduced in the reform is the concept of "innovation partnership", which grants similar flexibility for the development of innovative products, services or labor not already available on the market (OJ, 2014c).

Contractual PPPs embrace the "concessive model" (OJ, 2014b). The public service concession means that a contracting entity (public partner) entrusts a provision of public service to a contractor (private partner) according to predetermined terms of reference, whereas the remuneration of the service is covered by charges levied on the users of that service, sometimes supplemented by public subsidies. The public work concession, however, implies that the contractor is chosen to carry out and administer an infrastructure (e.g., water supply network) and is remunerated by users of that infrastructure, which may be supplemented by payments from the contracting entity. This specific means of remuneration – that is, the right to exploit the work or service – is essentially what distinguishes classic public service or work contracts (in which the pecuniary compensation to the contractor is borne directly by the contracting entity) from a public service or work concession. This right, however, also implies that the operational risk of not being able to recover the investment costs is borne essentially by the contractor and only to some extent by the contracting entity.

Institutionalized public–private partnerships (IPPPs) are entities established for delivering public works or services that are "held jointly" by public and private partners (EC, 2004). The joint entity is responsible for delivering the work or service for the benefit of the public. This is close to the French NatCat and the Spanish Insurance Compensation Consortium (ICC) systems. In both cases, insurance against natural hazards is mandatory (linked with a base policy) and funded via a flat rate surcharge on the insurance premium collected by private companies. Under NatCat, the French

state co-manages the insurance fund (setting additional premiums, establishing deductibles and declaring the state of natural catastrophe), offers reinsurance (through the state owned *Caisse Centrale de Réassurance*) and channels part of the resources into a state-managed fund for the development of prevention and protection instruments. Under the Spanish system the ICC provides direct insurance against natural hazards on a subsidiary basis if the coverage is not explicitly assumed by a private company or the company cannot meet its indemnification obligations. As a result, premium surcharges vary widely, from 0.008 to 0.021 % of the insurance premium in Spain and from 6 to 12 % in France (Maccaferri et al., 2012).

2.2 State aid to make good the damage caused by natural disasters

Regular financial support by the public sector is supplied through ex ante (e.g., subsidies on risk premiums) and/or ex post (e.g., public reinsurance or recovery aid) subsidization, in compliance with national and EU regulations (Maccaferri et al., 2012). State aid on a selective basis that distorts (or threatens to distort) free-market competition is, according to Article 107 of the TFEU, incompatible with the EU's internal (single) market (EC, 2014a). Clause 2(b) of the same Article made reference to "aid to make good the damage caused by natural disasters" that was admissible, provided that any intention to grant similar aid is (i) promptly notified to the EC (Article 108 TFEU) and (ii) the EC raises no objection (Article 4 of the Council regulation 659/1999) (OJ, 1999). Without prior notification, any aid not otherwise exempted (see further ahead for the exemptions from the notification requirement) is not permitted, and any aid that has already been provided unlawfully may be revoked. The regulation applies solely to state aid granted to economic undertakings, and any compensation of disaster damage to individuals (citizens) not associated with the pursuit of any economic activity does not constitute state aid in the sense of Article 107 of the TFEU.

Council regulation 994/98 (OJ, 1998), amended in 2013 (OJ, 2013b), empowered the EC to declare some categories or levels of aid compatible with the internal market and hence exempt from the notification requirement. These provisions are known as group exemptions and de minimis aid. As part of the State Aid Modernisation initiative (EC, 2012b), the EC revised and simplified both de minimis aid regulation and the General Block Exemption Regulation. The categories for which block exemptions can be applied were substantially extended in 2013 to include, among others, aid for making good damage caused by natural disasters and aid making good damage caused by certain adverse weather conditions in fisheries (OJ, 2013b). The reform of de minimis aid (OJ, 2013a) maintained a ceiling of EUR 200 000 (EUR 100 000 for the road freight transport sector) for a single undertaking over a period of 3 fiscal years, irrespective of the form of aid and expressed as net present value if granted through periodic instalments. If granted in other than a direct grant, such as a soft loan or a guarantee, the gross grant equivalent of the aid needs to be estimated. A subsidized loan of up to EUR 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 up to at least 50 % of the loan.

