WORKING ON MOSE

Climate jobs, lagoon adaptation, and future maintenance in Venice

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ABSTRACT: Workers' and union representatives' assessments of the future of the MOSE mobile barrier project in Venice, Italy, position the Italian state as a bureaucratic entity unwilling to respond to the shared needs of workers and the lagoon. Skilled workers and union leaders were interviewed in early 2024 to map power relations around the flood defense infrastructure during its first years of operations. Their responses outline two growing contradictions within the state 'safeguarding' mandate. First, essential roles on the MOSE project are becoming more precarious without guaranteed future employment. Second, high water event protocols are appearing more short-sighted as sea-level rise threatens to disrupt lagoon stability. Workers hope that the government resolves both contradictions through creation of the long-delayed Authority for the Lagoon. They also express visions for a future economy that revalourises maintenance work and provides clear guidelines for future interventions. This aspirational framing of coastal adaptation work aligns with calls for good climate jobs across the world, suggesting that a just transition for the lagoon workscape requires equity-oriented leadership to make social and ecological spaces endure.

KEYWORDS: Venice, MOSE, sea-level rise, labour, maintenance

Introduction

At face value, Venice, Italy might seem to be an ideal case study for coastal adaptation to sea-level rise. But though the city has historically held an aquapelagic identity, consisting of a rich patchwork of island and watery spaces, as well as maintaining a boat centered and tidally aware social fabric, contemporary Venice finds itself in hydrological crisis (Codato, 2023, p. 192; Hayward, 2012, p. 3; Porzionato, 2021, p. 182). With most of its island geography currently less than a metre above the surface of a tidal lagoon, connected to the Adriatic Sea by three narrow straits (Figure 1), the city has experienced *acqua alta*, high water events, occurring with increasing frequency due to the effects of climate change and lagoon modifications (Faranda et al., 2023, p. 1; Ferrarin et al., 2015, p. 30; Ghezzo et al., 2010, p. 694).

The MOSE project is a set of mobile barriers located at each of the three lagoon mouths, designed to temporarily separate the lagoon from the sea during extreme tides. It represents the single most expensive piece of infrastructure in Italian history. Despite many doubts and polemics during its protracted 20-year construction, the barriers have been deployed since October 3, 2020, so as to effectively shield the historic city and other inhabited islands from the worst damages of *acqua alta* (Vianello, 2021, p. 109). The presence of flood barriers has radically altered the city's present and future, effectively pushing an increased risk of

flooding onto future generations and casting high water as a threat that must be kept away from the historical center rather than as an integral part of the aquapelago (Kelman, 2021, p. 83; Schlumberger et al., 2022, p. 2381).

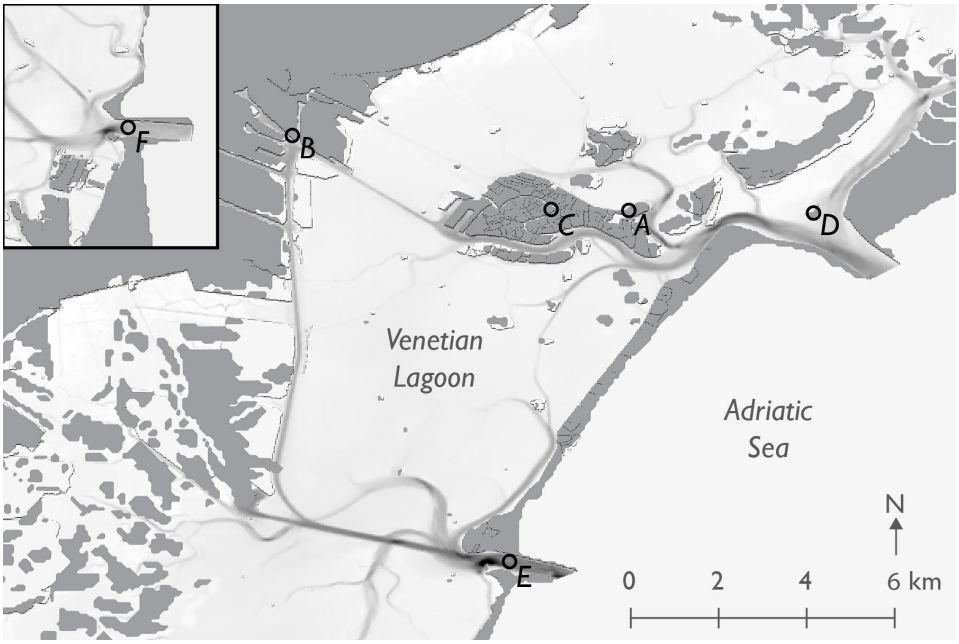

Figure 1 - Oblique view of central Venetian Lagoon with lagoon bathymetry and main locations referred to in the text.

A: Arsenale Nord, offices of Consorzio Venezia Nuova, Comar, and Thetis s.p.a. B: CGIL Venezia offices, Mestre-Marghera. C: Offices of ex-Water Magistrate (ex-Magistrato alle Acque) and future offices of Authority for the Lagoon (Autorità per la Laguna). D: MOSE barrier at Lido, main control room on artificial island. E: MOSE barrier at Malamocco. F (inset): MOSE barrier at Chioggia. The Malamocco-Marghera canal for large ships (also known as Canal dei Petroli) runs from E to B. (Cartography by Egan Turner, Middlebury College Department of Geography, 2024. Data from NOAA and Magistrato alle Acque, Venezia [elaborated by Saretta et al., 2010]. EPSG: 4326 WGS 84.)

