

# Coping with floods: impacts, preparedness and resilience capacity of Greek micro-, small- and medium-sized enterprises in flood-affected areas

Coping with  
floods

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Antonis Skouloudis

*Department of Environment, University of the Aegean, Mytilene, Greece*

Walter Leal Filho

*Research and Transfer Centre "Sustainable Development and Climate Change Management" (FTZ NK), Hamburg University of Applied Sciences, Hamburg, Germany and Department of Natural Sciences, Manchester Metropolitan University, Manchester, UK*

Georgios Deligiannakis

*Department of Natural Resources Management and Agricultural Engineering, Agricultural University of Athens, Athens, Greece*

Panagiotis Vouros

*Department of Environment, University of the Aegean, Mytilene, Greece and Department of Accounting and Finance, University of Thessaly, Larissa, Greece*

Ioannis Nikolaou

*Department of Environmental Engineering, Democritus University of Thrace, Xanthi, Greece, and*

Konstantinos Evangelinos

*Department of Environment, University of the Aegean, Mytilene, Greece*

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## Abstract

**Purpose** – This paper aims to investigate aspects of flood experience, attitudes and responses of micro-, small- and medium-sized enterprises (MSMEs) in Greece and to indicate a typology of strategies associated with their relative effort to build flood resilience capacity.

**Design/methodology/approach** – A qualitative study protocol was used, based on pertinent literature that considers how business entities withstand, adapt and/or recover from non-linear climate change impacts, natural hazards and extreme weather. Data was obtained by conducting semi-structured interviews with 82 MSMEs' owners-managers who had recently experienced flooding.

**Findings** – The study reports limited activities of MSMEs towards flood resilience capacity despite the threat of relevant disasters. Findings suggest that most owners-managers of these enterprises are not adequately preparing their businesses for the impacts of flooding.

**Research limitations/implications** – The findings call for multi-level and dynamic perspectives to be examined in assessing MSME resilience capacity to floods. It is attitudinal, managerial, organisational, behavioural and regulatory (as well as other institutional) factors that merit further investigation. Such an investigation would allow a better understanding as to whether these factors hinder or enable conditions for microeconomic flood preparedness and resilience as well as how they may interact with each other or create feedback loops.

**Practical implications** – The study carries managerial implications and policy recommendations in terms of nurturing opportunities towards awareness-raising campaigns for reducing deficits in managerial knowledge and competencies. It also encapsulates practical implications in terms of emphasising supporting mechanisms from key institutional stakeholders to allow MSMEs scan available options they have in effectively reinforcing the business premises from the forces of rising waters.

**Originality/value** – Most of the related studies have examined flood impacts, responses and/or resilience capacity at the household- or community-level. Empirical work that is conducted to ascertain how MSMEs cope with flooding remains thin on the ground. In response to this, the current study and the typology of MSMEs' strategic postures that are suggested seek to contribute to this under-researched topic.

**Keywords** Flooding, Micro-, small- and medium-sized enterprises, Resilience, Qualitative study, Greece

**Paper type** Research paper

## Introduction – background

Flooding is undeniably the most frequently occurring type of natural disaster. Of a total of 10,320 natural disasters that took place globally during the past 30 years (1990–2020), approximately 42% were floods [Institute for Economics and Peace (IEP), 2021]. Such extreme weather events can be recurrent and extremely hazardous, causing substantial damages and severe socio-economic interruptions, usually aggravated by rapid urban growth/expansion and aggressive land use change (Duy *et al.*, 2018). Researchers have examined flood impacts and resilience capacity at individual (i.e. household) and collective (i.e. community) levels, but empirical work conducted to ascertain how micro-, small- and medium-sized enterprises (henceforth MSMEs) [1] cope with flooding is burgeoning but still thin on the ground (Samantha, 2018; Miceli *et al.*, 2008; Xiao and van Zandt, 2012).

While enterprises can be essential socio-economic units that nurture and promote adaptation to environmental perturbations (Averchenkova *et al.*, 2016; Crick *et al.*, 2018; Linnenluecke and Griffiths, 2015; Eleftheriadis and Anagnostopoulou, 2017), it is well established in the literature that MSMEs tend to fall short in terms of resources and skills to prepare for, withstand and recover from weather extremes such as floods (Biggs *et al.*, 2012; Hall, 2006; Reynolds, 2013; Howe, 2011; Chaliha *et al.*, 2012). This is despite the MSMEs' importance to socio-economic development at various scales (i.e. local, regional, national and international) and that, in general terms, they are characterised by increased vulnerability and exposure to environmental stressors. Supporting arguments for this claim can be found

in [Piotrowski \(2006\)](#), who indicates that disruptive events are largely overlooked in the business management curriculum and the priority setting of business practitioners, as well as in [Spillan and Hough \(2003\)](#), who report that relevant planning receives scant attention in small(er) enterprises and mainly in a reactive manner, following the occurrence of a catastrophic event.

Compared to their larger counterparts, MSMEs operate with much smaller cash reserves, primarily depend on local customers, can be found located in non- or semi-engineered buildings and usually do not possess backup resources (i.e. spare assets and capabilities) in cases of emergency ([Zhang et al., 2009](#)). These enterprises tend to lack the know-how to design and implement business continuity management systems, making them susceptible to operational interruptions, asset damages and mechanical failures from floods ([Crick et al., 2018](#); [Howe, 2011](#); [Marks and Thomalla, 2017](#); [Reynolds, 2013](#)). As [Reynolds \(2013\)](#) indicates, “[...] lacking access to the capital and resources of large corporations, small businesses can suffer lasting economic damage as a result of a single extreme weather event” (p. 3). Supporting arguments for this claim are also found in [Kreibich et al. \(2011\)](#), who studied the flood resilience of German small business entities and reported that more than half of the sample firms were particularly unprepared for flooding. In this respect, a relatively recent report suggests that 66% of 1,200 surveyed UK small- and medium-sized enterprises (SMEs) have been impacted by extreme weather events in recent years, with flooding being primary. In this regard, more than 75% of microenterprises did not have a formal resilience plan of any description in place, while the economic burden of such perturbations is estimated to reach £7,000 per enterprise [[Federation of Small Businesses \(FSB\), 2015](#)]. While such an amount may be considered low, from a MSME point of view, it can significantly deteriorate organisational planning and even pose threats to the viability or survival of the firm.

For this study, we define organisational flood resilience capacity as the ability of an enterprise to anticipate a flood event, withstand using preventive actions, quickly recover to a functional state and engage in adaptive measures after a flood disaster ([Gilbert, 2010](#); [Lhomme et al., 2013](#); [Sorensen et al., 2016](#)). Indeed, the continuity of organisational activities after a low probability, high-impact event (such as flash floods) reflects an array of challenging tasks. Firms (MSMEs) with increased resilience capacity to flooding are better prepared to address related challenges and rebound from adversity in a strengthened and more resourceful way. However, they also contribute to sustainable development and increased competitiveness, since equipping business entities to confront such environmental perturbations and unexpected changes enhances their competitive advantage and improves the development options of future generations ([Linnenluecke et al., 2012](#); [Sheffi, 2007](#); [Moore and Manring, 2009](#)). [Folke et al. \(2010\)](#) point out that environmental perturbations “[...] open up opportunities for re-evaluating the current situation, trigger social mobilisation, recombine sources of experience and knowledge for learning, and spark novelty and innovation” (p. 5). In this respect, [Aldunce et al. \(2015\)](#) indicated that disasters (such as extreme floods) open up new possibilities for innovation and change management adjustments through learning. In contrast, those business entities lacking awareness of how to prepare or who are not planned for unexpected weather extremes will experience significant downtime losses or (eventually) cease operation.

Understanding the ability of European MSMEs to increase their resilience to floods is of utmost importance, as they account for 99.8% of all for-profit entities in the European Union (EU), they contribute with approximately 53% to the total value added of the EU business sector and provide approximately 65% of the private-sector jobs in the EU Member States [[European Commission \(EC\), 2021](#)]. In this respect, the policy of involving every stakeholder

(including key actors of the small business sector), beyond those pertaining to the government level, is deemed to be essential to reduce such impacts and has been highlighted in disaster risk reduction plans and policy [Federal Emergency Management Agency (FEMA), 2011; Clark-Ginsberg, 2020]. Thus, scholars have pinpointed the need for more primary research on the MSMEs-extreme weather events (EWEs) debate to gain a better understanding of key vulnerability points, aspects describing their resilience capacity and drivers of (mal)adaptive behaviours (Howe, 2011; Schaer and Kuruppu, 2018). Likewise, numerous scholars have attempted to develop conceptual frameworks and analytical lenses for understanding the enabling conditions that allow enterprises to be resilient over EWEs and floods in particular (Berkhout *et al.*, 2006; Linnenluecke *et al.*, 2011; Linnenluecke *et al.*, 2012; Linnenluecke *et al.*, 2013).

Conducting a systematic literature review, Vakilzadeh and Haase (2021) attempt to unpack the critical factors that drive organisational resilience in terms of anticipation, coping and adaptive capacity towards adversity. Their analysis indicates that the anticipation of external disturbances relates to environmental scanning, resilience planning and leadership behaviour. Successful coping with adversity entails relational, financial, technological as well as emotional resources, specific leadership attributes, organisational culture and innovation. Lastly, Vakilzadeh and Kaase point out that adaptation, taking place after successfully overcoming an unexpected adverse situation, necessitates fruitful organisational learning and internal transformative processes of change management that, in turn, enhance the organisation's resilience potential against unforeseen threats.