As for making good damage caused by natural disasters, Commission Regulation 651/2014 (OJ, 2014a) exempted aid from the obligation to notify the state for aid, pursuant to the following conditions. First, the regulation declared "earthquakes, landslides, floods (in particular floods brought about by the overflow of riverbanks or lake shores), avalanches, tornadoes, hurricanes, volcanic eruptions and wildfires of natural origin" (OJ, 2014a) as events constituting a natural disaster, while excluding damage arising from adverse weather conditions (frost, hail, ice, rain or drought). Second, the damaging event must be recognized by competent authorities as a natural disaster; a clear causal link needs to be established between the disaster and damage suffered; and the total payments for making good the damage, including the payments under insurance policy, may not exceed 100 % of eligible damage costs. Third, the aid scheme must be introduced within 3 years, and any aid must be granted within 4 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 6 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 only case on record in which the EC decided to initiate a formal investigation refers to non-notified aid schemes granted by the Italian government in the aftermath of the 1990 Sicily earthquake, the 1994 floods in Northern Italy, and the 2009 Abruzzi earthquake (SA.33083/SA.35083) (EC, 2012a, c). The form of aid included suspension, deferral or payment in instalments of taxes and compulsory social security and occupational insurance contributions by undertakings located in the disaster affected municipalities. Following the Eastern Sicily earthquake on 13–16 December 1990, the payment of taxes and contributions for years 1990–1992 was deferred until the 2000s and subsequently reduced to 10 % of the amount due. Similar aid was granted in the aftermath of the November 1994 flood in Northern Italy for the years 1995–1997 and the April 2009 Abruzzo earthquake for the years 2009–2010. In 2007 and 2010 the Italian Supreme Court of Cassation ruled that the reduction of taxes and contributions granted ought to be applied to all undertakings who could have claimed the same right, to avoid unjust disparity of treatment. The EC enjoined Italy to suspend any aid under these schemes and opened a formal investigation.

2.3 Solvency

EU efforts to define a common framework that regulates the ability of insurance companies to meet their liabilities go back to the 1970s. Substantial modifications were adopted through the new generation of insurance directives in the 1990s, first giving ground to the Solvency I Directive (OJ, 2002b), and later Solvency II. The Solvency II Directive 2009/138/EC (OJ, 2009) codified and uniformized insurance regulations across the EU, primarily focusing on margin requirements to limit the risk of insolvency, and replaced 13 previous EU directives. The newly added regulations included authorization, corporate governance, supervisory reporting, public disclosure, risk assessment and management, as well as other aspects of solvency and reserving. The implementation of the Solvency II directive was overseen by the European Insurance and Occupational Pensions Authority (EIOPA). Directive 2014/51/EU (Omnibus II), approved on 11 March 2014, complemented Solvency II by operationalizing EIOPA's scope, which included (i) defining the role of EIOPA in uniformizing technical approaches for calculating technical provisions and capital requirements; (ii) defining the areas in which EIOPA can propose technical standards; and (iii) defining the role of EIOPA in settling disagreements between national authorities (OJ, 2014e). The implementing rules for Solvency II were adopted by the EC on 10 October 2014 (OJ, 2015a). The first set of Implementing Regulations was adopted in March 2015 and deployed technical standards on supervisory approval procedures for undertaking specific parameters (OJ, 2015e), ancillary own funds (OJ, 2015f), matching adjustment (OJ, 2015g), special purpose vehicles (OJ, 2015d), internal models (OJ, 2015b), and joint decision on internal group models (OJ, 2015c). The Solvency II project is divided into three areas or "pillars" (OJ, 2009, 2015a): quantitative basis (Pillar 1), qualitative requirements (Pillar 2) and enhanced reporting and disclosure (Pillar 3).

Pillar 1 focuses on quantitative solvency in two ways: (i) it addresses how insurers value their liabilities and assets and (ii) it specifies the amount of resources insurers need to have on hand to make sure they are solvent and able to pay eventual claims by policyholders. For the former, Solvency II introduces EU-wide uniformized valuation standards. In the latter case, two thresholds are established: Solvency Capital Requirement (SCR) and Minimum Capital Requirement (MCR). The SCR is the capital that guarantees that the insurance company will be capable of meeting its obligations during a 12-month period with a probability higher or equal to 99.5 %. It is calculated by means of a standard formula or (only under regulatory approval) an internal model. The MCR represents the capital threshold below which the regulator has the insurance company intervene. It is calculated as a linear function of specified variables and cannot fall below 25 %, or exceed 45 % of an insurer's SCR. Regulatory capital requirements for the assets of some categories of insurance and reinsurance companies were amended on 30 September 2015 (OJ, 2016).

