DOES FLOODING DEFINE THE AQUAPELAGO?

Constructing Venice's flood disaster risk personality

[Received November 2nd 2020; accepted February 8th 2021 – DOI: 10.21463/shima.102]

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ABSTRACT: Part of Venice's character and appeal is sometimes constructed and construed as being not just about water, but also about the role which flood management plays, especially avoiding floods. A 'disaster risk personality' is created regarding water-land interaction, based mainly on avoiding inundation. This paper explores the construction of this approach for Venice's flood disaster risk personality through a conceptual examination of Venice as an aquapelago to understand water-land links and separations. With this baseline, three decision-making lessons for Venice's flood disaster risk personality are detailed: (i) the dynamicity of the water-land interface and hence the aquapelago, (ii) the impact of structural approaches on disaster risk personality, and (iii) the implications of submergence. While non-structural approaches to flood risk management tend to have the best long-term successes in averting flood disasters, Venice has chosen the opposite approach of constructing a large barrier, substantively changing its disaster risk personality. This choice is not inherently positive or negative, with the desirability and usefulness being subjective and based on the (flood) disaster risk personality sought for the locale.

KEYWORDS: climate change adaptation, disaster risk management, disaster risk reduction, floods, risk

Venice's disaster risk personality

Venice's history of disaster risks and disasters is long and varied. Examples are:

- Air pollution (Trozzi et al, 1995).
- Blackouts, such as on 28 September 2003 (UTCE, 2004).
- Disease outbreaks, such as plague (Ell, 1989) and COVID-19 (Stella et al, 2020).
- Droughts, such as in July 2017 (Ninfo et al, 2009).
- Earthquake damage, such as on 3 January 1117 (Guidoboni and Comastri, 2005).
- Economic decline, such as in the early 17th Century (Norwich, 2003; Tenenti, 1967).
- Violent conflict, such as The War of the League of Cambrai in the early 16th Century and piracy (Norwich, 2003; Tenenti, 1967).
- Terrorism, such as on 30 March 2017 when four people were arrested for an alleged plot to bomb the Rialto bridge (Giuffrida, 2017).
- Volcanic ash disruption, such as aircraft grounded in April and May 2010 after Eyjafjallajökull in Iceland erupted (Bolić and Sivčev, 2011).

All these situations match the typical understandings from baseline disaster research (Hewitt, 1983; Lewis, 1999; Wisner et al, 2004) that disasters emerge from long-term processes of intersecting multi-scalar hazards and multi-scalar vulnerabilities. This work explains that the real cause of the disaster process is not the hazards. Even when hazards manifest rapidly, such as earthquakes and sequences leading to power failures, the disasters were not events, but were long-term processes, since the vulnerabilities took a long time to build up. Thus, disasters are caused by vulnerabilities, meaning that people and infrastructure are not ready or able to withstand hazard-related impacts, usually because they do not have the resources or choices to avoid difficulties from known and observable disaster risks. These situations are political constructions which happen slowly to permit vulnerabilities to accrue, meaning that "natural disaster" is a misnomer because disasters are caused by society.

This tenet, that disaster risk is a combination of hazard and vulnerability but the cause is vulnerabilities, applies to a much wider scope. Space weather, cyberattacks, and meteorite strikes have already affected and could at any time affect almost all places around the world, so Venice is not immune. Excessive tourism in Venice (Bertocchi et al, 2020) could be labelled as a disaster given the harm which it does to the natural environment, the infrastructure, and the heritage. Efforts over the years to curtail tourist numbers have met with some success, including banning cruise ships and implementing a tourist tax. Broadening understandings of 'disaster' in this respect matches disaster research (Hewitt, 1983; Lewis, 1999; Wisner et al, 2004) leading to further conceptualisations of 'disaster' relevant for Venice and most other locations in the world:

- Corruption (Lewis, 2011), as shown for Venice when the mayor resigned in 2014 over allegations pertaining to the flood barrier (BBC, 2014).
- Poverty, which is discussed for Venice from 1400-1700 (Pullan, 2004).
- Oppression and powerlessness (Wisner, 1993), perceptions of which have led to political movements for increased Venetian autonomy and even independence from Rome (Giovannini and Vampa, 2020), although others might consider independence for Venice to be a disaster.