Drawing from the dynamic capabilities and organisational routine theoretical lenses, Neise and Diez (2019) present an array of strategic responses to flooding:

- Proactive strategy: flood impacts are reduced through coordinated and long-term actions and plans. Proactive firms are characterised by sophisticated approaches to flood risk mitigation and invest in technological measures such as early warning systems. Consequently, these organisations embrace new knowledge and the development of new risk-anticipation skill sets, while they are open to adopting flexible routines and innovative techniques to reduce flood exposure.
- Relocation strategy: identified as a last resort option when all other management plans are found to be ineffective. Firms choosing to relocate have the financial resources required, are often under increased pressure from suppliers and/or clients to minimise possible downtime losses and realise that locational characteristics can significantly undermine their viability.
- Reactive adaptation: organisational responses to flooding are shaped as the event occurs. Firms operating in a reactive manner are attempting to cope with inundation using short-term solutions that will not divert from pre-existing routines, despite the relevant low probability, high-impact risks that are identified. These are usually firms with limited resources and a resistance to change that mainly focus on their mere survival rather than flood mitigation.
- Surrendering strategy: flood mitigation is postponed, as the firm is unable to engage in relevant measures and build relevant dynamic capabilities. Lacking the necessary funding or management skills and being under intense competitive pressures, enterprises adopting a surrendering strategic direction demonstrate a wait-and-see behaviour. They are willing to tolerate the losses of a flood event rather than dedicate time and resources to gain new competencies and build their resilience.

- Depending strategy: the firm mainly relies on the plans and measures implemented by local stakeholders and state authorities. Business-level interventions are minimal or not applied, as the organisation is counting on large-scale flood management infrastructures and defences that governmental bodies undertake.
- Collaboration strategy: identified as a joint response of local or regional stakeholders (i.e. business entities, community groups, local authorities) to flood exposure. The individual firm acknowledges the benefits of combining its resources and competencies with those of others towards risk reduction, by going beyond self-interests and supporting the common goal of collective adaptation.

In a similar vein, [Mamouni Limmios \*et al.\* \(2014\)](#) identify four organisational archetypes that capture the manifestations of resilience, spanning from a capacity for adaptive learning to a demonstration of resistance to change:

- (1) The “adaptive” archetype pertains to organisations exhibiting increased levels of adaptive capacity. Such business entities have nurtured an array of dynamic capabilities and resources at their disposal to address the challenges of a turbulent environment. They can be characterised as ambidextrous entities emphasising both the exploitation of competencies they already possess and the exploration of new capabilities to reach an optimal system state under situations described by uncertainty.
- (2) The “vulnerable” archetype refers to organisations being vulnerable to external disturbance and changing conditions. They are described in terms of managerial inertia and underinvestment in resilience interventions or the exploration of new competencies, which is primarily driven by market pressures and providers of capital and/or resources.
- (3) The “rigid” type reflects those business entities that experience capital constraints that would otherwise allow them to initiate resilience-oriented restructuring or changes. They demonstrate patterns of business-as-usual approaches and managerial myopia to unexpected turbulence and exhibit rigidity in terms of transformational interventions.
- (4) The “transient” type pertains to organisations exhibiting flexibility and which promote significant organisational changes in an attempt to withstand and adapt to external turbulence. However, these pivotal changes make them prone to underperformance or even collapse, rather than achieving increased resilience capacity.

Investigating business responses to climate change impacts and extreme events, [Berkhout \*et al.\* \(2006\)](#) focus on organisational reactions to climate stimuli stemming from (actual or perceived) implications that EWEs may have on operations, and they identified four alternative adaptation strategies:

- (1) a wait-and-see posture, described by deferral and stemming from scepticism and/or uncertainty around the impacts of climate change and the potential benefits of adaptation;
- (2) a strategy relying on risk assessment and appraising options in preparation for adapting existing organisational routines;
- (3) bearing and managing risks: a strategy that places emphasis on managing-handling risks and opportunities arising from climate change impacts by employing organisational resources and capabilities; and

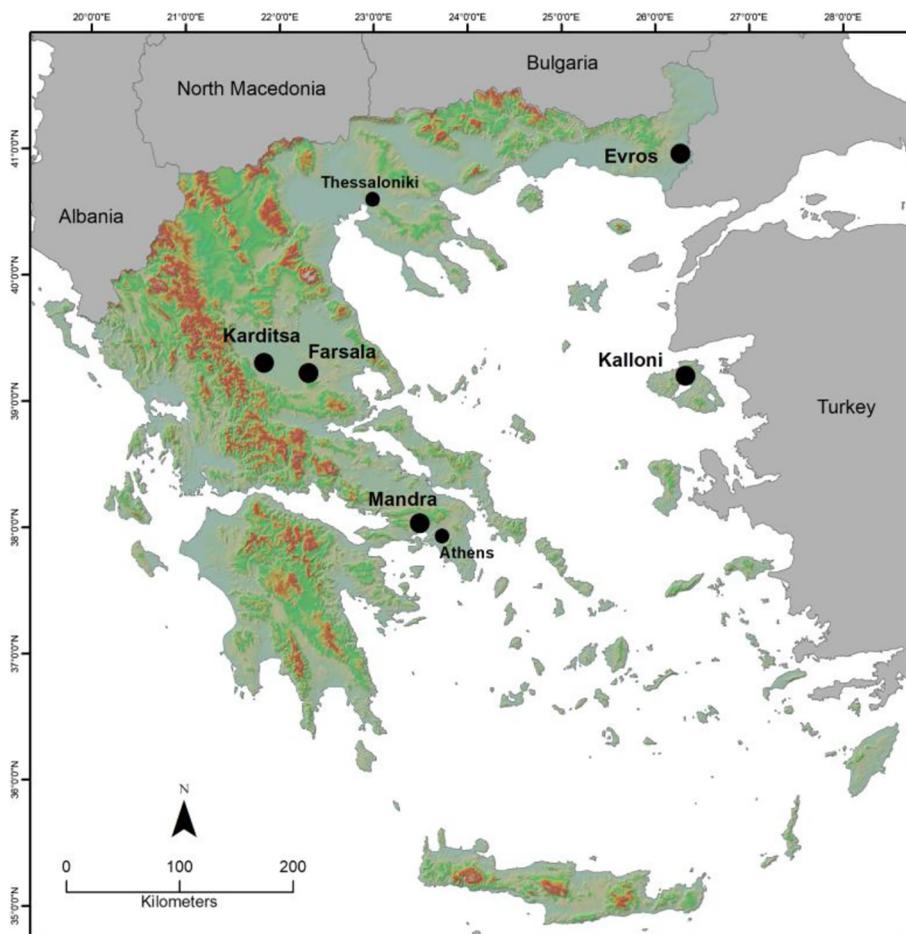
- (4) a sharing-and-shifting risk strategy where possible climate change implications are externalised through insurance and collaboration.

Against this background, the present study explores the attitudes, responses and expectations of Greek MSMEs owners-managers in relation to the impacts that their enterprises experienced in the face of flooding. MSMEs are the backbone of the Greek economy, representing the absolute majority of domestic business activity (99.9%), accounting for approximately 56.7% of total value-added and approximately 83% of overall employment [European Commission (EC), 2021]. According to Eurostat, the majority of Greek firms are micro-enterprises (94.6%), with substantial growth (i.e. >10%) in both SME value-added and employment indicated for 2021 [European Commission (EC), 2021], making the country's SME sector a unique case in the European Research Area on business resilience research. It is important to know more about MSMEs' responses to flooding and the underlying aspects describing flood resilience capacity and mitigation behaviours to plan and implement appropriate policy interventions and preventive actions that will increase proactive adaption and decrease economic losses. To date, little research has addressed the attitudes and responses of domestic MSMEs to flood stimuli, and with this study we attempt to respond to questions such as the following: What were the key learnings and behavioural changes of MSME owners that took place after the occurrence of a flood event? What are their expectations in terms of assistance and support from institutional stakeholders to better prepare for and protect business operations and assets from floods? Can these attitudes, responses and expectations allow for a classification (typology) of MSMEs according to the strategies used and their decision-making towards flood resilience? Previous work provides relatively sparse insight into pressing issues such as the above, and this is where this paper seeks to contribute. We concentrate on MSMEs owners' key learnings from flooding and their knowledge and understanding of such risks, preparedness levels and interventions to reduce future flood impacts, along with assistance needs from institutional stakeholders. The findings complement the literature on small business resilience and are contextualised within the spectrum of existing typologies describing behavioural patterns and strategic directions.

### Material and methods

Our study is exploratory in nature and follows a qualitative approach. It was conducted during the second half of 2021 in four different flood-prone areas in Greece: the rural area of Evros in Northern Greece, the town of Mandra, a western, outer suburb of Athens, the cities of Karditsa and Farsala in Southern Thessaly, and Kalloni, a coastal community in the west-central part of the island of Lesbos (Figure 1).

