Flood
Can Miami learn from Venice (or the opposite)

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Abstract: On the one hand, “la Serenissima”, a millenary city, which saw its heyday between XIII and XV centuries. On the other “the Magic City”, famous for leisure and pleasure, born in the late nineteenth century from the encounter of two American pioneers. Apparently, they have nothing in common. Yet they share a lot in common. They are both situated in lagoon areas. They rely heavily on tourism and port activity for their economy. And, they find themselves at the frontline of climate change. Venice has always been confronted to flooding, but this condition has been worsening, due to over extraction from aquifers, which caused the city to subside, and to sea level rise. In contrast, flooding isn’t part of Miamians’ culture and tradition. In recent years, however, with climate change bringing about higher rainfalls and storm surges, and causing sea level to rise, Miami has been experiencing more and more floods. Both cities are now highly jeopardised. After developing on the differences and similarities between Venice and Miami, this article proposes to investigate what answers these cities come with to address climate change effects, and to question what they could learn from each other.

Introduction

Upon my first visit to Miami[1], seven years ago, looking at the city from a boat, I felt the same amazement as when, 30 years earlier, I saw Venezia for the first time: a city built not on land, but on water! This vision triggered my interest and I soon started wondering: why isn’t Miami River as busy as the *Grand Canale*? Is Miami also subject to *acqua alta*? My first impression was that, contrary to my idea of Venezia, an aristocratic old lady who lives on in a long term, complex and enduring relation with water - at once ally and foe - Miami is an *enfant gâté*, whose relation to the ocean is mainly hedonistic, apparently unconcerned by either its dangers or the opportunities its offers. Soon I discovered how fragile this *enfant gâté* really was, and how ignorant of his condition he seemed to be. I wondered: how could the old lady last so long in middle of water, lacking everything? I kept asking myself if there was anything the *enfant gâté* could learn from her about surviving with water.

I followed a simple methodology: I spent a lot of time looking around and I asking myself questions. I tried to imagine possible answers, then I looked for elements to corroborate or better to refute them. These elements came from publications, books, or other media. They sometimes resulted from discussions. At a certain point, I tried frame my iteration by summarising factual information that seemed relevant to the matter. I collected most of the data I used from 2015 through 2017.
I chose to include here non-academic references, first because they give an idea of what information non academics might have on the subject, second because non-academic information often refers to academic information, which may encourage further investigation that I did not engage in. Third and most importantly because they participate in the “Zeitgeist.” Indeed, the question that haunts me is how can we really begin to think climate change in the way that it is totally transforming the backdrop of our lives?

Some facts

Geography

Venice and Miami share the condition of being located in coastal lagoons.
A lagoon is a body of water separated from a larger body of water by a barrier. Coastal lagoons are situated along flat continental coastal plains. They are separated from the ocean or the sea by a sandbar also called

[1] I use “Miami” as a generic term designating Miami Dade County

"outer bank". Coastal lagoons have brackish water, because of the freshwater they receive from rivers and the saline water that enters through inlets in the outer bank.
Lagoons are fragile and unstable environments, sensitive to sea level variations, which can either submerge them or dry them out, and to embankment, due to the settling of sediments carried by the rivers.
Many rivers originally carried freshwater to the "Laguna di Venice", in particular, the Bracchiglione, the Brenta, the Dese, the Sile, the Piave and the Livenza. Some, including the Brenta and the Piave, were channeled out of the Laguna in an effort to stop silting. The outer bank of the Laguna di Venice is now known as the "Lido," and Venice itself was built in the middle of the laguna, on four islets.
Miami is located on the coastal side of a lagoon called "Biscayne Bay," whereas Miami Beach is located on its outer bank. Biscayne Bay receives freshwater from the Everglades, now mainly through the channeled "Miami River" but also from aquifers.
Both lagoons have comparable geology, typically consisting of layers of sediments, brought by the rivers, and confined aquifers, separated from the sediment layers by thin layers of clay. But in the Venice laguna, these sediments are mainly composed of sand, whereas in Biscayne Bay, the sediments consist of limestone.
One of the major differences between these lagoons is their respective coastal geography. In the case of Venice, the continental relief, first characterised by the large plain of the Pô, rapidly rises northward into the Dolomites and the Alps. Whereas in the case of Miami, it consists of the Everglades, a marshland that runs across the Florida peninsula, no higher that two meters above mean sea level, and has been partially drained and urbanised. Another major difference between Miami and Venice is their respective climate: subtropical in Miami[2], Mediterranean in Venice.