Despite the long-standing diversity of disasters and disaster risks affecting Venice, much of the city's image relates to water as a complementing duality of hazard and resource, mainly in the context of the canals and lagoon. The focus is frequently on Venice's long history of dealing with the hazard of too much water, most notably due to surge from the Adriatic Sea and runoff from rainfall (Camuffo and Sturaro, 2004; Enzi and Camuffo, 1995). Water as a Venetian characteristic has helped to define the archipelago. It was accessible only by going on or through water until a causeway with railway tracks was completed in 1846 followed by a road in 1933. Throughout these decades, the advent of balloons, dirigibles, helicopters, aircraft equipped for water landings, and parachutes, among others, provided alternative means to reach Venice.

Given its low elevation, flatness, and dozens of islands, floods in Venice have been documented for centuries (Camuffo and Sturaro, 2004), with the sea surges termed *acqua alta* (high water). The water encroaches onto the land as a result of elevated seas and runoff, combined with the city's subsidence, both natural and human-caused – including from groundwater extraction and canal construction and dredging (Camuffo, 2001; Camuffo and Sturaro, 2004; Fagherazzi et al, 2004; Fletcher and Spence, 2005; Sarretta et al, 2010). The most famous flood in memory is suggested as being 4 November 1966 when the inundation of key buildings led to an Italian law for protecting the city (Trincardi et al, 2016). Then, on

13 November 2019, the water level nearly reached the same level and two people died. Continuing flood-related concerns include polluted waters along with human-caused climate change leading to sea-level rise meaning higher surges and increased storm intensity meaning more rainfall.

With water being an integral part of Venice's cultures, histories, personalities, attractions, and characters, it has become engrained as a dominant risk to Venice and as part of the city's disaster risk personality. Yet this perspective rarely includes too little water leading to drought, plus in January 2020, Venice's canals experienced severe water shortages due to low tides (BBC, 2020). Instead, the main focus is usually highlighting too much water leading to floods.

This paper uses floods and flood risk management in Venice to explore the construction of its flood disaster risk personality through a conceptual examination of Venice as an aquapelago within the island cultures context that water defines island assemblages as much as land. The next section draws on the combination of island studies and disaster research to explain more specifically Venice's flood disaster risk personality. Then, three lessons are detailed leading to conclusions regarding the importance of constructing Venice's flood disaster risk personality.

Creating Venice's flood disaster risk personality

As known from disaster research, floods, flood risks, and flood disasters are not the same (Hewitt, 1983; Lewis, 1999; Wisner et al, 2004). A flood is, in effect, more than the typical amount of water on land temporarily. If no one is harmed, inconvenienced, or disrupted, then by definition, it is simply a flood, not a flood disaster. Floods are frequently part of human society and livelihoods, especially for farming; for instance, helping to enrich soil, producing fertile land, and being used for irrigation (Bryan, 1929). The flood is simply the potential hazard, which is only part of flood risk, while also being a resource in some contexts. The other part of flood risk is vulnerability, meaning the processes which place people and property in harm's way, so that it can intersect with the flood hazard to yield a flood disaster.

For example, following a 1953 North Sea storm which killed over 300 people on land in England and over 2,000 more around Europe, a moveable barrier across the River Thames was built and started operations in 1982. Afterwards, the major financial centre of Canary Wharf was constructed, placing extensive and expensive infrastructure in one of London's floodplains. This part of London has not been flooded by a storm surge since, but the prospect remains, so there is huge flood risk from the high vulnerability irrespective of the low hazard. Should the Thames Barrier fail, or should a flood exceed the barrier's design parameters, then Canary Wharf could be flooded along with dozens of residential high-rises, several Tube lines, cultural centres such as Tate Modern, and the Houses of Parliament. This situation would be a flood disaster, which for London last occurred in 1928 when the Tower of London, the Tate Gallery (now Tate Britain), and Parliament were deluged.

Venice is analogous. Excess water temporarily in the city is not necessarily a concern if people are prepared for it, do not become casualties, do not lose property, and can easily clean up afterwards with limited disruption. Yet many people and much infrastructure are not fully prepared for flooding – especially with saltwater, silt, and pollutants – so a high potential for death, damage, and disruption remains, yielding flood risk. Novembers 1966 and 2019 realised this risk, producing flood disasters.