The examined areas were selected based on their different characteristics in terms of vulnerability, demographics and flood type. The Evros River is the largest river in South East Balkans, running through Bulgaria, Turkey and Greece. The Evros drainage network, which is also connected to multiple irrigation channels, waters almost all cultivated land of the Evros Prefecture (Tsantopoulos *et al.*, 2013), making it a cornerstone for the regional agriculture and boosting the local economy. Still, the Evros River has repeatedly caused extensive riverine floods, which affect close-by villages and cultivated farms for a considerable length along its main branch (Diakakis *et al.*, 2012). The flood which occurred during the spring of 2006 and resulted to more than 200 km<sup>2</sup> of farmland inundation is a typical example. During this event, agriculture, transport and water supply networks were severely damaged, causing the worst negative effect on economic activity over the past 50 years (Markantonis *et al.*, 2013).



**Figure 1.**  
Study area locations

The area of Mandra is located in Thriassion plain, Attica, one of Greece's most important industrial centres and logistic centres (Diakakis *et al.*, 2020). Mandra has an exceptional flood history, with several events in the past decades (Diakakis *et al.*, 2012). On 15 November 2017, a high-intensity storm outbreak in the mountain over the city of Mandra. It produced a total rainfall of nearly 300 mm in 13 h, with the majority falling within 6 h, and caused a severe flash flood, devastating the city of Mandra and the surrounding industries and infrastructure. Apart from the extensive damage to buildings, infrastructure and transportation networks, the flood resulted in 24 tragic losses, making it the deadliest flood in Greece over the past 40 years (Diakakis *et al.*, 2019).

The Kalloni river basin drains the broader area of Kalloni town, which is the second-largest commercial centre of Lesbos Island. The area has a Mediterranean climate type, and the land is predominantly covered by agriculture (olive groves), grassland and brushland habitats (Tzoraki, 2020). The main economic activities in the area are agriculture, livestock and small and medium enterprises (Koutsovili *et al.*, 2021). During the past

decades, short-duration high-intensity rainfalls have triggered flash flood events in the urban fabric, with hazardous consequences for the people and infrastructure. The most significant flash floods in Kalloni occurred in 1986, 2005, 2011 and 2016 (Diakakis *et al.*, 2012; Matrai and Tzoraki, 2018).

Karditsa and Farsala cities are located in Central Greece, at close distance from each other. Although they belong to different (but neighbouring) prefectures, they are among the areas with increased flood problems in Greece (Diakakis *et al.*, 2012), as they lie near to the tributaries of the main Pinios River. This drainage network often overflows, affecting buildings, infrastructure, crops and human lives. The main economic activity of this area is agriculture, which has also led to continuous overexploitation during the past three decades (Tsangaratos *et al.*, 2018). On 18 September 2020, the greater Karditsa area was hit by an extreme 15-h long rainfall that caused extensive flooding over a number of cities, including Karditsa and Farsala. Both cities suffered severe economic losses and damage to public assets, transportation networks, buildings and agricultural areas, including four human losses (Tegos *et al.*, 2022).

Data was obtained by conducting both semi-structured, face-to-face interviews and (due to the COVID-19 restrictions) telephone key informant interviews with 82 owners-managers of local MSMEs who had experienced flood impacts in recent years. The duration of individual interviews ranged from 25 min to an hour and a half and were based on a guide of open-access questions (Brinkmann, 2008; Cachia and Millward, 2011; Rowley, 2012; Babbie, 2016; Bell *et al.*, 2022). Of these 82 interviews, 21 were recorded and transcribed, while detailed notes were taken for the others. The interview protocol centred on how the occurrence of flooding affected managerial responses and organisational procedures. In addition, through these interviews, we sought to shed light on thoughts, attitudes and behavioural changes from their experience with flooding, their awareness and understanding of flood risks and related driving forces, their attitudes towards flood resilience capacity and the adoption of relevant measures, along with perceptions around assistance and support needs to cope with flooding in the future. This allowed us to examine whether MSMEs' interviewees revised internal routines and to shed light on barriers to developing micro-level flood resilience capacity. Interviewees were asked to share their memories from the recent flood that affected their enterprise and recall the events that took place during the flood as well as in the recovery period that ensued. They were also asked to outline the responses their enterprises pursued before the flood and during the event, as well as whether and how these have changed as a result of the natural disaster they experienced. The interview guide included questions on employee training on emergency preparedness, barriers to building flood resilience, stakeholder engagement and support mechanisms, as well as whether long-range planning is in place for developing the business.

As the first step of data analysis, all interviews were transcribed to spreadsheet, and the text parts identified as answers to the interview guide questions were marked. Each interview was broken down into pieces of narrative information and classified into a category scheme based on the interview guide's structure and rationale. The classification of interview excerpts per category was performed manually, with the overarching aim being to gain a good understanding of the text's meaning, focusing on patterns of similar statements as well as responses with exactly the same or very contradictory meanings (Brinkmann, 2008; Cachia and Millward, 2011; Rowley, 2012; Babbie, 2016; Bell *et al.*, 2022). This led to an evaluation summary of findings presented in the next section.

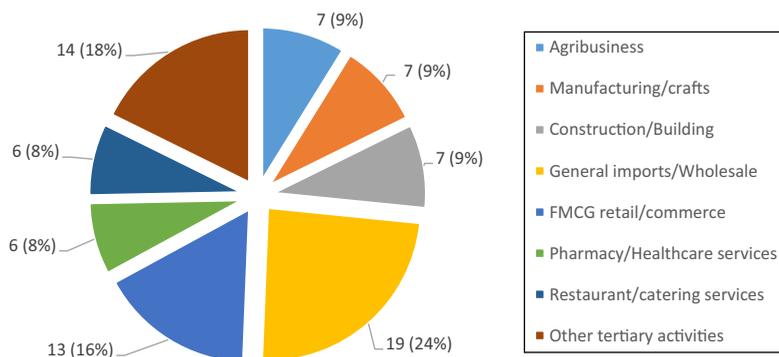
#### *General information about the participating MSMEs and the interviewees*

Most enterprises in our study are business entities with fewer than 50 employees, while 80% are microenterprises, employing less than ten workers. Likewise, the vast majority of

interviewees (95%) are either the owner or co-owner of the firm, and in terms of legal form-status – apart from very few exceptions – they mostly pertain to family-run sole proprietorships, followed by collective or limited partnerships. Seven MSMEs are new enterprises, founded less than five years ago. Nine MSMEs have been in business for more than 50 years, while 60% of all firms were established more than 20 years ago. The average company age is approximately 23 years. Figure 2 presents the share of sample firms in terms of business activity and industry affiliation. Almost 50% of the MSME owners had no medium- or long-term focus in terms of business development planning and/or relevant objective setting; through their responses, it was evident that they are striving to carry out the day-to-day running of their business to keep it afloat, and this left them little room for other than operational decisions for the next one to six months. Eight of the MSMEs had a two-to-five-years growth plan (primarily focusing on the acquisition of new equipment, market expansion and/or the modernisation of facilities), and only one business owner had devised a 10-year (strategic) growth plan. In this respect, out of these enterprises, only three have incorporated flood risk management into their plans in terms of purchasing an insurance policy and/or applying structural property-level interventions that aim to reduce or prevent future flood damages.

### Disaster experience – managerial experience with flood disaster

Most MSME owners-managers reported significant damages, business disruptions and economic losses from flooding. The most common impacts were halted operations and the loss of critical raw materials and/or product stock, which both exerted pressures on the firms' viability and questioned whether it would ever return to pre-disaster levels of performance or merely survive. In certain cases, power outages further exacerbated inundation effects, as attempts to reduce impacts during the flood event using water pumps were, to a certain degree, suspended. In Mandra, all of the interviewed MSME owners faced a complete disaster of their property, with effects so severe that it resulted in a recovery period spanning from 4 to 12 months. Likewise, in Farsala, MSME owners found themselves on the brink of total disaster or an irretrievable loss of assets and equipment that led to a recovery period of four to seven months. Many interviewees stressed a loss of revenue ranging from 40% to 70% during the first post-disaster and recovery months, when compared to pre-flood levels. In certain cases, customer displacements and reliance on local suppliers (who also were impacted by the flood) contributed to such income flow reductions. Repeated flood events in the Evros area disrupted both MSME premises but also had significant secondary effects on the supply chains the enterprises are embedded in. Many



**Figure 2.**  
Distribution of MSMEs according to their field of activity

of the owners-managers who we interviewed pointed out that the land-planning violations in terms of urban development and anthropogenic interference with water catchment areas are the primary reasons for the flood disasters they experienced. Their efforts to bounce back and reinstate their businesses were mostly funded either from their resources or from the financial and/or in-kind support of relatives, friends and suppliers. Most participants asserted that flood protection planning, infrastructure and respective measures in their area by the appointed governmental bodies proved to be insufficient and ill-prepared. In this respect, they went on to indicate that governmental support, financial aid and state compensation left much to be desired and were particularly inadequate to address the losses they faced and to properly restore property damage. To this regard, very few of the MSMEs were insured for natural hazards and obtained remuneration from their policy providers.