Pillar 2 addresses how the structure and management of insurance businesses are governed, enabling insurers to identify, measure, monitor, manage and report risks to which they are exposed. In particular, it comprises (i) the Own Risk and Solvency Assessment (ORSA), a decision-making tool that continually assesses the solvency needs related to the specific risk profile of the insurance company; (ii) a risk management system that quantifies and models risks, not limited to a contribution to the ORSA and also including involvement in asset-liability management, risk mitigation arrangements, etc; and (iii) a supervisory review and intervention, including an independent internal audit function.

Pillar 3 specifies what information insurers report on their business and how it is reported. Some reports are public and anyone can see them, while others are privately reported to the financial regulator. Insurers are required to publish details of the risks facing them, capital adequacy and risk management. Enhanced reporting and disclosure provides transparency and open information that help to assist market forces in imposing discipline on the industry.

Solvency II sets a broad, unique and transparent regulatory framework for insurance provision and solvency assessment. Predefined solvency thresholds (Pillar 1), homogeneous assessment methods (Pillar 2) and consistent reporting (Pillar 3) offer a sound basis to accurately identify and address the need for public support in the provision of insurance against low probability–high impact risks. However, Solvency II introduces additional restrictions to insurers as compared to previous regulations (e.g., increasing the cost of long-term investments). Some of these restrictions affect the ability of insurers to extract returns from collected premiums, increasing the opportunity cost of the insurance activity (OJ, 2009). This may result in higher premiums and demand further public support to keep affordability constant (or otherwise result in higher losses), thus transferring part of the solvency burden from the private to the public sector.

2.4 Solidarity in the wake of extraordinary natural disasters

The Treaty on European Union (TEU) considers solidarity among the essential values on which the EU is based, values that include respect for human dignity, freedom, democracy, equality, rule of law and respect for human rights (Article 2) (OJ, 2012). Chapter IV (Articles 27–38) of the EU's Charter of Fundamental Rights is entirely dedicated to solidarity (social and economic) rights and justiciable civil and political rights (O'Leary, 2005). The former include, among others, social and territorial cohesion (Article 36) and environmental protection, as well as improved environmental quality (Article 38). The TFEU substantiates the solidarity principles through Articles 174–175, 196 and 222. Article 174 recognizes (actions meant to strengthen) economic, social and

territorial cohesion as vital for harmonious development. Article 196 stipulates cooperation between MS to improve risk prevention, protection and response to natural and manmade disasters.

Article 222 of TFEU (the "solidarity clause") invokes solidarity, in the most explicit way (Myrdal and Rhinard, 2010), in cases of a terrorist attack or a natural or manmade disaster. The scope of the solidarity clause includes the land, sea and air of the EU territory, ships in international waters and airplanes in international airspace, as well as critical infrastructure such as off-shore oil and gas installations under the jurisdiction of a member state (Myrdal and Rhinard, 2010). When requested by a member state, victim of a disaster or a terrorist attack, the EU is bound to "mobilize all the instruments at its disposal, *including its military resources*" (emphasis added). The declaration (37) on Article 222 of the TFEU, however, leaves the choice of the "most appropriate means" to comply with the solidarity obligation to the MS. The solidarity clause complements, or offers alternatives to, the mutual defence clause (Article 42(7) of TEU) which compels aid and assistance in the case of armed aggression.

The European Union Solidarity Fund (EUSF), created in 2002 (OJ, 2002a) and amended in June 2014 (OJ, 2014g), translates solidarity into the form of financial aid to EU member and candidate countries experiencing "serious repercussions on living conditions, the natural environment or the economy" following a natural disaster (OJ, 2014g). Attempts to extend the scope of the fund to manmade disasters (EC, 2005b) have so far been unsuccessful. According to the newly revised rules, the EUSF can be mobilized in cases in which the direct damage exceeds EUR 3 billion (in 2011 prices) or 0.6 % of the country's gross national income (GNI), whichever is lower, or if the damage at the regional (NUTS2) level exceeds 1.5 % of that region's gross domestic product (GDP) (1 % for outermost regions). A neighboring member state or accession country that is affected by the same disaster can also receive aid, even if the amount of damage does not reach the threshold. The EUSF has an annual budget of EUR 500 million, down from a billion under the previous regulation (OJ, 2002a). The aid is limited to non-insurable damages and essential emergency and recovery operations, 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. The recent EUSF reform responds to some weaknesses identified previously in EC (2009b, 2011, 2013c) with respect to the rapidity of the aid and the transparency of the criteria allowing mobilization of the fund.