For the last few decades, Venice's economy has been heavily oriented toward the production of a certain image for its burgeoning tourism economy, an image which MOSE itself helps maintain.[1] The city is also wrestling with the ongoing legacies of Porto Marghera, its polluted industrial area whose shipping (and cruise ship) traffic is disrupted whenever MOSE's panels are raised (Giupponi et al., 2024, p. 44; Porzionato, 2021, p. 168). On the basis of its two largest economic sectors alone, Venice's social arrangements are at odds with the alarming reality of rising seas, discussed in greater detail at the end of this section. So far, state agencies have done little to alter these unsustainable practices (Anzidei et al., 2024, p. 364; Munaretto and Huitema, 2012, n.p.).

Out of the public spotlight and far from high-level political battles, the hundreds of workers operating and maintaining the MOSE system are adept at anticipating the meteorological

[1] 1the flood barriers were built to preserve exactly this image; see Vianello (2022, p. 114).

conditions associated with *acqua alta* and coordinating with other parts of the lagoon's workscape to activate the flood barriers. Given the project's enormous impact on the rhythms of everyday life in the lagoon, engineers and technicians have started to use the phrase 'after MOSE' (*il dopo MOSE*) to describe the new social arrangement brought about by this adaptation project. Thanks to their work, anyone walking through Venice has great certainty that their feet will (mostly) stay dry.

Yet there is a flip side to the phrase 'after MOSE': it also asks, 'what comes next?' In the copious literature about Venice's challenges of sea-level rise, there has not been any deep engagement with perspectives on lagoon futures from inside the MOSE project. This article presents a snapshot of workers' assessments of MOSE during a period of high uncertainty, when responsibility for lagoon interventions is being transferred to a newly created state agency, the Authority for the Lagoon (*Autorità per la Laguna*; see Perulli, 2021, p. 3). Analysis of workers' testimony is used to answer the question: are current lagoon interventions likely to produce a liveable future?[2]

Over three months in early 2024, I recorded seven semi-structured interviews in Italian with skilled workers and union leaders. Five men and two women between the ages of forty and seventy, all of whom are university-educated and Italian-born, were chosen for their willingness to speak in-depth about lagoon adaptation as well as for their diverse relations to the MOSE project. These conversations were informed by a previous six-month period of anthropological fieldwork in which I met dozens of people associated with the MOSE project. By the seventh interview, I had reached a point of data saturation in responses, indicating that the sample group held a fairly consolidated set of perspectives despite their various roles. I transcribed interviews, coded for common themes, and validated findings in follow-up review with all interview subjects. This analysis forms the basis of my central argument: that in workers' analysis, the phrase 'after MOSE' represents job instability and uncertainty for future life in the Venetian aquapelago. Far from being the rigid standard-bearers of engineering solutions to coastal adaptation (Vianello, 2021, p. 112; Vaughn, 2022, p. 12), I find that MOSE workers are constrained subjects, carefully critiquing the state's approach to lagoon management while labouring to bring about more liveable environmental conditions.

In this article I delve into the working side of MOSE, focusing in particular on the skilled workers who occupy a liminal and increasingly precarious position between the state and the population they are trying to protect. Through an understanding of how these workers see the lagoon and the 'workscape' of laborious tasks that help maintain it, I identify them as agents of regeneration[3] who, perhaps surprisingly, share long-term visions and values with other bottom-up voices in the debate about Venice's future, like fishers and resident-activists. Key to workers' analysis is what exactly constitutes a 'just transition' for those who perform maintenance in the lagoon space. I link their narratives of island adaptation work to the values expressed by ongoing calls for climate jobs across the world. Both issues are driven by a demand for government agencies to break their silence and deliver on plans for a "deliberate transformation" of economies to foster stable work opportunities that do not exploit the living environment but, rather, care for it.[4]

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[2] A research question inspired by Buck's *After Geoengineering*: "Is the proposed program or project likely to produce a livable world 200 years from now?" (2019, p. 37).

[3] Or reproduction, to use the ecofeminist Marxist term; see Salleh (2010, p. 205).

[4] Quoted in Ytterstad (2021, p. 259); see also Scaramelli (2019, p. 388) for workers' perspectives on lagoon transformations from Türkiye.

Climate jobs and lagoon adaptation

Climate job plans, writes Andreas Ytterstad (2021, p. 252), respond to both employment needs and climate change needs. In the best cases, they provide well-paying, meaningful jobs that mitigate carbon emissions, adapt the built environment to climate change needs, or do both. The work has a close relationship with climate science and relies on technology that already exists, without recourse to single 'silver bullet' solutions like geoengineering. Above all, strong climate job plans do not privilege the interests of the financial sector over those of the working class. Steering away from neoliberal logic, climate jobs are funded in part by public institutions but may also be organised by non-state actors like community collectives or trusts. However, in many cases where climate job plans could exist, there is little structural support to meet these conditions (e.g. Afsari Bajestani et al. 2024, p. 4). The MOSE system is one such case: though its workers express a strong desire to have stable jobs that coordinate mitigation and adaptation to climate change, the governance structure around them appears unwilling to help them make that transition.

The creation of the Authority for the Lagoon, expected to be established by summer 2025, reflects the state's reluctance to make a climate jobs plan. Construction and management of MOSE has been very slow in part because of the fragmented governance system of the Venetian lagoon (Biermann et al., 2009, p. 14). To consolidate and simplify legal jurisdiction, the state decreed in August 2020 that a new Authority would be created to take over coordination of all lagoon interventions, including the flood barriers (Perulli, 2021, p. 3). As of this writing, there has been little clarity on exactly what the Authority's future plan for adaptation might be.