The flood disaster that the interviewees coped with, and which permanently affected their enterprise, left many of them with apparent trauma effects, while a few stated indications of long-term psychological health effects pertaining to despair, increased anxiety and the fear of sooner or later having to relive such events at some point in the future. In certain cases, the health issues endured by the MSME owners-managers reflected particularly serious implications ranging from signs of (severe) sadness, depression, flashbacks or panic attacks and, to a certain degree, suggested symptoms of post-traumatic stress disorder. Through their responses, some interviewees revealed that the flood events had a mediating role on their stress levels during the winter months and/or sudden changes in weather. There were cases where interviewees expressed a sense of helplessness and uncertainty were a new flood event to occur, and they felt overwhelmed by negative thoughts surrounding the idea of the threats it would once more pose to their enterprise. Likewise, a persistent feeling of increased vulnerability and constant alertness was identified in those that were hit the hardest by the flood; a few of them admitted that each time a thunderstorm occurs, they tend to think about what they can retrieve or save from inundation and if they would (once more) fail to keep critical fixed assets intact from damages. A number of MSME owners maintained that there was not much they could do during the flood, due to the severity of the event and the traumatic shock they experienced during the first moments of its occurrence.

### **Knowledge and attitudes towards floods**

The owners of MSMEs hit the hardest by flooding ranked such risks much higher in terms of importance in comparison to owners whose enterprises were less affected. The latter tended to highlight other business risks (financial, credit, compliance, competitive or reputational risk) as far more critical, while the former stressed that, while being a low probability event, a flood can have a profound impact on the enterprise, and therefore the risks it poses should be prioritised. Those owners-managers of MSMEs that were less impacted by flooding expressed a sense of immunity from such events and were comparatively far less concerned about such natural phenomena that may occur in their (flood-prone) area in the future, reflecting moderate to low levels of risk awareness and perception. While the majority of interviewees acknowledged a possible link between climate change, changing weather patterns and the increased occurrence of extreme weather events in absolute numbers, a small number of MSME owners rejected such relationships and asserted that floods mainly occur due to outdated protection measures, man-made interventions to water catchments and uncontrolled land use change, as well as urban sprawl. Flood protection, impact mitigation and flood defences were identified as of critical importance by most interviewees, but apart from a few low-cost property-level measures

they pinpointed as necessary to implement in their business premises, they stressed that such flood management tasks are responsibilities of the state authorities, with the central and local government being the authorities that should ensure flood threats are properly addressed.

In a similar vein, MSME owners from all four study areas denoted a willingness to engage in practices and interventions other than non-structural measures, which are considered “low-hanging fruits” had they had the necessary financial resources and guidance. To this regard, almost half of the MSME owners in our study did not identify competitive advantages from becoming less vulnerable to floods. They viewed planning and implementing relevant protection measures as additional costs they needed to bear (and would most likely hinder the long-term growth of their business) or as something that it would be “good to have” but were unconvinced whether such efforts would allow them to reduce damages and overcome catastrophic events (like those they experienced). Relocating their business to another area to minimise flood risk was not an option for the majority of interviewees. Their responses reflected a strong place attachment to the greater area that their enterprise is located within and a sense of embeddedness in the local community, feeling part of the community and having strong bonds with its members. Many of these owners-managers rejected relocation as an option due to pressing financial and cash flow constraints, while others added that their main suppliers, along with their customer base, are locally based, which would require them to “start their business from the beginning” if they chose to relocate, making it particularly indeterminate whether the new location would allow the business to retain (at least) a level of performance comparable to the existing one. Lastly, the interviews revealed that, compared to younger ones, owners of older MSMEs undertook fewer protective measures to increase their firm’s resilience to future flood threats. A similar pattern in terms of preparedness behaviours was identified by contrasting the responses of enterprises of the primary and secondary sector *vis-à-vis* those of the tertiary activities, with the former ones being more willing to adopt and engage in flood resilience-building modifications in their business premises.

### Disaster preparedness

While not being a priority (according to their opinion), in the months following the flood disaster, the majority of MSMEs owners we interviewed performed informal and random internal audits on their premises to identify vulnerability points. Very few of the respondents had developed such audit processes more systematically and were well aware of “what needs to be done” to mitigate future flood impacts. As a result of such audits, “soft” property-level interventions were implemented by almost a third of the sample MSMEs. These enterprises adopted temporary measures such as floodgates, sandbags, flood-resistant door and window frames, air-vent covers, braced shelves and equipment or small-scale flood-proofing in an attempt to increase their ability to reduce future flood damages. The reduction of physical vulnerability of business structural property was undertaken by only 11 of the MSMEs we interviewed, and only 20% of them implemented permanent actions involving retrofitting of existing structures to increase their integrity. Through their responses, MSME owners also denoted that the existing land use planning/building regulations and permits leave them few options to engage in permanent interventions in their enterprise that would structurally alter the business facilities and most likely violate existing building construction codes and legal requirements. In contrast, none of the interviewed MSMEs considered devising a written plan of emergency actions in case of flooding. Only approximately 25% of the interviewees of these enterprises (apart from those being sole proprietorships) asserted that such planning activities have been informally discussed with employees or verbally communicated within the firm, denoting that “everyone now knows how

to act and what to do in case inundation occurs". Likewise, very few interviewees denoted that the flood disaster they experienced led them to pay more attention to the weather forecast due to behavioural changes under the scope of increased risk awareness. Interestingly, owners of enterprises of the retail and hospitality industries (i.e. coffee shops and restaurants) were particularly reluctant and indisposed to implement flood preventive measures that could significantly alter their firm's façade, image and identity, as they were perceived by their customer base (and, thus, stressed that modifying the shopfront would possibly undermine future sales and revenue streams). In this respect, MSME owners who lease the operating space were not allowed to apply such permanent interventions by the owner(s) of the property, who disapproved of such flood preventive modifications.

In terms of property insurance coverage, MSME owner responses revealed that only those who are the owner (or co-owner) of the business structure took on insurance as a way to protect their property (i.e. their "investment" in their own words). Most others (i.e. those who lease the operating space) did not view the use of flood-focused insurance as a potential shock absorber of unforeseen natural hazards but as an unnecessary financial burden that they would be very hesitant to bear, given the perceived low probability of such events. Despite being a reliable technique-mechanism of risk transfer, most Greek MSMEs fail to identify such benefits, have limited financial resources to acquire such policies and underutilise such recovery strategies. Likewise, more than 80% of these MSMEs have made minimal investments in preparations to reduce downtime losses and ensure operational continuity in case of flooding in the future; none of the owners we interviewed had acquired or considered the installation of an electricity generator to ensure that there will be no interruption in electrical power during a loss of lifeline utilities or fluctuating power supply from the grid. Likewise, none of the interviewees considered keeping backup folders and data of critical business records in safe storage in off-site locations that cannot be damaged by flood.

### **Assistance needs**

While 80% of the sample MSMEs are members of local chambers of commerce and/or are subscribed to industry/trade associations, they all underlined that the support and guidance they received on flood preparedness was either insufficient or non-existent. Some of the interviewees would not identify such organisations as competent enough to assist them in their efforts to flood-proof their enterprise and further added that such aspects are out of the scope of such membership organisations' missions, which are (strictly) dedicated to championing the economic growth, networking and visibility of their members. In contrast, all interviewees stressed that flood risk management and governance is the sole responsibility of the central and local government, whose appointed executive bodies and authorities should become more involved than previously in managing weather extremes. According to the MSME owners, this could be achieved in four ways. Firstly, they can invest in new community-level, (more) effective flood defences and flood control mechanisms and maintain and reinforce existing ones. Secondly, they can plan and implement awareness-raising initiatives and disseminate sets of formal capacity-building guidelines for MSMEs to better cope with floods. Thirdly, they can stimulate protective behavioural changes and coping-mitigation strategies towards floods through economic incentives: subsidies and loan subsidy schemes, tax reliefs and/or reduced municipal/communal dues (to those enterprises actively engaged in increasing their flood resilience capacity) as well as state-led funding, where the government regulates and funds continuing business resilience (using national and European funding options). Fourthly, they can adopt certain legislative amendments that will reduce the cumbersome bureaucratic procedures that undermine

recovery efforts after a flood and facilitate the implementation of permanent interventions in their enterprise.

Apart from very few exceptions, MSME owners expressed high levels of mistrust in banks as providers of capital that would be necessary to fund flood resilience interventions and measures under consideration; they specified that they would only consider such an option if financial institutions had tailor-made loans for flood-proofing their enterprise to specifically meet their business needs and with particularly low-interest rates. Denoting that they tend to suffer from significant cash flow problems and limited access to liquidity, they also pointed out that while acquiring an insurance policy would be the best option to mitigate future flood impacts, financial constraints are particularly detrimental to considering such property insurance and, thus, to ensure robust (post-event) recovery. Few interviewees proposed government-subsidised flood insurance premiums as a policy option, primarily in regions and areas of high risk. Lastly, only ten of the interviewees would be willing to receive professional consulting services on business continuity and available options to build flood resilience. All others rejected such solutions, either by reiterating the limited resources at their disposal or because they saw little added value in these services, explaining that, given the severity of the event they experienced, such third-party input would be of no actual use and/or they were now well aware of how to act in case of future flood events.