The EUSF is not the only instrument available. The EU Internal Security Fund (OJ, 2014f), established in April 2014, and the resources endowed to the new EU Civil Protection Mechanism (CPM; OJ, 2013c) provide additional resources that can be mobilized for extended cooperation across the MS in the field of prevention, protection and response to natural hazard risk. Furthermore, Article 122 of the TFEU empowers the Council to grant additional financial assistance, in a spirit of solidarity, to MS "threatened with severe difficulties caused by natural disasters or exceptional occurrences beyond its control".

Coordination of EU solidarity instruments listed above, along with MS own security policies and strategies. is implemented through the EU's Internal Security Strategy (ISS) adopted in 2010 (EC, 2010b). The risks posed by natural and manmade hazards are targeted by the ISS along with organized crime, terrorism, cybercrime and management of the EU's external borders. Solidarity is exhibited between MS "in the face of challenges which cannot be met by MS acting alone or where concerted action is to the benefit of the EU as a whole" (EC, 2010c). The ISS sets to, among others, "increase Europe's resilience to crises and disasters". This comprises crises and disasters including those associated with climate change, requiring "both solidarity in response, and responsibility in prevention and preparedness" (EC, 2010b). The ISS emphasizes multi-hazard risk assessment covering all natural and manmade disasters. In the pursuit of this goal, the EC elaborated its "Guidance on risk assessment and mapping" (EC, 2010a) and a "Synthesis cross-sectoral assessment of major natural and manmade risks" (EC, 2014b), the latter based on the National Risk Assessment (NRA) reports produced by 17 MS and Norway. The newly revised CPM regulation (OJ, 2013c) has introduced an obligation for all MS to report, starting from 2015 and every 3 years thereafter, on risk assessments at the national or appropriate subnational level and risk management capabilities (Article 6 of Decision 1313/2013/EU).

2.5 Civil and environmental liability

The reparation of disaster losses caused or exacerbated intentionally or through negligence or omission that damage rights or protected interests of others can be granted through civil liability. Damages for which third parties are held liable are excluded from the eligible damage in the state aid regulation and the solidarity aid. The established liability systems across the EU MS differ substantially in taxonomy and structure (von Bar and Drobnig, 2004). The German civil code, for example, associates general liability for fault with cases where the wrongdoer has infringed a legal right of the victim (Wagner, 2009). Vice versa, the scope of English tort law is based on the duty of care. English and Irish Common Law distinguish some 70 torts, among which the most important ones for our purpose are trespass, negligence, breach of statutory duty and nuisance (von Bar and Drobnig, 2004). An example of nuisance is a use of land which causes damage or interference with another's use and enjoyment of his/her land. Under English and Irish Common Law's "common enemy doctrine" a landowner is empowered to defend his land

from diffused surface waters, for example by improving the drainage system, while increasing the volume of discharged water on lower property. In contrary, the German "civil law doctrine" subjects landowners to flowage easements for natural drainage patterns. Hence the landowners cannot alter the drainage pattern of their own land in a way that increases the discharged water on the lower properties of others. The "reasonable use" doctrine is a compromise between the two, in the sense that while some alteration of natural drainage patterns is necessary, it is only lawful if conducted in a reasonable manner and the utility of drainage outweighs the gravity of resulting harm to others.

The EC backed the development of the Common Frame of Reference (CFR), primarily in the contract law, as a collection of common principles, terminology and model rules to be referred to by the EU legislator (EC, 2003). The Draft Common Frame of Reference (DCFR) (von Bar et al., 2009) was conceived as a legal experts' response to the EC quest – an attempt to uniformize European private law. Book VI of the almost 5000-page compilation addresses non-contractual liability arising from damage caused to another. The term "non-contractual liability" is neutral in language used in common law civil law systems, making reference to the incidence of damage being the only connection between the damaged party and the party held accountable. The European Group on Tort Law produced in 2005 an alternative compilation of guidelines aimed at uniformizing European tort law, the Principles of European Tort Law (PETL) (European Group on Tort Law, 2005). It defines damage as a "material or immaterial harm to a legally protected interest" (Art. 2:101), while the accountability for the damage is given either by a fault or by abnormally dangerous activity (Art. 1:101). The so-called Rome Regulations (OJ, 2007, 2008) specify rules on cross-border contractual, non-contractual and pre-contractual obligations in situations where there is a conflict of law.