All MOSE workers whom I spoke to have high expectations for the Authority for the Lagoon, believing that it will help to expedite their current projects and relieve much of the bureaucratic morass that has made their jobs difficult or insecure, thereby helping the lagoon to be better maintained. However, the five-year delay, mostly because of the national government's slow pace in appointing members of the Authority, has made MOSE workers even more precarious. To boot, it is likely that many of them will be excluded from the limited 'in-house' jobs at the Authority, and those that do make the transition will receive lower salaries. A recent headline on the delays: a union representative demanded that the national ministers in Rome "must listen to the professionals who work on MOSE, and the Authority needs to be the response… with these delays there is the risk of environmental consequences."[5]

The Authority is only the most recent form of national intervention in lagoon futures. Since 1973, in reaction to the 1966 flood and increasing concerns about effects of industrialisation, the state has put the lagoon under a special mandate, whose opening text reads:

> *The Republic of Italy guarantees the safeguarding [*salvaguardia*] of the landscape [*ambiente paesistico*] and historical, archaeological, and artistic environment of the city of Venice and its lagoon, protects [*tutela*] its hydraulic equilibrium, and preserves its environment from atmospheric pollution and from water and assures it of socioeconomic vitality in the context of its general development and of the territorial resources of the Region.*[6]

[5] Brunetti (2024).

[6] Legge Speciale 117/1973, 1.1. Translation by the author.

It is important to note that the legal language of 'safeguarding' in the mandate is extended mostly to the built environment of Venice, without reference to people except to guarantee the territory's 'socioeconomic vitality,' albeit according to positivist logic of development. In other words, national interests are subtly oriented to preserving standing capital, like real estate and artistic heritage, and the mandate affirms that these resources within Venice's lagoon system are best protected through state management (Iovino, 2016, p. 55; Porzionato, 2021, p. 168). Nearly three decades after the second World War, as working-class and student liberation movements were on the rise, the 1973 national mandate upheld a vision of Venice that took a hard line on stabilising the territory through top-down governance. After much debate, the safeguarding mandate eventually took the form of the MOSE project as a further iteration of state interests in preserving standing capital (Mencini 1996, p. 61-67).

A brief sketch of how perspectives on the mobile barriers have unfolded during their construction phase: Italy's leading politicians since the Berlusconi era of the early 2000s have promoted large projects such as MOSE, the high-speed rail line (TAV), and the bridge at the Strait of Messina. Under the guise of populism, massive state projects offer a way for local elites to make profit and consolidate political power, reinforcing elite interests. At each of these sites, local activist groups (often composed of self-identified environmentalists, students, and community leaders) have contested the projects and their dominant logic. In Venice, the 'No MOSE' committee was highly active in the early years of construction (2003-2007), condemning the project's impact on lagoon ecology and clamouring for alternative designs, all of which were overridden by national decree. Tensions over the project came to another head in 2014, when a 'blitz' on the offices of Consorzio Venezia Nuova (CVN, the private entity responsible for operating MOSE) revealed an enormous embezzlement scheme in which certain individuals stole hundreds of millions of euros from the project. Overall, then, the MOSE project has largely represented upper-class interests at the expense of public funds, middle-class civil society groups, and the lagoon ecosystem.

Even working fishers, who do not tend to ally with environmentalist groups, have been opposed to the MOSE project for the way it has altered currents in the lagoon. As reported by anthropologist Rita Vianello (2021, p. 98), Venetian fishers have long linked the MOSE project to an ongoing and systematic process of degradation of the lagoon environment. They offer observational evidence from their deep familiarity with place to attest to such changes, concluding that the mobile barrier project does not in any way accord with their vision of a liveable future. An older fisherman whom I met in the northern lagoon confirmed this critique, telling me that MOSE is "an offense" to fishing communities. Contrary to Vianello's assessment, however, I do not find that MOSE workers and fishers have mutually exclusive perspectives. Though divided by beliefs about what constitutes effective intervention, both groups are aligned in their conviction that the Venetian lagoon suffers from state mismanagement.

Rather than focus on broken relations, I will place emphasis on workers' visions of the future that sketch out the potential for turning lagoon adaptation work into good climate jobs. This analysis falls in step with Barca and Leonardi's (2018, p. 488) description of labour environmentalism, a form of activism that calls for 'differently politicising the economy' through working-class subjectivities. In their terms, it entails analytically linking production with reproduction and ecological relations as a way to reframe how wealth is distributed, while actively interrogating the histories that have created the current arrangement. MOSE workers' visions try to sketch one or more lines of flight through the complex dynamics that they observe. They position MOSE as a possible starting point for an idea of a "differently politicised economy" in the lagoon workscape under sea-level rise

MOSE workers are well-aware of what climate science predicts for the lagoon. Venice is subsiding at a rate of two to three millimetres per year, in part because of groundwater extraction for industrial purposes in the late 20th century (Ferrarin et al., 2013, p. 23); climate change further compounds local sea-level rise (Faranda et al., 2023, p. 1). As early as 1990, Venice's city council was discussing how the greenhouse effect could eventually make *acqua alta* an everyday occurrence (Mencini, 1996, p. 84), although the effects of climate change on Venice have been pointed out since the late 1960s.[7] Depending on the rate of carbon emissions and feedback loop interactions on the global scale, IPCC scenarios suggest that the lagoon will experience an additional average sea-level rise between 40 and 150 centimetres of sea-level rise by 2100 (IPCC WGII, 2022, p. 1828). However, it is dangerous to reduce lagoon futures to these numbers: nonlinear dynamics of climate feedback loops and future lagoon interventions may cause much greater local sea-level rise (Anzidei et al., 2024, p. 363).