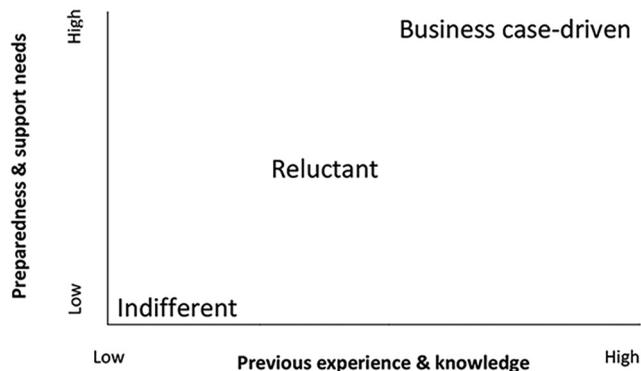
## Discussion

In line with prior findings [Kreibich *et al.*, 2011; Federation of Small Businesses (FSB), 2015; Josephson *et al.*, 2017], our study reports limited activities of MSMEs towards flood resilience capacity despite the threat of relevant disasters. The general picture sketched out by the qualitative data of this study suggests that most owners-managers of these enterprises are not adequately preparing their businesses for the impacts of flooding. The interview findings provide supporting evidence for the claim of Mpekiaris *et al.* (2020), who reported that the continuity management and resilience planning of Greek firms lack in key respects, with domestic SMEs being highly vulnerable to natural disasters and unaware of resilience-building measures (i.e. laggards). As Mpekiaris *et al.* (2020) pinpoint, bureaucratic constraints and the absence of strategic planning from critical decision makers, coupled with limited resources at their disposal, leave MSMEs with very few opportunities to overcome natural disasters. To this regard, despite being a future hazards' risk reduction tool in monetary terms, very few of the MSMEs in the study took steps to transfer the risk of business interruption and property loss to insurance carriers by acquiring such policies, underutilising such recovery strategies and further confirming evidence from other national terrains (Abbas *et al.*, 2015; Pathak and Ahmad, 2018; Yoshida and Deyle, 2005; Howe, 2011). The study's findings are also in line with prior evidence from other national settings, indicating that MSMEs appear unprepared to cope with natural hazards and undertake relevant planning processes (Spillan and Hough, 2003; Howe, 2011; Pathak and Ahmad, 2018). In all four of the research areas that this study addressed, the interview responses revealed an absence of meaningful negotiation processes among the critical actors (local enterprises and community members, municipality councils and other governmental bodies) to actively engage and become collectively involved in revising current flood protection policies. Still, certain aspects of relational resources were found to be an essential component of recovery for the interviewed MSMEs, and this is consistent with the findings of Biggs *et al.* (2012) and Parsons *et al.* (2018), who also note that businesses with support from family and friends demonstrate relatively higher levels of resilience. Likewise, as in Marshall *et al.* (2015) and Graveline and Gremont (2017), we also recognise that the business characteristics and owner-manager attitudes are of critical importance in understanding MSME adaptive

efforts and resilience towards flooding. In this respect, we find supporting evidence that certain business characteristics could be associated with the likelihood of planning for flood resilience and disaster preparedness, in particular, the organisational size and age as well as the ownership of the business property which are also reported in the studies of [Corey and Deitch \(2011\)](#), [Herbane \(2015\)](#) and [Howe \(2011\)](#). Likewise, newly founded MSMEs and those owners-managers of higher education were found to be more willing to enhance the flood resilience capacity of their enterprise, echoing relevant findings by [Lo et al. \(2019\)](#) and [Josephson et al. \(2017\)](#), among others. Indeed though, such elements and variables (size, sector, business age, education level, cash reserves, social capital and formal/informal management structures) warrant further attention and empirical confirmation.

Drawing on typologies of organisational responses to flooding and external stimuli put forward by previous studies ([Neise and Diez, 2019](#); [Mamouni Limmios et al., 2014](#); [Berkhout et al., 2006](#)), we identified distinct patterns of entrepreneurial accounts in relation to building flood resilience and developing adaptive capacity to such events. These diverse groups of accounts pertain to the enterprises' responses of indifference, reluctance or being business-case driven in addressing flood threats ([Figure 3](#)).

*Indifferent* MSMEs (representing more than 75% of the interviewees) seem to have resigned themselves to the presence of flood risk, acknowledging that when you live and operate a business close to a flood-prone area you are bound to expect the relevant impacts. Fostering and sustaining a low concern, through their owners' responses, shaped the very limited activities they undertake towards flood resilience, which can be attributed to a sense they have that, since they managed to bounce back from the previous flood event (regardless the period of down time), they will manage to successfully overcome the occurrence of respective natural perturbations in the future as well (e.g. see also [Marshall et al., 2015](#)). Indifferent business entities all suffer from particularly limited resources and resistance to change, while they solely focus on their mere survival rather than flood mitigation measures (which are constantly postponed under the scope of a wait-and-see behaviour). These characteristics leave them in a constantly disadvantaged position, making them much more susceptible to flood impacts as they only develop reactive responses that further deteriorate the already weak financial resources and tend to surrender and outright accept exposure to flooding as something that is unavoidable. Their narratives reflected arguments of wishful thinking and fatalism, with a willingness to tolerate the losses of a flood event rather than dedicate time and shape skills to gain new competencies and build resilience. While the literature suggests that past experiences with flooding in an area increase the likelihood of local community members to adopt preventive measures and damage mitigation behavioural changes ([Kreibich et al., 2005](#)), we



**Figure 3.**  
Typology of reactions and attitudes based on patterns of entrepreneurial accounts

found a particular lack of attention to preparing for adversity among those enterprises less affected in our study, which were not inclined to invest either time or resources in precautionary interventions, partially confirming findings that emerged in the studies of [Thieken et al. \(2006\)](#) and [Siegrist and Gutscher \(2008\)](#). Lacking in key respects (i.e. resources, time and skills), indifferent MSMEs remain uninterested in information flows and the awareness-raising actions of governmental bodies on how to prepare for flooding, leaving them with particularly fragmentary knowledge on how to prepare their enterprise for such risks as well as on the benefits of flood control interventions. Having low stocks of social capital, expressed by strong mistrust of (local and central) governmental bodies as well as financial institutions and insurance providers, they tended to have little faith in public flood protection/defences and to reject relevant support mechanisms; they also had particularly low expectations from collective action and public engagement for flood mitigation planning. Such distrust is further amplified by the high levels of bureaucracy and institutional fragmentation characterising the Greek state, where flood protection measures become cumbersome and time-consuming tasks, since the relevant responsibilities are allocated among numerous actors and different agencies.

*Reluctant* MSMEs (representing 16% of the interviewees) allowed us to infer through their narratives that prior experience with such natural disasters is not necessarily a predictor of increased resilience-building, as such firms were wary and/or unwilling to engage in relevant actions, even though they acknowledged a high exposure to flooding due to the firm's geographical location (see also [Rincon et al., 2001](#); [Kuang and Liao, 2020](#)). While they acknowledged the critical importance that flood resilience capacity encapsulates, having already faced severe flooding in the past, they do not make respective efforts to increase it within their operations and physical assets, assuming that such low-probability (yet, high-impact) events are not to be considered a priority in their planning and business development activities. This is in contrast to prior results of [Spittal et al. \(2006\)](#), who indicate that small businesses are unlikely to undertake a relevant crisis planning agenda unless they have experienced similar adversity in the past. Besides, the limited activities towards flood resilience may be attributed to a sense (reflected through many of the MSME owners' responses) that, since they managed to bounce back from the previous flood event (regardless of the period of downtime), they will manage to successfully overcome the occurrence of respective natural disasters in the future as well ([Marshall et al., 2015](#)). While actions and practices to build resilience capacity are not totally in their absolute control (e.g. when facing mandatory local building codes or operating in a leased property), most reluctant MSMEs only implemented what was perceived as low-cost interventions (i.e. the "low-hanging fruits") and those that would not significantly alter existing business operations and the overall identity of their enterprise to the customer (i.e. the façade). They tend to be locked into maladaptive managerial inertia of business-as-usual approaches and underinvestment in resilience measures, disregarding the underlying benefits that an exploration of resilience-oriented restructuring may yield. In justifying such behaviour, they tend to set forth market pressures and competitive concerns as the primary reasons that leave them with choice but to be rigid in terms of transformational and structural interventions to cope with future flood hazards.

Lastly, *business case-driven* MSMEs (a rough 9% of the enterprises in our study) have experienced significant impacts from flooding and – by that very fact – they demonstrate a level of learning from environmental disturbances, which in turn stimulated their capacity to adapt to such perturbations and eventually led to resilience-building through experience (also indicated in the studies of [Folke, 2006](#); [Olsson et al., 2004](#); [Carpenter et al., 2001](#); [Resilience Alliance, 2007](#); [Godschalk, 2003](#); [Aldunce et al., 2015](#)). Enterprises that are business case-driven primarily focus on performance and have identified flood protection as one of the key

levers that may affect their bottom line. Indeed (as certain scholars have also argued), in very few of the MSMEs we interviewed, the past flooding events stimulated learning cycles through repetition, which in turn contributed to effective adaptive management and resilience-building interventions (Zevenbergen *et al.*, 2008; Ten Brinke *et al.*, 2008). MSME owners-managers of these “performance-oriented” firms opted for a more proactive-precautionary approach and have an increased understanding of flood occurrence likelihood and severity, and therefore, they have engaged in preparedness behaviours and implemented comparatively more sophisticated precautionary measures. However, the owners of these enterprises have access to necessary financial resources, and thus, they had developed robust internal and external competencies over time, shifting their flood anticipatory planning from a wait-and-see to a forward-looking one. Such enterprises have much less rigid structures or resistance to change and promote collaborative engagement with neighbouring firms and local authorities. Yet, they expressed concerns for the free-riding effects and cumbersome community-level decision-making processes in the viability of such flood risk governance structures. Still, this group of MSMEs clearly articulated the institutional support needs that they require (and external guidance that they would expect to receive) to upgrade their flood resilience capacity, mainly in terms of appropriate economic incentives to stimulate business continuity management as well as better governmental-led awareness-raising initiatives and risk communications to inform the affected business entities on the threats, consequences and protection measures before and during the occurrence of the flooding event.