Economy

Venice and Miami rely mainly on tourism and maritime transport for their economy. Venice receives 20 million visitors each year and is one of the favourite destinations of Mediterranean cruise boats. Miami Dade County welcomes 16 million visitors each year and the Port of Miami is now the first cruise ship harbour in the world, with almost 5 million passengers in 2016-2017, Port Canaveral and Port Everglades, also located on the Florida East Coast are respectively second and third. In Miami, real estate is the other essential economical sector, whereas in Venice, petrochemical industry has been an important sector during the 20th century. But it is now in decline[3].

History

The two cities differ totally in their respective histories. Venice goes back more than a thousand years, and saw its zenith in the Late Middle Ages, whereas Miami is only 125 years old and is still booming. Obviously, they developed in very different historical contexts and "Zeitgeists," but both cities exemplify why and how human groups came to live in unwelcoming marine environments, and the specific technical and intellectual resources they developed for achieving that.

In the Venetian laguna, virtually in the sea, the first settlements in date from 500 AC.
This extremely unwelcoming environment was the natives' best answer to escape invading barbarians. Facing barbaric perils, they preferred the perils of the sea. Or rather, they chose to put themselves under the protection of the sea. A very risky gamble, but one which would prove to have been a winning one. Indeed, the sea not only protected the Venetians from invasions for more than a thousand years, it also made their fortune. From very precarious premises, Venice developed to become one of the most important and richest European ports, dominating the eastern Mediterranean for three centuries[4], compelling admiration and amazement from visitors[5] with its astounding settings, its beauty and wealth. Venice's existence in the middle of the sea, which

[2] Miami is actually the only metropolitan area of the western world with a subtropical climate

[3] For more detail, see Molinaroli, E, Guerzoni, S., & Suman, D. (2018, May 21). *Adaptations to Sea Level Rise: A Tale of Two Cities – Venice and Miami*. Url: https://doi.org/10.31230/osf.io/73a25 Last consulted on May 24, 2019

[4] From 1204 and the sack of Constantinople, through 1453 and the fall of Constantinople

[5] One of them, Marc'Antonio SABELLICO, reports in 1502: *« vien bagnata essa città non come molte altre da alcuna parte con le onde del mare, ma essa tutta in mezzo le acque è posta»* See Marc'Antonio SABELLICO, *Del sito di Venetia Città, Venise* [1502], Venise, Libreria Filippi editrice, 1985, p. 10. Quoted by Jean-François Chauvard, *Centralités et système urbain à Venise (XVe-XVIIIe siècle)*, Rives nord-méditerranéennes 26 | 2007, mis en ligne le 07 mars 2008. Url : http://journals.openedition.org/rives/851 ; DOI : 10.4000/rives.851 Last consulted on May 23, 2019

had to be constantly fought for, fuelled the notion among visitors but above all among the Venetians themselves, of a Venetian myth, or even of a Venetian miracle[6]. A myth and a miracle that the Venetians political power relied on, nurtured and often orchestrated. Every year, on Ascension Day, the Venetians would celebrate la Sensa, re-enacting their marriage with the sea. The city itself became the theatre stage where architecture acted out the Venetian miracle, while, backstage, the struggle against water went on.