To compound the situation, the lagoon has been in a state of net erosion for several centuries, meaning that it tends to lose more sediment than it gains, and MOSE has continued this trend (Ghezzo et al., 2010, p. 696; Ferrarin et al., 2015, p. 2). Without interventions that counter erosion, lagoon morphology becomes less like an estuary and more like the open sea. Sea-level rise accelerates this transformation to a more marine environment, upsetting a stable sense of place, and for this reason loss haunts the lagoon workscape under sea-level rise (Iovino, 2016, p. 55; Porzionato, 2021, p. 168). Fearing loss, the safeguarding mandate has opted to 'save' Venice by positioning the sea as a threat (Vianello, 2021, p. 104), thus playing into an adaptation strategy of resistance: one that Mach and Siders (2021, p. 1294) suggest comes from a "motivation to avoid transformation: to enable people to continue living where and how they have in the past." Though resistance tactics have produced a period of relative stability for the lagoon city, it is unlikely to be a viable long-term strategy as erosion continues and sea-levels rapidly rise. Here, visionary planning — including pathways of accommodation or retreat — may play an important role in transforming the urban aquapelago's future from below, rather than saving it from on high.[8]

As a union leader remarked during an interview: "we are re-accustoming ourselves to a new water, to a water we have never known." Amid changing waters, the ultimate aim put forward by workers' analysis is to make liveable environmental conditions through transformative lagoon adaptation practices. Labour, in this formulation, becomes an invaluable part of the practical realisation of infrastructure that connects human and nonhuman needs in good climate futures. Lagoon adaptation workers in Venice already extend their subordinate subjectivities to the environment around them when they insist that their future is folded in with the future of the lagoon and vice versa. Taking on responsibility for intergenerational persistence, MOSE workers already act in an ecological space, even if they do not use those terms. Their critiques punch up to power and wait for a sea-change that might signal an opportunity for new economic arrangements and better working livelihoods.

[7] A point made by notorious journalist Indro Montanelli in a 1968 docu-film on Venezia, cited in Mencini (2005, p. 37); see also Faranda et al. (2023, p. 2) for historic events attributed to effects of climate change.
[8] Though it lies out of the scope of this article, the *Amphibia* project (Fredrick et al., 2021) is a particularly inspiring speculation on what deep adaptation might look like for the Venetian aquapelago.

Essential and precarious

Unique to the MOSE project, workers who operate the flood barriers belong to at least three different 'realities' that reflect the complex task of managing water levels in the lagoon space. Personnel from two firms, Thetis s.p.a. (from here on, "Thetis") and Comar, are responsible for monitoring and operating MOSE, and they are represented by the National Chemical Workers' Union (FILCTEM) and the National Metal-mechanics' Union (FIOM), respectively. Employees of Consorzio Venezia Nuova (CVN), the conglomerate entity that has been granted exclusive rights to coordinate MOSE construction since 1984, are represented by the National Construction Workers' Union (FILLEA). In collective bargaining and contract negotiations, cross-reality discussions must account for the particular perspectives and needs of all three sectors. According to the union leaders I spoke with, the complexities under a fragmented governance system make coordinating contracts a difficult but rewarding task (see Biermann et al., 2009, p. 14).

Unions have negotiated with the MOSE project from the beginning. In 2003 the Venice branch of national confederated union CGIL publicly opposed MOSE. They called out its reduction of lagoon stewardship to one major intervention, its lack of environmental impact planning, its impact on port operations, and the general lack of attention given to longstanding maintenance practices (CGIL Venezia, 2003, n.p.). Yet, CGIL representatives have also been active participants in establishing accords that protected workers' rights during the period of construction and operation, a mechanism for collective bargaining that is still active today. Despite any misgivings of the overall project, unions continue to valourise workers' contributions and work to defend them at every turn.

Skilled MOSE workers belong to these three private firms contracted to fulfill the state mandate. They are proud of their roles, one describing it to me as "almost a civil defense job" for how they are able to shield the city from water levels when the Adriatic Sea swells up to over two metres above the local datum.[9] At the same time, they also take on enormous responsibility: "everything is on your shoulders" when a high water event happens, an engineer remarked. They have a deep working knowledge of the tides, rattling off water levels as indices of how severe an *acqua alta* event would be and what they would do in response, and they are keenly aware of how different parts of the lagoon, not just Venice, are affected and protected by their work. Despite this technical experience, however, they noted that they are seeing many colleagues retire early or move elsewhere because of uncertain job prospects, a trend that jeopardises MOSE operations if their "know-how" is not passed on.