## Conclusions

### *Managerial and policy implications*

Our study’s findings carry some important managerial implications and policy recommendations. Firstly, nurturing opportunities that trigger the formal sharing of SMEs’ disaster experiences would be an interesting option towards awareness-raising campaigns. Such sharing and dissemination of flood experience from selected entrepreneurs to a wider audience of local business constituents could stimulate community members and other MSME owners to better understand the need to engage in risk adjustments and resilience capacity-building interventions. In this context, local agencies and business associations/chambers should support this information dissemination of disaster experience and response to increase engagement in resilience capacity strategies and promote the flood proofing of the local economy. Governmental bodies should promote mentoring (or similar educational efforts) in managing flood resilience capacity, using MSMEs that pioneer such efforts and that can be designated as “exemplars” in this area of business preparedness. Such business “champions” could assist in communicating to peer firms how to better integrate such planning into core business practice and better identify the underlying benefits that increased resilience capacity offers through the exploration of exemplary characteristics. Nurturing relevant learning networks, by also taking into account sectoral differences, through trade associations and chambers of commerce, could provide MSMEs with access (in an appropriate learning environment) to an array of complementary experiences and expertise, facilitating the dissemination of valuable knowledge about the specific business gains that abound and the parameters that can support the success of flood-proofing.

Secondly, it is necessary to provide MSMEs with essential information on flood hazards to better envisage possible consequences, minimise the underlying MSME owners’ misconceptions of flood risk and trigger preparedness behaviours. Likewise, information flows on possible preventive interventions, emphasising technical details and cost–benefit appraisals of both permanent structural changes to property and short-term adjustments, could fill in knowledge gaps and promote managerial competencies towards continuity planning and disaster recovery. Addressing such knowledge deficits could certainly allow

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MSMEs to scan the available options they have in effectively reinforcing the business premises by safeguarding its contents, both in terms of assets and human capital, from the forces of rising waters.

Thirdly, the purchase of property insurance as a way of transferring the risk of MSMEs' damages and economic losses to insurance providers should be further promoted in the domestic business system. The critical importance of such risk transfer mechanisms is also pointed out by [Yoshida and Deyle \(2005\)](#), [Pathak and Ahmad \(2018\)](#) and [Howe \(2011\)](#), and policymakers should consider the additional support that domestic SMEs require in flood preparedness and resilience-building by examining, through feasibility studies, the benefits of natural disaster or catastrophe (cat) bonds, weather derivatives and/or natural disaster swaps, which give room to financial security during emergency situations and allow firms to mitigate the impacts of unforeseen events. In this regard, new funding mechanisms should be explored to elicit the resilient reinstatement of MSMEs' assets and property. In countries such as New Zealand, France or Spain, government-sponsored natural disaster insurance pools have been established with certain advantages over private insurance, and such schemes could provide fruitful and actionable insights to domestic central and regional government authorities ([McAneney et al., 2016](#); [Mpekiaris et al., 2020](#)).

Lastly, steering development and investment funds to climate adaptation and organisational resilience, as well as ensuring that available public infrastructures will withstand relevant disruptions, should definitely be on the priority list of the state authorities and pertinent local governmental bodies. The government at both the local and national level should consider financial incentives (subsidies and tax relief schemes) and risk-based premium rates to encourage and incentivise MSME management to implement flood resilience interventions and measures. Likewise, it should act as a mediator between MSMEs and banks to strengthen ties between financial institutions and enterprises that are particularly vulnerable to flooding through more affordable interest rates and better loan terms according to individual support needs and intrinsic characteristics.

### *Final remarks*

As the occurrence of floods has increased in absolute numbers every year since the 1980s [[Institute for Economics and Peace \(IEP\), 2021](#); [Munich Re, 2017](#)], making MSMEs more resilient to such disturbances is becoming a sheer necessity. Still, the literature on the current status, perceptions and challenges in flood-proofing MSMEs is still lacking in key respects and in many national settings. Drawing from semi-structured interviews with 82 representatives of Greek MSMEs, we attempt to contribute to this discussion and address this literature gap. Poor dynamic capabilities and long-range planning are identified as key determinants of the reactive and surrendering strategies most interviewed MSMEs demonstrate to flood threats and their relative exposure to extreme weather. The interview findings show that the levels of preparedness of Greek MSMEs do not differ substantially; very few came forward as being keen to actively engage in building their resilience capacity to floods, whereas most displayed little interest in increasing their knowledge and adopting a preparedness-focused behaviour towards such unexpected events.

MSME coping mechanisms towards floods involve a wide range of factors that can collectively create an enabling environment that will allow them to attain resilience to such catastrophic events. Our findings call for multi-level and dynamic perspectives to be examined in assessing MSME resilience capacity to floods. The attitudinal, managerial, organisational, behavioural and regulatory (as well as other institutional) factors merit further investigation as to whether they hinder or enable conditions for microeconomic (flood) resilience and how they may interact with each other or create feedback loops. With an economy dominated by

enterprises of the tertiary-service sector, Greece needs to invest in building the resilience of such business entities, taking into account their intrinsic characteristics and dependencies. In this respect, the findings suggest that the resilience capacity of the MSMEs that we interviewed is hampered by the limited financial resources at their disposal, given that most domestic firms have never (fully) recovered from the long-lasting national economic downturn. Likewise, the perceptions pertaining to flood risk and low levels of competitiveness contribute to the reactive, rigid and particularly vulnerable position towards natural hazards, such as the flooding we have identified. There is very little shift in strengthening flood resilience as the deficit in dynamic capabilities, primarily referring to slack resources as well as to internal and external competencies (i.e. managerial skills and institutional support), leaving much to be desired, contrasting with the insights of [Gasbarro and Pinkse \(2016\)](#) or [Wedawatta and Ingirige \(2012\)](#) drawn from UK SMEs, but in line with the recent findings of [Neise and Diez \(2019\)](#) from Indonesia. Our findings also confirm the previous observations and insights of [Berkhout \*et al.\* \(2006\)](#), [Samantha \(2018\)](#) as well as [Kato and Charoenrat \(2018\)](#), who also describe ill-defined levels of continuity management and a low prioritisation of flood resilience-building plans and practices in MSMEs.

Certain limitations in this study, reflecting opportunities for future research, are noteworthy. The choice of the SME owners-managers participating in this study raised the issue of the representativeness of the survey interviewees per local population; this issue needs to be verified. Being an exploratory study, the findings cannot be generalised or considered representative of similar research. In this respect, a clearer and more reliable picture of SMEs' resilience to flooding could be drawn from mixed-methods approaches on a larger sample, complemented with action research studies, to better describe how local SMEs cope with floods and what interventions are necessary to support them to address such natural hazards. Likewise, as the decision to build organisational flood resilience capacity is not a "one-size-fits-all" situation, because it can be shaped according to owner, business and/or locational attributes, future research should further assess the relevant MSMEs resilience-building strategies using explanatory variables of such descriptive characteristics (e.g. single-owner vs partnership; owned vs leased property; located in a coastal or insular vs inland area).

Nevertheless, studies such as ours address persistent knowledge gaps on the ways that MSMEs deal with exposure to natural hazards and allow for insights through which critical stakeholders can gain a better understanding of the challenges in enhancing flood resilience in the individual enterprise. Indeed, a better understanding of the firms' responses to flooding does have socio-political as well as academic relevance, but much work still needs to be done to disambiguate such perspectives, as the increasing impacts of such events will most likely make the need to flood-proof the MSME sector even more pressing in the coming years.

#### Note

1. According to the European Commission, micro and small enterprises are business entities that employ no more than 10 and 50 persons, respectively, and whose annual turnover or annual balance sheet total does not exceed €2m (micro) and €10m (small). Likewise, a medium-sized enterprise is firm that has a staff headcount of less than 250 employees and an annual turnover that does not exceed €50m.

#### References

- Abbas, A., Amjath-Babu, T.S., Kächele, H. and Müller, K. (2015), "Non-structural flood risk mitigation under developing country conditions: an analysis on the determinants of willingness to pay for flood insurance in rural Pakistan", *Natural Hazards*, Vol. 75 No. 3, pp. 2119-2135.