The conquest of Constantinople by the Ottomans, in 1453, is generally seen as having initiated the economic decline of Venice[7]. Very interestingly, it seems to have also triggered the implementation, by the Venetian Republic, of remarkable resource management policies and, in an apparent paradox, its unique cultural radiance. Both lasted until 1797 when Napoleon invaded the Veneto and Venice lost its independence.

Regarding resource management, one needs to bear in mind that, because of the city's settings, it lacked everything, except that which could be harvested from the sea, such as fishing products and salt. Rainwater had to be gathered in wells to provide fresh water[8]. Everything else, food (other than fish), construction material, timber, firewood, had to come from the mainland. Timber and firewood shortage were a major and constant concern, because the city needed enormous amounts of wood for its shipyard, its building activity, for the maintenance of its network of breakwaters and levees, and for domestic and industrial heating. As long as the Venetian fleet dominated the Mediterranean, commerce provided wood, but as of the capture of Constantinople by the Turks, the Venetian Republic saw its area of influence shrink, while its needs continued to grow. To the Venetian Authorities, the lack of wood became just as great a peril as flooding or invasion. Aware that they had to rely on a limited supply area, and despite their reluctance to interfere in the "terraferma," they decided that the Republic should take control of surrounding mainland forests so as to secure its wood provision, stop deforestation by the local population, whom they designated as the main cause of wood shortage because of their selfish, improvident and profligate behaviours which ran counter to common interest and natural order[9]. Seeing themselves as guarantor of natural and common interests, they set themselves to monitor and maintain forest ecology on the mainland in the same way that they had been doing for centuries with sea ecology, in the complex lagoon water system. And their motive was the same: survival, which they saw as depending on working with nature rather than against it. On the mainland, however, the peril did not come from nature itself, but, according to the Venetians, from the populations inhabiting it. The Venetian authorities adopted complex and innovative legislation, which notably designated vast forest estates as common goods, in order to make them inalienable (public good, "res publica," was an intrinsic value of the Venetian Republic), and they developed an unprecedented forestry bureaucracy to implement it[10]. Remarkably, their actions dramatically contrasted with the dominant contemporary European ideology, which promoted individual fulfilment through the improvement and privatisation of nature [11].

On the 12th of May 1797, Venice finally fell into the hands of the invader.

That day Napoleon Bonaparte's troops took the Veneto, putting a brutal end to the Venetian Republic, with its millennial independence, its comprehensive approach of environment, its sacrosanct principle of common goods, and of course of its arsenal. Napoleon immediately replaced the long enduring Venetian institutions and their organic value system by new ones, based on the values of the enlightenment which ruled the dominant European nations. External domination and mechanical values forced Venice to an abrupt and much deferred plunge into "modernity[12]." The subtle, challenging and painstaking convergence of ecology, public and private interests which characterised the Venetian miracle no longer ruled, indeed the time of miracles had long since

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[6] See Crouzet-Pavan, E. (1997). *Venise, une invention de la ville (xiii^e – xv^e siècle)*, coll. « Époques », Champvallon,

[7] Another cause is the new navigation routes, which, as of 1492 would replace the old spice and silk routes

[8] As Venetian historian and diarist Marin Sanudo (1466-1536) wrote : "Venice è in acqua ma non ha acqua"

[9] For a detailed analysis of the relation between the Venetian Republic and the mainland forests, see Appuhn, K. (2009) *A Forest on the Sea: Environmental Expertise in Renaissance Venice*. Baltimore: Johns Hopkins University Press

[10] Appuhn (2009) Op. cit p.114

[11] "The rhetoric of a providential nature that was favoured by Venetian forestry officials, reflects the persistence - in Italy - of Renaissance ideas of an organic, mystical nature, during a period when (…) Protestant Europe was often concerned with demystifying and desacralising nature." Appuhn, K. (2009) Op. cit. p.283