A moment from August 2021 can illustrate how the MOSE workers position themselves against the uncertainties around the safeguarding project. State agencies had missed salary payments to MOSE workers on-and-off for two years prior to that summer. In response, workers went into dialogue with union representatives, held a general assembly, and eventually called a strike during a planned test of the barriers on August 26. Their frustration with bureaucratic delays demonstrates a self-narrated rift between the MOSE workers and

[9] In interviews, engineers reported observing tides in the Adriatic since 2020 that topped two metres above the local zero, but because of MOSE the lagoon has never swelled as high as this. The highest recorded *acqua alta* was 194 cm above local zero (4 November 1966), followed by 187 cm (11 November 2019); both devastated the city. Piazza San Marco begins to flood at 80 cm; many parts of the city flood at 110 cm and above. MOSE is currently (as of late 2024) is activated in such a way to keep the lagoon height always below 110 cm. See Faranda et al. (2023, p. 2).

high-level politics, playing into a discourse about essential labour. A union leader commented to reporters: "we cannot forget that if MOSE exists today, it is because these two hundred and fifty, three hundred people have contributed to the construction and functioning of this project." Regional media outlet RAI News called it "a symbolic gesture that does not damage the city but reminds everyone that MOSE does not raise itself up."[10] The MOSE workers eventually negotiated for their payments, but not without creating distance between their experience and the upper-class roles they criticised.

It should not be surprising, then, that these skilled workers have tended to identify with hands-on labour during our conversations. Their deep familiarity with the systems built into the mobile barriers is a point of shared experience with the subcontractors who participated in the constructing and testing process. Many of the people who I spoke with have an engineering background, giving them a technical language more in common with construction workers than with politicians. A distinction certainly exists; for example, workers at CVN, Comar, and Thetis have a view toward how MOSE operations affect the wider lagoon, while technicians from subcontracted firms will only be tasked with maintaining specific parts of the system. But despite their knowledge-economy roles, MOSE workers still claim practical know-how that Barca and Leonardi (2018, p. 489) connect to a 'working-class ecology.' Part of their motivation to seek sideways alliances with unions and other workers is likely due to their positioning under a state that seems not to have their best interests in mind.

MOSE workers also tended to distance themselves from critical citizen groups, represented in the early 2000s by the 'No MOSE' committee. Although they may share many of the same values represented by these environmentalist critiques (including the desire for a liveable city, concern about the future of the lagoon, and distrust of national oversight of the project), MOSE workers repeatedly told me that they do not agree with a politics that is gridlocked by disagreement. They prefer to do something, even if the action taken is not perfect. This reasoning both explains their differences with fishers and environmentalists, who denounce the project for its lack of precaution, and also supports MOSE workers' critique of the 'politics of do-nothing' at the national level. They see themselves instead as problem-solvers and decision-makers who will try to make the best of the situation they are handed.

MOSE workers' practical attitude speaks to a secondary, less-visible set of actions they perform under the safeguarding mandate. Beyond simply operating MOSE, workers from all three firms are involved in coordinating other parts of the lagoon workscape. For one, the team at Arsenale Nord communicates with other parts of the lagoon workscape, notifying the port authority, fishing associations, and medical response teams about how and when the mobile barriers will close off water access to the Adriatic Sea. For another, tasks that one might call 'nature-based solutions' such as rebuilding salt marshes, dredging canals, and restoring coastal habitat fall under their purview as compensation works for MOSE. These responsibilities were tagged on to the mandate in the mid 2000s after a lengthy review process found the flood barrier construction to have violated certain EU standards about critical habitat preservation, and they now represent parallel projects in efforts to maintain hydrologic equilibrium.[11]

[10] RAI News, August 26, 2021. Online video segment accessed March 4, 2024.

[11] This questionable series of events is reported directly on the MOSE website, https://mosevenezia.eu/2001-2003/# and in linked documents.

These restorative interventions in the lagoon system are a crucial aspect of 'safeguarding' for the workers whom I spoke with. They cited them as complementary to the mobile barriers, which are just "one piece" in a larger mosaic. The maintenance and monitoring work on other elements of the lagoon suggests an interpretation of 'safeguarding' that extends to the nonhuman environment and its persistence. Indeed, workers were emphatic when describing the lagoon space as a place that needs to be carefully stewarded: "it's all something, and every part of it is important," an engineer told me. Taken together, the two-pronged responsibility of flood defense and habitat restoration leaves workers feeling proud of their contribution to the well-being of the lagoon.

The part of the safeguarding mandate that responds to nonhuman elements of the aquapelago, however, has routinely gone underfunded. After the 2014 scandal, most funding and workers were redirected toward the mobile barrier project to complete MOSE as quickly as possible. In the meantime, the salt marsh reconstruction was "all stopped," a technician reported. In the best of cases, perhaps a few crews were still working on these vital adaptation projects, but they proceeded slowly for years and only in the early 2020s have been re-started on a larger scale. Compared to the short-term safeguarding actions that shield the city, long-term hydrological balance receives little attention and few resources under current governance (Anzidei et al., 2024, p. 386; Munaretto and Huitema, 2012, n.p.).

In a working analysis of the situation, then, workers see their own fates reflected in that of the lagoon system. Propped up for a short time to preserve appearances, their long-term futures are eroded by systemic lack of attention, producing conditions of precarity. These conditions, for workers, are in contradiction with the essential nature of their jobs, seeming to reveal the state's negligence for workers' stability and, by extension, the stability of the lagoon system. As an engineer told me, "people are like the lagoon, either you take care of them and take them with you, or else they disappear, and their knowledge disappears too… and after safeguarding, at a certain point MOSE will be withdrawn, down there, because no one knows how to raise it anymore." The phrase "after safeguarding" is used by workers to indicate degradation, because to them, without MOSE and lacking further interventions, the future appears worse than the present for the entire lagoon. MOSE workers, rather than attributing morphologic change only to the flood barriers (e.g., Tognin et al., 2021, p. 906), see a lack of care-centred working relations to the lagoon as the larger condition that has created a degraded aquapelago.