An exception to the above is liability for damage caused to the environment, addressed by the Environmental Liability Directive (ELD; 2004/35/CE). The ELD (OJ, 2004b) was adopted in 2004 but applies only to activities that have caused environmental damage after the full transposition of the directive into national legislative frameworks (i.e., 30 April 2007). The ELD does not supplant civil liability, insofar as only damage caused to the environment (i.e., protected species and habitats, water and land) is comprised. Consequently, personal injuries, damage to property or economic losses incurred to third parties are not taken into consideration, as they are subject to of civil liability claims. Environmental damage caused by "a natural phenomenon of exceptional, inevitable and irresistible character" (Article 4) is exempted from the scope of the directive. The ELD holds liable both physical and natural, private and public persons. In line with Article 191(2) TFEU committing the environmental damage rectification "at source" and by polluter, the ELD obliges those who exercise or control occupational activities causing environmental damage (in the sense of Article 2) to (i) adopt preventive and remedial measures and (ii) inform competent authorities. The EC commissioned several reports analyzing the ELD transposition by MS, definition of biodiversity damage and possible revision of the Annex III activities (BIO Intelligence Service, 2013, 2014; BIO Intelligence Service, Stevens & Bolton LLP and Cardiff University, Naider and TME, 2013; Milieu Ltd. and IUCN, 2014; Stevens & Bolton LLP, 2013). The possible changes include imposing strict liability on activities currently under a fault-based liability regime, extending the scope of the environmental damage to the air; a stricter regulation of the financial security and guarantees; and establishment of an industrial fund.

3 Flood RE: public–private partnership for flood insurance in the UK

Private flood risk insurance in the UK has a long tradition, and coverage of residential properties is among the highest in Europe (Maccaferri et al., 2012). Housing insurance typically covers a portfolio of risks, in addition to floods, and is compulsory for securing mortgage loans. Public–private cooperation in the flood insurance sector started in the 1960s and gradually evolved into a partnership entailing tangible commitments on both the public and private sides. Studies have examined in detail how the market has developed over the past (Ball et al., 2013; Lamond et al., 2009; Penning-Rowsell et al., 2014; Penning-Rowsell and Priest, 2014). In 2013, the UK government selected the Flood RE as the preferred approach for ensuring that affordable flood insurance provision was maintained for properties exposed to high flood risk (DEFRA, 2013). The scheme replaced the previous deal embodied in the Statement of Principles (SoP), the latest of a series of informal agreements between the UK government and the Association of British Insurers, which expired in 2013 (Horn and McShane, 2013; Surminski and Eldridge, 2015).

The core framework of Flood RE was laid down in the 2014 Water Act. The UK government conducted public consultation on the regulation of the scheme between July and September 2014. Later the same year the UK government notified the EC on the state aid enclosed in the scheme. The EC issued a favorable opinion in January 2015 (EC, 2015). The operational regime of the scheme was detailed in secondary legislation (the Flood RE Regulations on Scheme and Scheme Administrator Designation and the Flood RE Regulations on Scheme Funding and Administration) released in March 2015 and approved by the UK Parliament in November 2015 (FR Regulation, 2015a, b).

From the beginning the scheme had been designed as a publicly accountable but privately owned and managed, non-profit service organization. Public supervision was implemented by enabling legislation, monitored by the Department of Environment, Food and Rural Affairs (DEFRA); by su-

pervision through financial regulators (Prudential Regulation Authority, Financial Conduct Authority); and by the National Audit Office review of economy, efficiency and effectiveness of resource use, as well as regularity and propriety in management. The scheme administrator is held accountable to the UK Parliament for the operation of the Flood RE scheme.

The ownership and management of the scheme is entirely in the hands of the insurance industry, with the government having a limited membership role. This also includes a delegated power to call on a supplementary (top-up) levy or contribution, as explained later. Annual liability of Flood RE is limited to around GBP 2.5 billion, equivalent to 1 : 200-year loss scenario (Horn and McShane, 2013). The government has no financial liability for the scheme. In its response to the 2014 consultation the UK government stated, along with its previous informal commitments, that "should flooding occur on a scale greater than 1 : 200 event, Flood RE and the government will decide how to best respond, as part of a wider response to what would be a national emergency" (Edmonds, 2016).

The Flood RE scheme is a reinsurance mechanism for flood components of housing policies. The commercial insurers are free to choose whether to reinsure the written risk on the market or cede the flood-risk component of housing policies to the scheme at predetermined, capped prices. In the latter case, any and all damage claims will be paid by the scheme and the primary insurers continue acting as a broker. The capped premiums are higher on average than those previously paid but lower than prices otherwise charged on the free market (Diacon, 2013). The capped prices for 2016 are specified by regulation (FR Regulation, 2015b), and for successive years updated by the consumer price index (CPI) and revised every 5 years.