- Alidunce, P., Beilin, R., Howden, M. and Handmer, J. (2015), "Resilience for disaster risk management in a changing climate: practitioners' frames and practices", *Global Environmental Change*, Vol. 30, pp. 1-11.
- Averchenkova, A., Crick, F., Kocornik-Mina, A., Leck, H. and Surminski, S. (2016), "Multinational and large national corporations and climate adaptation: Are we asking the right questions? A review of current knowledge and a new research perspective", *WIREs Climate Change*, Vol. 7 No. 4, pp. 517-536.
- Babbie, E. (2016), *The Practice of Social Research*, Boston, MA.
- Bell, E., Bryman, A. and Harley, B. (2022), *Business Research Methods*, Oxford University Press.
- Berkhout, F., Hertin, J. and Gann, D.M. (2006), "Learning to adapt: organisational adaptation to climate change impacts", *Climatic Change*, Vol. 78 No. 1, pp. 135-156.
- Biggs, D., Hall, C.M. and Stoeckl, N. (2012), "The resilience of formal and informal tourism enterprises to disasters: reef tourism in Phuket, Thailand", *Journal of Sustainable Tourism*, Vol. 20 No. 5, pp. 645-665.
- Brinkmann, S. (2008), "Interviewing", in Given, L. (Ed.), *The Sage Encyclopedia of Qualitative Research Methods*, Thousand Oaks, CA, pp. 471-472.
- Cachia, M. and Millward, L. (2011), "The telephone medium and semi-structured interviews: a complementary fit", *Qualitative Research in Organisations and Management: An International Journal*, Vol. 6 No. 3, pp. 265-277.
- Carpenter, S., Walker, B., Anderies, J.M. and Abel, N. (2001), "From metaphor to measurement: Resilience of what to what?", *Ecosystems*, Vol. 4 No. 8, pp. 765-781.
- Chaliha, S., Sengupta, A., Sharma, N. and Ravindranath, N.H. (2012), "Climate variability and farmer's vulnerability in a flood-prone district of Assam", *International Journal of Climate Change Strategies and Management*, Vol. 4 No. 2, pp. 179-200.
- Clark-Ginsberg, A. (2020), "Disaster risk reduction is not 'everyone's business': evidence from three countries", *International Journal of Disaster Risk Reduction*, Vol. 43, p. 101375.
- Corey, C.M. and Deitch, E.A. (2011), "Factors affecting business recovery immediately after hurricane Katrina", *Journal of Contingencies and Crisis Management*, Vol. 19 No. 3, pp. 169-181.
- Crick, F., Gannon, K.E., Diop, M. and Sow, M. (2018), "Enabling private sector adaptation to climate change in sub-Saharan Africa", *WIREs Climate Change*, Vol. 9 No. 2, p. e505.
- Diakakis, M., Mavroulis, S. and Deligiannakis, G. (2012), "Floods in Greece, a statistical and spatial approach", *Natural Hazards*, Vol. 62 No. 2, pp. 485-500.
- Diakakis, M., Boufidis, N., Salanova Grau, J.M., Andreadakis, E. and Stamos, I. (2020), "A systematic assessment of the effects of extreme flash floods on transportation infrastructure and circulation: the example of the 2017 Mandra flood", *International Journal of Disaster Risk Reduction*, Vol. 47 No. 101542.
- Diakakis, M., Andreadakis, E., Nikolopoulos, E.I., Spyrou, N.I., Gogou, M.E., Deligiannakis, G., Katsetsiadou, N.K., Antoniadis, Z., Melaki, M., Georgakopoulos, A., Tsaprouni, K., Kalogiros, J. and Lekkas, E. (2019), "An integrated approach of ground and aerial observations in flash flood disaster investigations. The case of the 2017 Mandra flash flood in Greece", *International Journal of Disaster Risk Reduction*, Vol. 33, pp. 290-309.
- Duy, P.N., Chapman, L., Tight, M., Linh, P.N. and Thuong, L.V. (2018), "Increasing vulnerability to floods in new development areas: evidence from Ho Chi Minh city", *International Journal of Climate Change Strategies and Management*, Vol. 10 No. 1, pp. 197-212.
- Eleftheriadis, I. and Anagnostopoulou, E. (2017), "Measuring the level of corporate commitment regarding climate change strategies", *International Journal of Climate Change Strategies and Management*, Vol. 9 No. 5, pp. 626-644.
- European Commission (EC) (2021), "SME fact sheets: Greece", SME Performance Review – European Commission, available at: [www.ggb.gr/sites/default/files/basic-page-files/Greece%20-%20SME%20Fact%20Sheet%202021.pdf](http://www.ggb.gr/sites/default/files/basic-page-files/Greece%20-%20SME%20Fact%20Sheet%202021.pdf) (accessed 15 January 2022).

- Federal Emergency Management Agency (FEMA) (2011), "A whole community approach to emergency management: principles, themes, and pathways for action", available at: [www.fema.gov/sites/default/files/2020-07/whole\\_community\\_dec2011\\_\\_2.pdf](http://www.fema.gov/sites/default/files/2020-07/whole_community_dec2011__2.pdf) (accessed 25 September 2021).
- Federation of Small Businesses (FSB) (2015), "FSB warning as more than half of small firms without flood plan", (press release FSB PR 02/2015, Blackpool, Federation of Small Businesses).
- Folke, C. (2006), "Resilience: the emergence of a perspective for social-ecological systems analyses", *Global Environmental Change*, Vol. 16 No. 3, pp. 253-267.
- Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T. and Rockstrom, J. (2010), "Resilience thinking: integrating resilience, adaptability and transformability", *Ecol. Soc.*, Vol. 15 No. 4, p. 20.
- Gasbarro, F. and Pinkse, J. (2016), "Corporate adaptation behaviour to deal with climate change: the influence of firm-specific interpretations of physical climate impacts", *Corporate Social Responsibility and Environmental Management*, Vol. 23 No. 3, pp. 179-192.
- Gilbert, S.W. (2010), *Disaster Resilience: A Guide to the Literature*, 1117. US Department of Commerce, National Institute of Standards and Technology (NIST).
- Godschalk, D.R. (2003), "Urban hazard mitigation: creating resilient cities", *Natural Hazards Review*, Vol. 4 No. 3, pp. 136-143.
- Graveline, N. and Gremont, M. (2017), "Measuring and understanding the microeconomic resilience of businesses to lifeline service interruptions due to natural disasters", *International Journal of Disaster Risk Reduction*, Vol. 24, pp. 526-538.
- Hall, C.M. (2006), "New Zealand tourism entrepreneur attitudes and behaviours with respect to climate change adaptation and mitigation", *International Journal of Innovation and Sustainable Development*, Vol. 1 No. 3, pp. 229-237.
- Herbane, B. (2015), "Threat orientation in small and medium-sized enterprises: understanding differences toward acute interruptions", *Disaster Prevention and Management*, Vol. 24 No. 5, pp. 583-595.
- Howe, P.D. (2011), "Hurricane preparedness as anticipatory adaptation: a case study of community businesses", *Global Environmental Change*, Vol. 21 No. 2, pp. 711-720.
- Institute for Economics and Peace (IEP) (2021), "Ecological threat report 2021: understanding ecological threats, resilience and peace", available at: [www.visionofhumanity.org/resources](http://www.visionofhumanity.org/resources) (accessed 25 January 2022).
- Josephson, A., Schrank, H. and Marshall, M. (2017), "Assessing preparedness of small businesses for hurricane disasters: analysis of pre-disaster owner, business and location characteristics", *International Journal of Disaster Risk Reduction*, Vol. 23, pp. 25-35.
- Kato, M. and Charoenrat, T. (2018), "Business continuity management of small and medium sized enterprises: evidence from Thailand", *International Journal of Disaster Risk Reduction*, Vol. 27, pp. 577-587.
- Koutsovili, E., Tzoraki, O., Theodossiou, N. and Gaganis, P. (2021), "Numerical assessment of climate change impact on the hydrological regime of a small Mediterranean river, Lesvos Island, Greece", *Acta Horticulturae et Regiotecturae*, Vol. 24 No. 1, pp. 28-48.
- Kreibich, H., Thielen, A.H., Petrow, T., Müller, M. and Merz, B. (2005), "Flood loss reduction of private households due to building precautionary measures—lessons learned from the Elbe flood in August 2002", *Natural Hazards and Earth System Sciences*, Vol. 5 No. 1, pp. 117-126.
- Kreibich, H., Seifert, I., Thielen, A., Lindquist, E., Wagner, K. and Merz, B. (2011), "Recent changes in flood preparedness of private households and businesses in Germany", *Regional Environmental Change*, Vol. 11 No. 1, pp. 59-71.
- Kuang, D. and Liao, K.H. (2020), "Learning from floods: linking flood experience and flood resilience", *Journal of Environmental Management*, Vol. 271 No. 111025.
- Lhomme, S., Serre, D., Diab, Y. and Laganier, R. (2013), "Analysing resilience of urban networks: a preliminary step towards more flood resilient cities", *Natural Hazards and Earth System Sciences*, Vol. 13 No. 2, pp. 221-230.