Venice's flood disaster risk personality can be queried in terms of how much is natural and how much is constructed; the negative and positive connotations and consequences of its flood disaster risk personality; and the definition and understanding of Venice as a place in relation to water. For the latter, Venice is fundamentally an amalgamation of land and water. It is an archipelago through being a collection of islands, while also representing an aquapelago, defined by Hayward (2012: 5) as "an assemblage of the marine and land spaces of a group of islands and their adjacent waters".

Encompassing "their adjacent waters" is especially important in the context of floods. Since coastlines are always dynamic, and Venice's history is no different (Amos et al, 2010; Linkov et al, 2014), within the aquapelago concept melding water and land, it seems that water temporarily on land should not be unusual, disruptive, or damaging. Flood disasters happen frequently, though, in several aquapelagos such as deaths and damage in New York City from Hurricane Sandy (Casey-Lockyer et al, 2013 and see Hayward, 2015 regarding New York City as an aquapelago) as well as in Venice.

These deaths and damage come from lack of preparedness, damage mitigation, and planning; that is, a lack of reducing disaster risk. Alternatively, living with floods means that floods do not become flood disasters, which has been implemented for millennia alongside developing many contemporary approaches (Liao, 2019; Szöllösi-Nagy and Zevenbergen, 2005; White, 1942/1945; Wong and Zhao, 2001). Most flood disasters, and other disasters, nonetheless continue to hit worst those with the least opportunities, options, and assets for pre-disaster actions to reduce their vulnerabilities (Hewitt, 1983; Lewis, 1999; Wisner et al, 2004). All this science, policy, and practice on accepting floods without being damaged by them through flood disasters would seem to be apposite for an aquapelago to better link land and water. Instead, Venice in recent times has framed floods as threats rather than as a desirable and manageable part of its disaster risk personality. Water is accepted as an integral part of the city, such as through the canals, yet with clear divisions between water and land. The flood disaster risk personality of Venice is taken to mean that water and land should not overlap, despite over a millennium of this happening.

In fact, the boundaries between water and land within Venice have been deliberately moved and reinforced through reclamation and dredging which, in turn, have exacerbated subsidence, ruptured sediment flows, and changed erosion and accretion patterns (Fletcher and Spence, 2005; Sarretta et al, 2010; Tosi et al, 2009). While these attempts aim at stopping water encroaching onto land, reclamation effectively forces land to encroach into water while dredging means removing land-building material (sediment) from water. That is, the human activities give water and land their own dedicated place, separating them and reducing integration, while engineering a solid, artificial, clear boundary between water and land.

These measures are often completed with river and sea walls, dikes, and levees around the world, creating a disaster risk personality where water and land do not overlap and which are well-documented to worsen floods, to increase flood risk, and to create flood disasters (Criss and Shock, 2001; Etkin, 1999; Fordham, 1999; Tobin, 1995). The rationale is that keeping water away from land inures people to the absence of regular flooding, so they consider the land to be dry and become lax in flood damage prevention measures. Reduced awareness of flood vulnerabilities and fewer measures taken before flooding result. Then, when a flood occurs—as is almost inevitable in a floodplain—people are less prepared and more surprised, so adverse consequences are higher.

With flood risk being a combination of hazard and vulnerability (see the first section), aiming to separate water and land alters the flood hazard to make floods less frequent, but increases flood vulnerability, with the result that flood risk tends to increase overall. The chance of a flood disaster occurring each year is reduced, but the consequences of any given flood disaster are much higher, leading to the moniker 'risk transference' (Etkin, 1999) because risk is transferred into the future. Depending on the specific form by which land and water are separated, any given flood onto land can also be much stronger and more intense, hence 'flood enhancement through flood control' (Criss and Shock, 2001). As an example, if a flood wall fails, then the flood has a high velocity component near the wall compared to a slow-rise flood with low velocity. Empirical evidence from locations relying on structural approaches for flood risk management has shown much higher flood vulnerability for London (Ward and Smith, 1998) and much higher flood damage over the long-term for Michigan (Brown et al, 1997). Thus, the flood disaster risk personality is manufactured, preferring lower hazard but higher vulnerability, and hence higher risk.

Venice has explicitly adopted this flood disaster risk personality through constructing a moveable barrier between the Venetian Lagoon and the Adriatic Sea. MOSE (MOdulo Sperimentale Elettromeccanico, Experimental Electromechanical Module) was first scheduled to be completed in 2011, then 2018, and now 2021, although it became operational in July 2020 and was first closed to stop a sea surge flooding the city in October 2020. As with London's Thames Barrier, Venice's MOSE is not the only measure, but is part of a wider programme highlighting structural approaches to stop water getting onto the land.