The Flood RE scheme is funded by an annual statutory levee set at GBP 180 million for the first 5-year period that is imposed on all home insurers operating in the UK (relevant insurers). The total amount of the primary levee was decided as an equivalent level of current cross-subsidy, which amounts to an estimated GBP 10.5 per household. In addition, the scheme administrator can raise supplementary (top-up) levees or contributions in cases where it does not possess sufficient resources to meet its non-reinsured claims. A call on additional contributions exceeding GBP 100 million in any given year, except for the initial capitalization, is linked to a duty to report to the Secretary of State. The primary and top-up levees are distributed among the major insurers in proportion to their market shares. These are obliged to provide information that makes it possible to determine the individual amounts due. Figure 1 presents the instruments used to short-circuit the link between damages and losses in the context of residential flood insurance in the UK and describes the roles of, and interaction between, the UK and EU legislative backgrounds for the case of the Flood RE scheme.

The UK government notified the EC of its plans to set up the Flood RE and asked the EC to review its compatibility with internal market rules under Article 107(3)(c) TFEU, i.e., as aid pursuant to developing economic activities or economic areas where this "does not adversely affect trading conditions to an extent contrary to the common interest". State aid is proven if (i) the aid granted to enterprises qualifies as a state resource and (ii) confers a selective advantage that (iii) may distort market competition and (iv) affect cross-border trade. The EC realized that the Flood RE scheme exemplified a selective advantage to the scheme administrator benefiting from the statutory and top-up levees qualified as state resources. In other words, both levies are compulsory and non-returnable, not unlike taxes. The levies are imposed selectively on insurers operating in the non-life, housing property insurance market. The primary insurers also benefit from the scheme and were consequently understood as recipients of state aid. Vice versa, the reinsurers contracted by the scheme administrator, seeking to transfer an upper layer of the risk portfolio so as to hedge against insolvency, have not been found to benefit from state aid. The EC also recognized a tangible threat of the scheme to distort market competition in the UK and influence cross-border trade (EC, 2015).

In its review, the EC has addressed the criteria of appropriateness, necessity, proportionality and minimization of competition distortions. Generally, the EC recognized the goal of ensuring affordable insurance against flood risk as a legitimate scope of public policy and accepted the motivation for setting up the scheme as well as the underlying assessment of the baseline, with no action taken by the UK government. Table 2 summarizes EC's findings using information from the EC's decision text (EC, 2015).

In terms of appropriateness, the EC appreciated that Flood RE will promote free flood insurance market and will rectify market failures that might or eventually would compel insurers to stop providing insurance coverage in some areas or only at high prices that would not be affordable by all households. The EC has not considered either of these outcomes acceptable. Furthermore, the EC acknowledged that Flood RE has been designed to minimize the (competitive) advantage granted to insurers and that the threshold above which insurers will be able to cede the premiums to the Flood RE scheme will be set in a way that limits the market intervention to only around 2 % of domestic insurance policies. The risk of insolvency for Flood RE is counteracted by the authority conferred to raise additional contributions or levee from all insurers eligible to carry out home insurance in the UK. For all these reasons the EC maintained that Flood RE was both appropriate and necessary.

As for proportionality, the EC recalled that the scheme is limited to 2 % of the household market prone to the highest risk and that this limit will be safeguarded by the very principles that make the scheme legitimate. The exclusion clause (along with the rules explained earlier) and the 5-year revision of Levee 1 will limit the risk that is transferred to the scheme. Furthermore, the fact that the amount of the pre-

Table 2. Summary of the European Commission's findings under the review of the Flood RE scheme. The EC's decision text (EC, 2015) can be consulted through the link provided in the reference list.