The essential and precarious current condition of the MOSE worker, yoked to the condition of the lagoon through both self-narrative and tangible working relations, is indicative of the type of labour environmentalism that can spring from lagoon adaptation in Venice. While having elements of climate jobs, insofar as MOSE workers equate stable employment with climate change adaptation (not to mention the way that salt marsh restoration sinks carbon, a form of mitigation work), these roles are unrealised without public investment and revalourisation. Conceptually allied with other subjectivities who are made precarious in neoliberal market logic, such as migrant workers, university students, and lagoon dwellers more generally, MOSE workers describe the Italian state as having failed to deliver on its promises of a stable environment, which is, after all, what the 1973 mandate for Venice and its lagoon was meant to provide.

Weather and climate

To further complicate matters, the lagoon environment is only stable insofar as it is in a state of 'dynamic equilibrium.' This term, borrowed from earth sciences, is a good index for assessing both the hydrological system and the conceptual frame that the state mandate uses to define a safeguarded lagoon. A lagoon in dynamic equilibrium experiences regular fluxes of water, sediments, and energy, but the long-term average rate of these fluxes does not significantly change, thus maintaining a certain set of conditions over time. A stable climate system, too, is in dynamic equilibrium. Climate change, however, disrupts the illusion of mandated lagoon stability (Faranda et al., 2023, p. 2). In the absence of state guidance for how to deal with dynamic non-equilibrium, rapid sea-level rise opens a rift between present and future action plans, disabling MOSE workers' capacity to plan for the after MOSE period and foreshortening the horizon of a secure future.

On paper, MOSE workers are tasked with maintaining a dynamic equilibrium by carefully deploying the mobile barriers in response to tidal-meteorological events that fall outside of the determined normal range (i.e. events greater than 110 centimetres above the local datum). The project has performed as planned, able to sufficiently shield the city from high water events, delivering certainty to lagoon residents. MOSE workers are therefore experts at anticipating and reacting on the time scale of weather. In the control room at Arsenale Nord, forecasting teams make models of lagoon water levels, cross-checking them with each other and with other forecasting centres across the region. "Events are always unpredictable," an engineer told me. The uncertainty of each forecast is about ±10 centimetres, mostly on account of wind conditions, which can 'tilt' the surface of the lagoon up towards the historical center if blowing from the south. With some probability modeling, the workers can account for wind effects, reduce error as much as possible, and deliver accurate forecasts. Managing uncertainty of weather-like phenomena is the know-how that makes MOSE work well.

In practice, however, MOSE workers also acknowledge that sea-level rise introduces a second, more worrying temporal dimension to their work: the time scale of climate. While workers are highly experienced at dealing with high water forecasts on the scale of days to weeks, it became evident in our conversations that on longer time horizons the fate of MOSE is so uncertain as to be laughable. As my questions asked them to speculate about the flood barriers twenty or fifty years in the future, it happened more than once that a MOSE worker replied by asking me, with full sincerity, what I thought would happen. Twice, a respondent told me simply "I'll be dead" by the time sea-level rise presents an urgent problem. Interviews made it clear that the current generation of workers are not mandated to think about what comes after MOSE. Indeed, until the Authority for the Lagoon is created, it seems that no one is directly responsible for thinking about practical long-term futures for Venice.

Nevertheless, MOSE workers recognised the gap between their current jobs and the work needed to face climate change, and they spoke about it in indirect ways. The temporarily stabilised lagoon future under MOSE is strongly haunted by signs of a system no longer in dynamic equilibrium, if it even was in the first place, and MOSE workers are one of several social groups able to raise the alarm. One engineer was particularly candid about the changes he has seen:

> *I can tell you a personal thing that I've shared with them [the other engineers] as well, we talk about these things here from time to time: that the last two*

> *years we've felt this change really physically, you know? And not by reading some analyses made by who knows who, who knows where. It's evidence that the tide levels are rising. Maybe these are extraordinary years… you don't know if it will continue in such an incremental way or not, however in the last two years we have noticed that… you notice it really physically, which on the analyses is a bit difficult because it changes a decimal point, you don't notice it over time… you see it, we see it, with the naked eye, you know, without an electron microscope.*

Despite hedging his observations, the engineer was firm about communicating how changes in average sea-level are apparent to the "naked eye" and "felt physically." Yet, he told me his observation of changing water fluxes only in the last few minutes of the interview, buffered by discourses about the importance of MOSE to everyday life in the lagoon workscape. If baseline conditions of lagoon morphology are changing with the climate, and changing because of MOSE's presence, which has significant effects on current and sediment fluxes (Tognin et al., 2021, p. 906), then the MOSE worker is put in a disempowered position between mandate and reality, creating a contradiction in responsibilities that reveals what is actually happening to the Venetian lagoon.

Climate-scale changes represent an unmanageable uncertainty for the current MOSE system, which in its present state is fundamentally unprepared for projected sea-level rise scenarios on the order of decades in the future (Umgeisser, 2020, p. 5; Giupponi et al., 2024, p. 44). Interviews with MOSE workers reflect these circumstances, as respondents made no mention of any plan that anticipates a metre or more of sustained sea-level rise. I suggest that this is not for lack of imagination on workers' part but is rather a systemic refusal by Italian leadership to grapple with the reality of the situation, allocate funding, and distribute resources accordingly. Instead, a laissez-faire approach leaves MOSE workers executing their duties on the temporal horizon of 'weather' while climate-scale changes go ignored, despite a broad awareness that they are happening.