The main benefit is more certainty about staying dry and not requiring post-flood clean-up – at least, until a flood exceeds the barrier's design capability or the barrier fails. These gains occur in the short-term due to the low likelihood of a flood disaster in the near future, but long-term costs are underemphasised, because Venice must flood at some point in the future at which time it will have a much lower level of flood-resistant properties, flood preparedness, and flood awareness. This change in the flood disaster risk personality might be desired and the different risks might be acceptable and accepted – after all, any choice of balancing hazards and vulnerabilities is political and value-based – so the concern is whether or not the risks are known, understood, and communicated.

What are the impacts of this decision on the conceptualisation of Venice's aquapelago? The assemblage in the definition of aquapelago (Hayward, 2012) still exists, but the major change is in the water-land relationship. Although the water and land are still adjacent to each other, their interaction and overlap have diminished. Whether or not aquapelagality has diminished is a matter of definition and interpretation. Does aquapelagality demand a close relationship, continual interaction, or actual overlap between water and land, which is frequently implied in island, aquapelago, and archipelago studies (Baldacchino, 2012; Hau'ofa, 1993; Hay, 2013; Hayward, 2012, 2015) and which has been explored for Venice (Grydehøj and Casagrande, 2019)? Or is aquapelagality only about the literal, uninterpreted definition of the assemblage in that the assemblage exists? Certainly, Venice's aquapelago has become an urban agglomeration of islands – such as Bangkok, Lagos, Macau, and Stockholm – without the integrated water-land dynamic and with reclamation defining the boundaries more than water and land (see also Grydehøj, 2015). Rather than being an integral part of the aquapelago, helping to shape and characterise it and its people, water has been assumed to have been controlled and tamed.

This viewpoint differs from removing or excluding water. The appeal of Venice's disaster risk personality (beyond floods only) continues to encompass the presence of water – which is

impossible to ignore given the canals, the boats, the bridges, and the lagoon. But the risk of and from water is presumed to have been substantially curtailed. The city, the aquapelago, the aquapelagality, and (to emphasise the urbanisation) the *aquapelagi-city* can now be accepted and enjoyed on the basis that water is not expected to encroach on the land any longer. The portrayal of Venice's water being inescapable within the city but unthreatening can also continue, just as Venice tends to be depicted in feature films with good weather and calm water, rather than being stormy, flooded, or dangerous.

This representation is, in effect, as a city *with* water – and the water-land boundaries are typically quite clear – rather than as water-land overlap. That is, the disaster risk personality involves the presence of water in a docile, pleasing manner, now fully controlled by MOSE, rather than it potentially causing harm and damage through vulnerabilities making a flood become a flood disaster. The assemblage has become two parts, an archipelago surrounded by but separated from water, rather than the aquapelago with the water-land connections, integration, and overlap. This difference might overcome Baldacchino's (2012) critique of the term 'aquapelago' that a neologism is not needed because 'archipelago' already suffices for a water-land assemblage. Now, though, one water-land assemblage has the two mediums separated or assumed to be so – like post-MOSE Venice – while another has them integrated – like pre-MOSE Venice. Which term, 'archipelago' or 'aquapelago', applies better to which circumstance would remain open for debate.

One possibility for moving forward with this terminological and conceptual discussion could be using parallels from discussions about *presqu'îles* or almost-islands, recognising that the definition of 'island' and traits of 'islandness' are not always lucidly delineated in this context (Hayward, 2016). Archipelagos and aquapelagos overlap – they are not necessarily distinct – and the (flood) disaster risk personality of Venice has changed from pre-MOSE to post-MOSE, but the two disaster risk personalities are not entirely distinct. Combining these points, when Hayward (2012) and Baldacchino (2012) describe the social and cultural water-land connections of islanders living in archipelagic and aquapelagic assemblages, it seems that the assemblage itself does not necessarily need to be entirely cut off from other land or water. In fact, such separation cannot be the case for Venice, since the lagoon is still connected to the Adriatic Sea and mainland waterways while the city is connected to the rest of Italy by a causeway (and see Grydehøj and Casagrande, 2019). Clear aquapelagic boundaries are hard to draw for Venice, as is often the situation. Therefore, just as some locations are seen as being *presqu'îles* or almost-islands (Hayward, 2016), an assemblage for which water and land are separate or assumed to be separate (rather than overlapping or being integrated) might be considered to be almost-aquapelagos/almost-archipelagos or *presqu'aquapels*/*presqu'archipels* (rather than aquapelagos or archipelagos). They would display what could be said to be almost-islandish characteristics, although the differentiation and categorisation might be as fluid as for *presqu'îles* and peninsulas (Fleury and Raoulx, 2016).