What qualifies state aid	European Commission opinion
Aid is granted through state resources.	The primary and top-up levees are compulsory and imposed by the legislator from state resources. The scheme administrator and the participating insurance undertakings are recipients of state resources and state aid. Policyholders are individuals and hence not subjects of the state aid regulation. Risk premiums ceded to the scheme voluntarily by the insurers do not constitute state resources. Reinsurers contracted by the scheme administrator through market procurement are not recipients of state resources and hence not granted any advantage.
Selective advantage	Flood RE provides selective advantage to the scheme administrator.
Cross-border trade	Flood RE will affect trade between MS as the scheme administrator reinsures its own risk on international reinsurance markets, and it will compete with other non-UK reinsurers in providing flood reinsurance.
Distortion of competition	Flood RE may distort competition

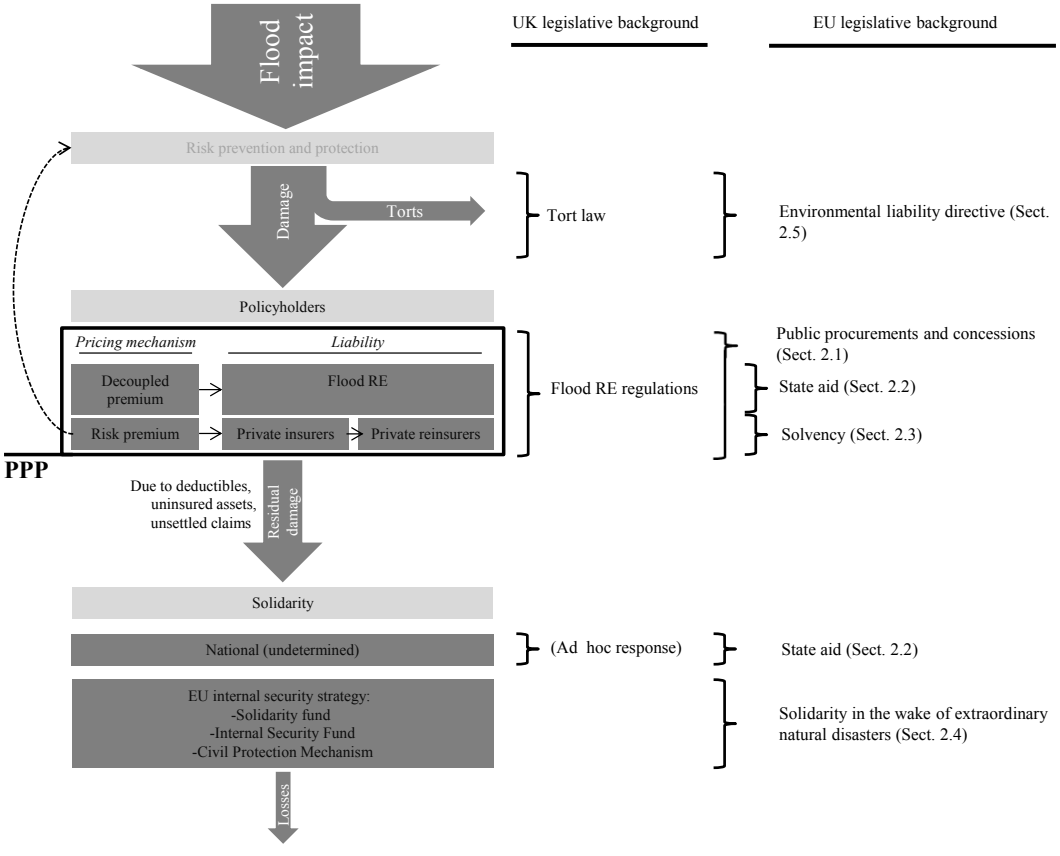

Figure 1. Schematic overview of the Flood RE scheme and related UK and EU regulatory backgrounds. Horizontal layers signify the instruments used to short-circuit the link between impact, damages and losses (grey vertical arrows). The dashed line represents the link between risk-based pricing and disaster risk reduction. The square with the thick outline frames the public–private partnership (PPP). The two columns to the right summarize the relevant UK and EU legislative framework and regulations per layer, and the section of the paper where they are discussed.

mium transferred is differentiated by the Council Tax band and inflation-adjusted on the basis that CPI has contributed to a positive outcome of the EC's review. As a result, the EC felt that the scheme was proportionate to its objectives.

Concerning the possible distortions of competition and the negative effects on trade, the EC found that Flood RE would have limited impacts. This is so because the scheme will be open to all (non-life) insurers operating on the UK market, and all participating companies will be required to pay the levee. More importantly, the scheme is designed as a transition measure and will be phased out after 20–25 years. During this time, the UK government will improve flood defence, ensure risk-sensitive development planning and contribute to better risk awareness through diffusion of flood risk assessments and maps. Finally, the scheme administrator will not be permitted to extend its activities to other market segments. In its final judgement the EC found that the scheme was "appropriate, necessary and proportional, and that it has limited negative impact on competition and trade between member states", and consequently the EC adopted the decision "not to raise objections" (EC, 2015).