The main outcome of this scalar mismatch between weather and climate temporalities in the MOSE work mandate is a consistent alleviation of the most visible symptoms of climate change (exceptional *acqua alta* flooding events), only weakly supported by long-term adaptation attempts at lagoon restoration and not at all supported by systemic carbon emissions mitigation plans. MOSE workers are active players in lagoon adaptation insofar as they aspire to make the best of this unjust transition by performing restabilisation (or reproduction) services to the urban aquapelago space, but they are also limited by top-down decisions that orient them toward short-term time horizons. Within this compromised space, however, new visions of working futures emerge.

Maintenance futures

Toward the end of one interview, an engineer moved his pen along an imaginary track, aiming straight for a 'wall' represented by his phone. This is the business-as-usual situation for MOSE workers right now, he said. CVN's management of the project is slated to end and be replaced by the Authority for the Lagoon at some point in 2025. In the five-year delay, workers are in an "interregnum," according to another respondent: a state where neither incoming nor outgoing power is taking responsibility. The first engineer moved the pen closer to the wall to make his point:

> *We have to jump onto another track if we want to give operational and managerial continuity to the people here, for all the reasons that we've been talking about, also because we absolutely need personnel to come here to work on this project, and we need new people… the sooner it gets done, the less afraid we'll be of this wall that will finish us sooner or later.*

In workers' analysis, the metaphoric wall represents the threat of non-transition for MOSE workers, which, they implied, is therefore a threat to the lagoon itself. As the engineer pointed out, the more time that elapses without a definitive plan for the after MOSE period (or any plan that accounts for climate-scale system changes), the greater the internal contradiction in the safeguarding mandate. Essential workers become more precarious without guaranteed job prospects, and highwater event protocols grow more short-sighted without plans for long-term sea-level rise.

Workers want state authorities to resolve the contradictions internal to the safeguarding mandate, but in the meantime, they feel they are about to crash into a wall. Or, in the words of another engineer, "the more this thing gets delayed, the more this place dies," a curious statement because I could not tell whether he was referring to Arsenale Nord or to the lagoon. When the Authority for the Lagoon finally gets created, it is hoped that the responsible figures will quickly update the Morphological Plan for the lagoon and redirect more funding to long-term adaptation and restoration projects. Until then, however, workers are worried about their futures.

Beyond the bare minimum expected from the Authority, MOSE workers also put forward their own vision for the future lagoon workscape, starting with an emphasis on maintenance jobs (Mattern, 2018). The lagoon already requires constant upkeep, an engineer argued:

> *These are expensive routine works that carry the economy and also make the community grow around them, because if there were no need to maintain the lagoon, there would be no work, and the population would disappear. Why does anyone come to live in Venice?… Either you create a way to make it so that people stay in Venice because they live there, because it's beautiful, and because there's work, probably connected to the lagoon because you're in the middle of it, or else it becomes Disney-Garda-land.*

The vision discursively ties meaningful maintenance jobs, coordinated to ensure their longevity, to the fate of the lagoon in such a way to resolve the essential-but-precarious dilemma currently facing MOSE workers. Workers' analysis again pushes responsibility for good lagoon adaptation onto an external authority, while also setting this vision against a common trope for Venice's overtourism. In this way the engineer suggested a social unionism that allies strongly with bottom-up critiques from students and middle-class resident activists, who regularly use the 'Venice Disneyland' figure as a tool to denounce extractive policies of its tourist economy.

In much the same way, a union leader proposed a new concept of dynamic equilibrium not between sea and land, but between work and lagoon biodiversity. In her vision, MOSE is no longer foreign to the system but a part of it, ready to be activated wisely in the gradual move toward understanding how to best steward the lagoon. Monitoring and knowledge-production about the dynamics are an essential and re-valourised part of the workscape, helping to inform responses to rising waters and community needs. Water quality testing, flora and fauna surveys, habitat restoration and infrastructure maintenance are all work

elements that will need to be supported and integrated into a larger mosaic of adaptive action.

Part of ensuring that maintenance jobs are created and carried forward is making them attractive roles for young people, another engineer told me. Envisioning a future workplace as a place of constant encounters and innovations, he wondered how the MOSE system and other parts of the lagoon would benefit from "new technologies and new ideas" brought in by the next generation. If deliberately supported and not prone to "bureaucracy and bad affairs," young lagoon workers would have an outsized impact on the fate of the workscape. Bringing them on board would enable intergenerational knowledge transmission to ensure that future engineers do not replicate past mistakes and leave successive generations even more of a mess to clean up, he said. A vision of the workscape as a kind of "university" or "laboratory" for lagoon stewardship sets up stable opportunities for young people and their families looking to live and stay in Venice.

It is telling that MOSE workers' visions also emphasised that the future lagoon might not be dominated by a single big project. An engineer confirmed that technological solutions have limits and are not always transferable across contexts, including into the future. Accompanying this admission was a tentative reply, shared among several respondents, that something will have to be done to MOSE, even if the choice is to do nothing and let it be buried by sediments. "For certain in this century" the project will have to be entirely re-thought, said one engineer, given the sea-level rise projections. In line with their action-oriented praxis, MOSE workers tended to advocate for the courage to make a future intervention, because creating and executing a plan is seen as correct action in their workspace. However, workers remained open to what such an intervention might look like, since they try to understand a situation and cross-check with other authorities before making an informed decision. This is an ethic that aligns with the ancestral Venetian practice of *scomenzèra* ('trial-and-error') lagoon interventions: "we start a project, then before going forward with the works we see what effect it provokes" (Testa, 2021, p. 45). Representing a completely different approach to lagoon interventions than that of MOSE, workers may find it useful to translate *scomenzèra* to future sea-level rise adaptation projects (see Fredrick et al., 2021).