Changing Venice's water-land interaction has changed its islandness and its disaster risk personality or, at minimum, its flood disaster risk personality, since all the other disaster risks such as those in Table 1 remain – as well as risks which might not always be classified as disasters, such as vehicle crashes, theft, drowning, smoking, and building mould. Even without MOSE, Venice's flood disaster risk personality was changing as sea level rises. Venice experiences absolute sea-level rise from human-caused climate change (Molinaroli et al, 2019) as well as relative sea-level rise from subsidence of over 0.23 metres since 1900 (Fagherazzi et al, 2004; see also Fletcher and Spence, 2005). While the flood risks, or even the flood hazards, in Venice have never been stable or static since its founding (Molinaroli

et al, 2019), past fluctuations have not been unidirectional. The difference for the future is that the sea level with respect to the land is rising from multiple factors, with little prospect for it falling, simultaneously with storm intensity increasing, with little prospect for it decreasing, leading to more rainfall. Consequently, in the absence of action, the Veneto region had been projected to have floods of higher intensity and magnitude (Molinaroli et al, 2019).

Thus, a decision was required. Either action would be needed to increasingly separate water and land (making it more of an almost-aquapelago or *presqu'aquapel*) or else Venice's disaster risk personality would become amphibious, then giving way to submergence. Submergence as a theme garners attention for islands, covering actual islands which were submerged such as some west of Gibraltar which went underwater approximately 11,000 years ago (Collina-Girard, 2001); imaginary islands such as Lyonesse, in southwest England (Mitchell, 2016); and potentially apocryphal islands such as Atlantis (Smith, 2016). It would seem that humanity collectively would generally oppose submergence of Venice, instead preferring to focus on a flood disaster risk personality with "almostness", as in an almost-island or almost-aquapelago/almost-archipelago. One important challenge is defining the almostness. If land is submerged only during some tides or floods, then is it almost-submerged, almost-aquapelagic, or both? Does the same hold if it is submerged except from some tides or droughts? One possible way to interpret almostness is to place each of submergence, aquapelagality, and archipelagity on its own axis. Each can have different levels of presence and absence, rather than each being a binary of either presence or absence. Almostness means being close to one end point of an axis. Each axis does not need to be a continuum with every value feasible. Instead, each axis could have discrete states to comprise a finite and/or countable set of possibilities for each of submergence, aquapelagality, and archipelagity. The axes could be combined into a three-dimensional space, so that a location such as Venice is represented by a point defining the states of submergence, aquapelagality, and archipelagity. Since those three characteristics are not independent variables, some points in the three-dimensional space would be excluded.

Which points defining this flood disaster risk personality would make Venice less of a 'Venice' than it was before? Should we accept that personalities change with age and (flood) disaster risk personalities are no different? Ultimately, so much is definitional and scoping. Venice's disaster risk personality has changed substantially with respect to floods for both hazard and vulnerability, yet so much about Venice is iconised as being about water. If Venice is defined primarily on its aquapelagality rather than its aquapelaga-city – that is, less about the urban component (the city) and more about water-land connections (aquapelagality) – then Venice and its flood disaster risk personality have changed substantially. If Venice is defined as the city with its water and land, the lagoon, and any internal connections and boundaries, then the only characteristic which MOSE has changed is potential flood frequency, in particular by removing the possibility of low-level flooding of Venice's land. This, in turn, changes people's behaviour and changes flood vulnerability.

As with all such changes to disaster risk personalities, including risk transference, advantages and disadvantages exist, with some emerging and some submerging. The key is that decisions have been made to control some aspects of the flood disaster risk personality, a decision which thus has advantages—such as keeping Venice drier than before – and disadvantages – such as increasing flood vulnerability (Etkin, 1999). The outcomes of these decisions should be communicated honestly and directly, rather than the continual assumptions that flooding and submergence mean 'Venice in Peril' (Montanelli, 1970 with page 18 implying it would be 'the death of Venice'; see also Fletcher and Spence, 2005) and that MOSE inevitably 'protects'

Venice (Fontini et al, 2010). Explaining what flood disaster risk personality is sought, why it is sought, how it will be achieved, and the positive and negative consequences will ensure that Venice's flood disaster risk personality is understood and is linked to its island, city, water, and land components.