[12] I use "modernity" in the sense of the Modern Era as historical period and value system

ended, Now was the time for heroes subduing and dominating nature. And it was no one less than the champion of modern heroes, Napoleon, the true incarnation of Weltgeist according to Hegel, who finally brought an end to the Venetian miracle. From then on, the resources, which had to be protected before, would be exploited; nature, which had been seen as perfect, would require serious and constant improvement and common good would submit to private interests. This new set of values triggered a dynamic which probably culminated with the construction of the Malamocco-Marghera "canale dei Petroli" and petrochemical complex (1920-1968), which, as Pignatti and Seminara (2009) insist, caused irremediable alterations to the lagoon geology and biology[13]. Furthermore, in the course of the 20th century, over-extraction of groundwater by local industries caused Venice to subside by more than 10 cm while global sea level to rose by the same amount.
Nevertheless, Venice is still there, considered by many as the most beautiful city in the world. It now relies on its glorious heritage for its economy. Indeed, with twenty million visitors each year, in relation a population of now only 53.000 in the historic centre, tourism is Venice's main if not unique source of income, to such an extent that it jeopardises the future of the city as much, if not more, than sea level rise.

When the first Europeans arrived in what is now Southeast Florida, around 1500 AC, the Tequesta, had already been living there, at the mouth of rivers, since the 3rd century BC. But by the time Spanish Florida was traded to the British, in 1763, they had disappeared. A vast number had been decimated by the diseases the Spaniards had brought with them, others perished during their massive relocation to Cuba by the Spanish missionaries. The rest had dissolved into Christianity or into other minorities. Because of the omnipresent marshes, the heat, moist and the mosquitos, Southern Florida stayed basically uninhabited. The first European settlements remained extremely limited and strictly localised along the shoreline. But as of the beginning of 18th century, natives, chased Southward by the second wave of European colonisers coming from the Northeast, began to migrate into the vast and "uninhabitable" Everglades. To quote the above paragraph, you could say that "this extremely unwelcoming environment was the natives' best answer to escape invading barbarians". The story of their exodus into the uninhabitable marshlands began like that of the Venetians, but it developed in a dramatically different way. As the "Laguna" protected the Venetians, the wetlands sheltered the Seminoles from their enemy. Indeed, from 1816 through 1858, the US Government carried three long and expensive wars against them without totally submitting them. When the last diehards retreated deeper into the Everglades, the US Government gave up, because of the cost and because it was believed that no white settler would ever want to live there. However, this unwelcoming but vast and very sunny territory, populated by a few hundred natives, kept attracting more and more bold frontiersmen (and women). William and Mary Brickell, Julia Tuttle, John S. Collins, the Lummus brothers, Henry Flagler, Carl Graham Fisher are the heroes of this other American frontier. Today, their names punctuate the cities of Southern Florida[14]. But, in a strange analogy with Venice, the hero who must truly be credited for the development of Southern Florida, was also called Napoleon Bonaparte. Indeed, with mottos like "Drain that abominable, pestilence-ridden swamp[15]," Napoleon Bonaparte Broward was elected to the office of Governor of Florida from 1905 until 1909. Draining the Everglades had been on US legislators' agenda as early as in 1842, after all, the US had inherited the mechanist values from the European enlightenment and the belief that nature had to be improved to render it economically productive[16]. In 1906 Broward commissioned an engineer, James O. Wright, to establish the drainage plans and in 1908 the works started, launching a still ongoing process that would deeply modify the Southern Florida

[13] Pignatti, S. & Seminara, G. (2009). *The future of coastal ecosystems: learning from Venice*. IN Rendiconti Lincei Url: https://doi.org/10.1007/s12210-009-0048-6 Last consulted on May 23, 2019

[14] In 1871 William and Mary Brickell settle on the south bank of Miami River. In 1891 Julia Tuttle settles on the north bank of Miami River, in Port Dallas (which would become Miami), In 1896 , with the Brickells, she convinces Henry Flagler to bring the East Coast Railway down to Port Dallas, Flagler will actually extend it all the way down to Key West in 1905. In 1895 John Edgar and J.N. Lummus settle in Miami. In 1901 John S Collins settles on the barrier island that would become Miami Beach. In 1912, he builds the first bridge across the lagoon, with financing from the Lummus brothers and Fisher. In 1910 Carl J. Fisher buys land on the barrier Island, he is credited for naming it Miami Beach
In 1911 Mary Brickell builds Brickell Avenue, running from the mouth of Miami River down to Coconut Grove and develops the area until her death in 1922.In 1912, the Lummus brothers buy land from Collins and start building modest family homes. In 1914 Carl J. Fisher Dixie builds Highway and joins in the development of Miami Beach.