4 Conclusions

We have reviewed and summarized the European Union's legislation and regulations, paving the way for private insurance against natural hazard risk and crafting options for PPPs in the wake of natural catastrophes. We have focussed on (i) public procurement and concessions, (ii) internal market regulation of insurance and solvency, (iii) state aid for making good the damage caused by natural disasters, (iv) the European Union Solidarity Fund and transnational disaster prevention and response policies and (v) civil and environmental liability.

Directive 2014/23/EU on the public concession contracts, along with the revised rules of public procurement, has contributed to a greater legal certainty and flexibility in the design of PPPs, especially the public service concession, which accounts for an estimated 60 % of the partnership programs in Europe. The reconfirmed competitive dialogue and newly introduced innovation partnership in public procurement regulation provided opportunity to develop innovative and well-tailored partnership schemes where existing marketable products are either not available or not suitable for the given purpose; this is the case of the equitable and affordable insurance provision for property owners and enterprises located in areas exposed to low probability–high impact risks, with the fewest effects of distorting competition.

The insurance partnerships in which the state plays a role as a partner have to comply with solvency requirements even if operating under state guarantee. It is in the public's interest to render the guarantee transparent in terms of state aid regulation, assessed in terms of gross grant equivalent. A sound risk analysis and assessment is an essential prerequisite and a preferred theme to be addressed in PPPs. The reformed General Block Exemption Regulation has no bearing on public–private ventures but makes it easier to develop alternative state-administered or supervised schemes of economic recovery in the aftermath of a disaster. This may encourage the MS to leave the door open for direct grants or other parallel forms of economic aid to citizens and enterprises, within the margins of the EU Stability and Growth Pact.

With the example of Flood RE in the UK, we have examined the compatibility of PPPs with the EU market competition regulation. The scheme preserves a free-market approach for residential properties situated in areas exposed to low to medium risks. The households exposed to high flood risk can accede to flood insurance via Flood RE, essentially a non-profit flood reinsurance fund owned and managed by the insurance industry, subsidized through a levy taken from all policyholders. Because this levy constitutes state resources, the UK government notified the EC and the scheme underwent a regulatory review. The EC found the scheme "appropriate, necessary and proportional" and attested a limited negative impact on competition and trade. Importantly, the Flood RE has yet to define the strategy for the transition to full risk pricing after the scheme expires and to avoid disincentives for risk reduction (Surminski et al., 2015).

The review of the EU policies in Sect. 2 highlighted a set of requirements that are essential for designing PPPs for (catastrophic) natural hazard insurance in the EU context. The partnerships should be designed so as to address market failures such as lack of or a limited access to affordable insurance and low insurance penetration. In doing so they should as far as possible limit market distortion and preserve competition. Ideally, private insurers (should) "have the opportunity to carry on using their savoir faire in an environment of mutual understanding" (Johansen, 2006). The PPPs should be shaped through constructive dialogues (between public and private entities) and conscious of mutual principles and limitations. The partnerships should actively promote or at least not harm the incentive for risk reduction, for example by making the individual insurance costs reflect those risks that result from each individual's choices (e.g., rewarding with lower premiums behaviors that reduce exposure and vulnerability and penalizing actions that go in the opposite direction). They should be built on principles of transparency and equal treatment, as in the case of public procurements. Sound risk analysis and efficient use of public resources are equally important principles and preconditions of successful PPPs.

Appendix A: Acronyms list

Acronym	Definition
CFR	Common Frame of Reference
CPI	Consumer price index
CPM	Civil Protection Mechanism
DCFR	Draft Common Frame of Reference
DEFRA	Department of Environment, Food and Rural Affairs
EC	European Commission
EIOPA	European Insurance and Occupational Pensions Authority
ELD	Environmental Liability Directive
EP	European Parliament
EU	European Union
EUR	Euro
EUSF	European Union Solidarity Fund
FR	Flood RE
GBP	Pound sterling
GDP	Gross domestic product
GNI	Gross national income
ICC	Insurance Compensation Consortium
IPPP	Institutionalized public–private partnership
ISS	Internal security strategy
MCR	Minimum capital requirement
MS	Member states
NRA	National risk assessment
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organization for Economic Cooperation and Development
ORSA	Own Risk and Solvency Assessment
PETL	Principles of European Tort Law
PPP	Public–private partnership
SA	State Aid
SCR	Solvency Capital Requirement
SoP	Statement of Principles
TEU	Treaty on European Union
TFEU	Treaty on the Functioning of the European Union
UK	United Kingdom

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