Lessons from Venice's flood disaster risk personality

Given that Venice's flood disaster risk personality is created and then managed to a large extent, it is effectively a social construct rather than a physical construct. That is, rather than the environment creating the personality, it emerges through societal decisions, whether deliberate or inadvertent – just as disasters are not natural, but are societal constructs. Which lessons should be considered in making decisions about Venice's flood disaster risk personality? How do these lessons link from Venice's flood disaster risk personality to Venice's wider disaster risk personality? Here, three principal suggestions are made, based on the previous section and further contextualised within and supported by baseline work in disaster research: (i) the dynamicity of the water-land interface and hence the aquapelago, (ii) the impact of structural approaches on disaster risk personality, and (iii) the implications of submergence.

The first lesson is the dynamicity of the water-land interface and hence the aquapelago. Coastlines and shorelines are not naturally static, instead always being geomorphologically dynamic temporally and spatially. One obvious temporal dynamicity is tides which, in most (but not all) locations, alter the water-land interface semidiurnally. The actual boundary between water and land (if one can really be set) also varies monthly, annually, and multi-annually. Venice's highest astronomical tide is 0.74 metres above mean sea level (Fagherazzi et al, 2004) and its average tide is 0.33 metres above mean sea level (Camuffo, 2001). Longer-term trends are evident, with subsidence and sea-level rise from human-caused climate change mentioned earlier and leading to increased water coverage over Venice. Conversely, reclamation and structures such as walls and engineered canals force land into water. Spatial variations in the land-water interface further occur through changes in sedimentation, such as upstream processes affecting freshwater sediment load entering the lagoon and changes in the wind (e.g. the Bora and the Scirocco) and wave regimes affecting sediment deposition and longitudinal drift (Fletcher and Spence, 2005; Umgiesser, 1997).

Consequently, Venice's flood disaster risk personality has always been changing, as has the rest of its disaster risk personality. Climate is always dynamic leading to weather variations such as wind power, air temperature characteristics, and precipitation regimes. Same with tectonic processes and disease, as well as air pollution, poverty, corruption, and terrorism. A uniform or static baseline should not be assumed for understanding the Venice aquapelago with respect to flood-related or other disasters. Nonetheless, much of the attempted creation and management of Venice's flood disaster risk personality seeks stability and lack of interaction between land and water, leading to a preference for structural approaches, such as MOSE.

The second lesson is then evident of how this structural bias impacts Venice's disaster risk personality. For floods, risk transference was described earlier, yet the alternative of not building a MOSE-like structure is accepting a flood disaster risk personality with increasing inundation and eventual submergence.

Similarly, to avoid earthquake casualties, a combination of structural and non-structural approaches is essential. The best life-saving advice during an earthquake is drop-cover-hold;

that is, get on the floor, go underneath a sturdy piece of furniture such as a strong table, and hold onto it during the shaking. This individual behaviour during an earthquake needs to be conducted in tandem with pre-earthquake non-structural actions such as bolting appliances and shelves to walls and securing objects such as books and vases, so that none of them fall onto people or leap across the room in the shaking. All these actions are much less effective if the building does not maintain its structural integrity, meaning that structural approaches remain necessary for earthquake risk reduction. Seismic-related investigations for Venice occur (e.g. Russo, 2013), but the amount of Venice-specific knowledge is far less than for flooding, presumably because the largest earthquake known to have affected Venice so far was in 1117 (Guidoboni and Comastri, 2005) while the largest flood known to have affected Venice was in 1966. Many other high floods have been experienced since 1966, but few damaging earthquakes have been experienced since 1117.