- 
- Linmenluecke, M.K. and Griffiths, A. (2015), *The Climate Resilient Organisation: Adaptation and Resilience to Climate Change and Weather Extremes*, Cheltenham, Edward Elgar.
- Linmenluecke, M.K., Griffiths, A. and Winn, M. (2012), "Extreme weather events and the critical importance of anticipatory adaptation and organisational resilience in responding to impacts", *Business Strategy and the Environment*, Vol. 21 No. 1, pp. 17-32.
- Linmenluecke, M.K., Griffiths, A. and Winn, M.I. (2013), "Firm and industry adaptation to climate change: a review of climate adaptation studies in the business and management field", *Wiley Interdisciplinary Reviews: Climate Change*, Vol. 4 No. 5, pp. 397-416.
- Linmenluecke, M.K., Stathakis, A. and Griffiths, A. (2011), "Firm relocation as adaptive response to climate change and weather extremes", *Global Environmental Change*, Vol. 21 No. 1, pp. 123-133.
- Lo, A.Y., Liu, S. and Cheung, L.T. (2019), "Socio-economic conditions and small business vulnerability to climate change impacts in Hong Kong", *Climate and Development*, Vol. 11 No. 10, pp. 930-942.
- McAneney, J., McAneney, D., Musulin, R., Walker, G. and Crompton, R. (2016), "Government-sponsored natural disaster insurance pools: a view from down-under", *International Journal of Disaster Risk Reduction*, Vol. 15, pp. 1-9.
- Mamouni Limnios, E.A., Mazzarol, T., Ghadouani, A. and Schilizzi, S.G. (2014), "The resilience architecture framework: four organisational archetypes", *European Management Journal*, Vol. 32 No. 1, pp. 104-116.
- Markantonis, V., Meyer, V. and Lienhoop, N. (2013), "Evaluation of the environmental impacts of extreme floods in the EVROS River basin using contingent valuation method", *Natural Hazards*, Vol. 69 No. 3, pp. 1535-1549.
- Marks, D. and Thomalla, F. (2017), "Responses to the 2011 floods in Central Thailand: perpetuating the vulnerability of small and medium enterprises?", *Natural Hazards*, Vol. 87 No. 2, pp. 1147-1165.
- Marshall, M.I., Niehm, L.S., Sydnor, S.B. and Schrank, H.L. (2015), "Predicting small business demise after a natural disaster: an analysis of pre-existing conditions", *Natural Hazards*, Vol. 79 No. 1, pp. 331-354.
- Matrai, I. and Tzoraki, O. (2018), "Assessing stakeholder perceptions regarding floods in Kalloni and Agia Paraskevi, Lesvos Greece", in Berillis, P. and Karapanagiotidis, I. (Eds), *HYDROMEDIT Conference*, University of Thessaly – School of Agricultural Sciences, Department of Ichthyology and Aquatic Environment, Volos, Greece pp. 822-824.
- Miceli, R., Sotgiu, I. and Settanni, M. (2008), "Disaster preparedness and perception of flood risk: a study in an alpine valley in Italy", *Journal of Environmental Psychology*, Vol. 28 No. 2, pp. 164-173.
- Moore, S.B. and Manring, S.L. (2009), "Strategy development in small and medium sized enterprises for sustainability and increased value creation", *Journal of Cleaner Production*, Vol. 17 No. 2, pp. 276-282.
- Mpekariis, I., Tsiotras, G., Moschidis, O. and Gotzamani, K. (2020), "Natural disaster preparedness and continuity planning of Greek enterprises", *International Journal of Disaster Risk Reduction*, Vol. 47, p. 101555.
- Munich Re (2017), "Topics Geo – Natural catastrophes 2016 – Year of the floods", available at: [www.munichre.com/content/dam/munichre/contentlounge/website-pieces/documents/TOPICS\\_GEO\\_2016-en4.pdf](http://www.munichre.com/content/dam/munichre/contentlounge/website-pieces/documents/TOPICS_GEO_2016-en4.pdf) (accessed 19 January 2021).
- Neise, T. and Diez, J.R. (2019), "Adapt, move or surrender? Manufacturing firms' routines and dynamic capabilities on flood risk reduction in coastal cities of Indonesia", *International Journal of Disaster Risk Reduction*, Vol. 33, pp. 332-342.
- Olsson, P., Folke, C. and Hahn, T. (2004), "Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in Southern Sweden", *Ecol. Soc.*, Vol. 9 No. 2.
- Parsons, M., Brown, C., Nalau, J. and Fisher, K. (2018), "Assessing adaptive capacity and adaptation: insights from Samoan tourism operators", *Climate and Development*, Vol. 10 No. 7, pp. 644-663.

- Pathak, S. and Ahmad, M.M. (2018), "Flood risk reduction through insurance for SMEs in Pathum thani province, Thailand", *Development in Practice*, Vol. 28 No. 2, pp. 303-310.
- Piotrowski, C. (2006), "Hurricane Katrina and organisation development: part 1. Implications of chaos theory", *Org. Dev. J.*, Vol. 24, pp. 10-19.
- Resilience Alliance (2007), "Urban resilience research prospectus Canberra, Australia", Phoenix, USA; Stockholm, Sweden, available at: [www.resalliance.org/files/1172764197\\_urbanresilienceresearchprospectusv7feb07.pdf](http://www.resalliance.org/files/1172764197_urbanresilienceresearchprospectusv7feb07.pdf) (accessed 11 December 2021).
- Reynolds, L. (2013), *Climate Change Preparedness and the Small Business Sector*, M.J. Bradley and Associates, LLC, Concord, MA.
- Rincon, E., Linares, M.Y. and Greenberg, B. (2001), "Effect of previous experience of a hurricane on preparedness for future hurricanes", *The American Journal of Emergency Medicine*, Vol. 19 No. 4, pp. 276-279.
- Rowley, J. (2012), "Conducting research interviews", *Management Research Review*, Vol. 35s Nos 3/4, pp. 260-271.
- Samantha, G. (2018), "The impact of natural disasters on micro, small and medium enterprises (MSMEs): a case study on 2016 flood event in Western Sri Lanka", *Procedia Engineering*, Vol. 212, pp. 744-751.
- Schaer, C. and Kuruppu, N. (2018), *Private-Sector Action in Adaptation: Perspectives on the Role of Micro, Small and Medium Size Enterprises*, UNEP DTU Partnership, Copenhagen.
- Sheffi, Y. (2007), *The Resilient Enterprise*, MIT Press, Cambridge, MA.
- Siegrist, M. and Gutscher, H. (2008), "Natural hazards and motivation for mitigation behavior: people cannot predict the affect evoked by a severe flood", *Risk Analysis*, Vol. 28 No. 3, pp. 771-778.
- Sorensen, J., Persson, A., Sternudd, C., Aspegren, H., Nilsson, J., Nordström, J., Jonsson, K., Mottaghi, M., Becker, P. and Pilesjö, P. (2016), "Re-thinking urban flood management – time for a regime shift", *Water*, Vol. 8 No. 8, p. 332.
- Spillan, J. and Hough, M. (2003), "Crisis planning in small businesses: importance, impetus and indifference", *European Management Journal*, Vol. 21 No. 3, pp. 398-407.
- Spittal, M.J., Walkey, F.H., McClure, J., Siegert, R.J. and Ballantyne, K.E. (2006), "The earthquake readiness scale: the development of a valid and reliable unifactorial measure", *Natural Hazards*, Vol. 39 No. 1, pp. 15-29.
- Tegos, A., Ziogas, A., Bellos, V. and Tzimas, A. (2022), "Forensic hydrology: a complete reconstruction of an extreme flood event in data-scarce area", *Hydrology*, Vol. 9 No. 5, pp. 1-19.
- Ten Brinke, W.B., Saeijs, G.E., Helsloot, I. and van Alphen, J. (2008), "Safety chain approach in flood risk management", *Proceedings of the Institution of Civil Engineers-Municipal Engineer*, Thomas Telford Ltd, pp. 93-102.
- Thieken, A.H., Petrow, T., Kreibich, H. and Merz, B. (2006), "Insurability and mitigation of flood losses in private households in Germany", *Risk Analysis*, Vol. 26 No. 2, pp. 383-395.
- Tsangaratos, P., Iliä, I. and Loupasakis, C. (2018), "'Land subsidence modelling using data mining techniques. The case study of Western Thessaly, Greece', natural hazards GIS-based spatial modeling using data mining techniques", *Advances in Natural and Technological Hazards Research*, Springer, Cham, pp. 79-103.
- Tsantopoulos, G., Tsoulakaki, D., Tampakis, S., Karelakis, C. and Mamalis, S. (2013), "Alternative crops – problems and prospects: a comparative research of landowners' views in the prefectures of Rodopi and Evros", *Procedia Technology*, Vol. 8, pp. 300-305.
- Tzoraki, O. (2020), "Operating small hydropower plants in Greece under intermittent flow uncertainty: the case of Tsiknias River (Lesvos)", *Challenges*, Vol. 11 No. 2, p. 17.
- Vakilzadeh, K. and Haase, A. (2021), "The building blocks of organisational resilience: a review of the empirical literature", *Continuity and Resilience Review*, Vol. 3 No. 1, pp. 1-21.

- 
- Wedawatta, G. and Ingrige, B. (2012), "Resilience and adaptation of small and medium-sized enterprises to flood risk", *Disaster Prevention and Management: An International Journal*, Vol. 21 No. 4, pp. 474-488.
- Xiao, Y. and Van Zandt, S. (2012), "Building community resiliency: spatial links between household and business post-disaster return", *Urban Studies*, Vol. 49 No. 11, pp. 2523-2542.
- Yoshida, K. and Deyle, R.E. (2005), "Determinants of small business hazard mitigation", *Natural Hazards Review*, Vol. 6 No. 1, pp. 1-12.
- Zevenbergen, C., Veerbeek, W., Gersonius, B. and Van Herk, S. (2008), "Challenges in urban flood management: travelling across spatial and temporal scales", *Journal of Flood Risk Management*, Vol. 1 No. 2, pp. 81-88.
- Zhang, Y., Lindell, M.K. and Prater, C.S. (2009), "Vulnerability of community businesses to environmental disasters", *Disasters*, Vol. 33 No. 1, pp. 38-57.

**Corresponding author**

Antonis Skouloudis can be contacted at: [skouloudis@aegean.gr](mailto:skouloudis@aegean.gr)

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