Finally, as has been stated above, visions for future lagoon workscapes include a governance system that gives clear and coordinated policies for long-term liveability. MOSE workers stated that the Authority for the Lagoon could fulfill this role if it remains free of special interests that prioritise financial gains over viable livelihoods in Venice. In the ideal case, the Authority would use its resources to carry over all 230 workers from the three private companies to its in-house firm, preserving their expertise and learning from their experiences to establish working guidelines that drastically reshape the economy of 'safeguarding,' prioritising lagoon adaptation through the creation of good climate jobs and revalourising the working roles that allow for socio-ecological reproduction in the aquapelago. While MOSE workers recognised that this is unlikely to happen fully or quickly, they were hopeful that the Authority can meet the needs of their work environment upon which so much of Venetian society depends.

By folding their fates in with the fate of the lagoon, MOSE workers have positioned themselves at the fulcrum of sea-level rise futures. Their experiences tangle labour issues and climate issues into a single problem of how long-term liveability is constantly undermined by non-responsiveness at the administrative level. In the frame of a just transition, their experiences put them in the role of 'transmitters,' or people who develop a

set of new know-how around lagoon infrastructure that will be invaluable as sea-level rise compounds flood risk in Venice (Kelman, 2021, p. 84). Unions are key players in advocating for these workers' fair treatment and using their own experience in collective bargaining tactics to exert pressure on public sector actors when they become untrustworthy partners in the move to a just transition (Ytterstad, 2021, p. 252). "MOSE does not work without people," a technician told me, and this is exactly the interpretation of safeguarding that is key to press forward in the push for good lagoon adaptation and climate job creation.

Conclusion

The skilled workers of the MOSE flood barrier project hold a diffuse vision for a just transition in lagoon adaptation work, citing good maintenance jobs and strong political leadership as two elements that will contribute to liveable futures. These calls for a 'differently politicised economy' resonate not only with other citizen groups across Venice and its lagoon, but also with labour movements elsewhere.

For instance, Barca and Leonardi (2018) present the case of the steelworkers' union in Taranto, Italy, as an instance where social unionism has emerged as a reorganisation of labour in response to a politics that favoured production over community health. I propose that a statement from Taranto can be adapted to the particular case of MOSE workers so as to highlight possibilities of lagoon unionism:

> *The Committee argues that citizens and workers should be the ones to decide about production [protection] issues, namely what, how, when, how much, where to produce [protect]. The "economy" belongs to the community, and not vice versa.* (Barca and Leonardi, 2018, p. 498)

Re-reading the sentence for 'protection' instead of 'production' re-activates a question of how safeguarding is actually manifesting in the Venetian lagoon. What is being protected? How, when, and how much? What, exactly, is being maintained?

Workers' analysis from MOSE engineers, technicians, and union leaders has suggested that, despite the very tangible civic benefits from fewer *acqua alta* events, the flood barriers protect interests of the political elite at the expense of future generations. Workers themselves get caught in the middle, benefitting from their expertise at anticipating and reacting to high water events but unable to imagine a viable way out of the current situation without a significant transition in the political economy: the "jump onto another track" possibly represented by the arrival of the Authority for the Lagoon, which may or may not address all of their concerns. Union leaders in particular are aware that continued delays hold MOSE workers in a precarious, suspended state from which they are unable to plan for the future, and so union-worker partnerships are leveraged to negotiate for longer-term certainty whenever possible.

The divergent political futures held by workers and the state is perhaps best captured by theorist Lisa Baraitser (2015), who writes about the different temporalities of production and maintenance. Under the current dominant western work arrangement, she writes, "productivity and creativity do not unfold onto better times, but are looped back into a stagnated now" (p. 23). For me, this phrase evokes images of over-tourism in Venice, where the productive economy is a repeated and stiff performance of certain tired tropes, like

gondola rides and carnival masks, and MOSE workers are tasked with protecting this state of affairs by not allowing disruptive waters to touch the historical center.

On the other hand, Baraitser writes, there is a maintenance-oriented temporality that refuses to continually devalourise the present but instead can open the way to "less bad experiences." Rather than tie it to any form of social progress, she names this maintenance relationship as "endurance": "a psychosocial practice that is involved in the complex and ambivalent processes of care, and in countering slow violences whose effects will be seen well beyond our own lifetimes" (p. 29). As I have tried to make clear, MOSE workers do not see their current work as having the qualities of endurance, but they aspire to such a state. Practices of labour environmentalism already embedded in their discourses seek to retool economic structures to open the possibility for work that regenerates and catalyses other meaningful work opportunities in the lagoon.

The specific lagoon adaptation work that seeks endurance practices are named by MOSE workers as those actions that enable liveable futures for many, not just for few. The labour-environment nexus has potential to regenerate broadly liveable futures, as such analysis works from present conditions to imagine stronger or smarter foundations that could be made in anticipation of the next flood. In the Venetian case, a common reference point for coastal adaptation around the world, much will depend on whether political leaders — or, in their absence, self-organised networks of care — are prepared to take on the labour of making social and ecological systems work with sea-level rise.

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