For earthquakes – and other aspects of Venice's disaster risk personality such as terrorism and blackouts – the ultimate aim is, reasonably, low risk. This aim applies to flood risk as well, yet it cannot be achieved through non-structural approaches alone, given that the known outcome without major structural flood-related interventions is continued inundation and eventual submergence. Do these flood-related structural approaches nonetheless reduce the risk, which is the clear case for earthquakes? Ultimately, the risk management issue is that relying on only structural approaches for Venice's flood disaster risk personality presents a false sense of security. The lessons are not about opposing MOSE or similar structures, but are (i) being honest regarding the flood disaster risk personality consequences and (ii) ensuring that non-structural approaches are implemented in tandem, to avoid seeking static thresholds between water and land. That is, the aquapelago must still be accepted as being dynamic, even with reduced dynamism for lower levels of flood hazard.

A defining question for Venice's aquapelago, leading to the third lesson, is whether or not aspects of submergence must be accepted. Submergence and inundation have generally been assumed to be negative for Venice, irrespective of the time scale considered. Despite its millennial-scale experience with seawater, floods still damage the infrastructure, partly because it is hard to construct buildings which can withstand saltwater and partly because little effort has been put into doing so or considering actions such as frequent maintenance alongside readiness for post-flood clean-ups. The idea of 'living with floods' has a lengthy history but encompasses modern cities (Liao, 2019; Szöllösi-Nagy and Zevenbergen, 2005; White, 1942/1945; Wong and Zhao, 2001) while learning from more traditional societies using water and floods for living and livelihoods, such as the Moken in Myanmar (Dancause et al, 2009) and the char people in Bangladesh (Sarker et al, 2020). The examples cover freshwater and seawater, including with sediment, but augmented challenges occur when attempting to live with floods contaminated by modern chemical pollution (Newman et al, 2020).

Today, retrofitting Venice to withstand floods, especially from the Adriatic, would be so extensive and so expensive – possibly even more so than MOSE – that the personality, including the flood disaster risk personality, would be comprehensively transformed. Living with other hazards and disasters, though, is not as straightforward in that acceptance of terrorist acts should be zero (Wilkinson, 1974) even while focusing on understanding and preventing fundamental causes (Tinnes, 2017); while living with earthquakes involves structural approaches (Blundell, 1977). Venice's attempt at zero-tolerance for flooding is a clear statement that inundation and submergence are not wanted as part of its disaster risk personality, but the question remains regarding how long this preference could be implemented, especially if melting ice sheets raise sea level by dozens of metres over coming centuries (Clark et al, 2016).

It also leads to the basic lesson that Venice, just like its disaster risk personality, is much more of a social construct that a physical construct. A disaster risk personality never denies the physicality of the environmental hazards, such as floodwater velocity and depth, earthquake accelerations, or silicosis from breathing in volcanic ash. Nor is the physicality of a city such as Venice denied, in terms of infrastructure and people using it. Choices are nonetheless made that a city is desired in this location, irrespective of the environment, and that its disaster risk personality should try to exclude as many floods as possible while embracing water. The aquapelago of Venice could take many forms, with the form currently chosen being socially constructed to accept water but not floods.

Conclusion

This article has explored Venice's flood disaster risk personality through a conceptual examination of key, linked themes – including the aquapelago, risk transference, and submergence – leading to enhanced understandings of its natural and artificial aspects along with decision-making approaches. While it would seem that the basic aim of constructing and managing Venice's flood disaster risk personality should be for reducing disaster risk, which includes adapting to climate change, in reality the choices end up supporting short-term approaches irrespective of the long-term consequences. The options used change Venice's flood disaster risk personality from a city in which water and land interact to a situation in which separation is attempted, challenging notions of archipelago and aquapelago into the almost- or *presqu'* realm. This is not necessarily good or bad, and a judgement is deliberately not made. It does have the potential of presenting Venice's flood disaster risk personality as something different to the reality, especially through assuming that the flood risk is much less than it really is.

In particular, non-structural approaches to flood risk management tend to have the best long-term successes in averting flood disasters, including in aqualpelago cities. For Venice, implementing only non-structural approaches would increase the long-term potential of the city no longer being dry, making aquapelagality more water than land, rather than the structural approaches which make aquapelagality more land than water, thereby highlighting aquapelagi-city (the urban component of the aquapelago). Any balance of land and water, as well as their interactions and interplays, is not inherently positive or negative. Their desirability and usefulness is subjective and is based on the (flood) disaster risk personality sought for a locale. That is, flooding can define the aquapelago, at least for Venice, if this choice is specifically made, but it is not inevitable. This starting point should be admitted rather than assuming that the preferred or only disaster risk personality for Venice is separating water from land.

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