[15] Napoleon B. Broward, quoted by Carter, W. Hodding (2004). *Stolen Water: Saving the Everglades from its Friends, Foes, and Florida*. Atria Books. p. 78

[16] For more on this theme, see: Capra, F. & Mattei, U (2015) *The Ecology of Law,* Oakland, CA, Berret-Koehler

landscape and bring its population from a few thousands to more than 8 million[17]. Unforeseen consequences, such as flooding, drought, peat fires, subsiding of the arable peat layer and salt water intrusion (not to speak of flora and fauna destruction) were felt as soon as in the 1920es[18], but the process went on regardless and it is only in the 1970es, when it became clear that draining the Everglades would deprive Southern Florida of drinking water, that it was called into question[19].

Drainage of the Everglades wasn't the only factor that made Southern Florida's demographic explosion possible, as Anthony Oliver Smith puts it: "Technological innovations such as pesticides, air conditioning and mass transportation have transformed Florida from a problematic environment for human habitation into one which is now inhabited by millions. In turn, population growth, agribusiness, tourism, and specific patterns of urban development have seriously affected the fragile ecology of Florida[20]."

Actually, the technological developments made during the 20th century didn't transform this problematic environment, but they substantially reduced its impact on humans. Set them aside, and the environment is just as problematic as it ever was. Worse, at the scale of the planet, these developments contributed to sea level rise and extreme climate episodes intensification (such as hurricanes), which both particularly threaten Florida. Thus today, this environment inhabited by millions, with its affected ecology, is an outpost on the climate change front line.

Nevertheless, Miami is there today. Like Venice, it is a myth and a miracle, but in a different way. Over a period of the few decades, this somewhat provincial but sunny resort for middle class retirees became an international metropolis.

Sea level rise

For dominant scientific research sea level rise is an effects of climate change, caused by the combustion of carbon rocks (coal, oil and gas). Melting of continental ice caps is the principal factor of sea level rise. Sea level rise isn't homogenous throughout the planet, other factors such as thermal expansion, currents, winds and vertical movements of the lithosphere interfere with it. Its principal consequences include shoreline recession, land and fresh water salinisation, fauna and flora migration. Based on 2006 data, some 100 million people would be affected by a 1m sea level rise[21]. But sea level rise could reach 2,5 meters by 2100[22], and population is scheduled to keep growing at least until 2050.

Like all existing lagoon areas, Venice and Miami are highly sensitive to sea level rise, but the risks they incur are different, due to their respective conditions in terms of vulnerability, preparedness and

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[17] For an analysis of the James O. Wright project and its consequences, see: Meindl Ch. F. Alderman D. H. & Waylen P. (2002) *On the Importance of Environmental Claims-Making: The Role of James O. Wright in Promoting the Drainage of Florida's Everglades in the Early Twentieth Century*. Annals of the Association of American Geographers. Vol. 92:4 pp.682-701Routledge Url: https://www.tandfonline.com/doi/abs/10.1111/1467-8306.00311 last consulted on May 21, 2019

[18] For a summarisation of the Everglade drainage process and its consequences, see: Ingebritsen, S.E. McVoy, Ch. Glaz, B. Park, W. *Everglades: Florida Everglades: Subsidence threatens agriculture and complicates ecosystem restauration* IN *Land Subsidence in the United States* (2001) US Geological Survey. P. 95 Url: https://pubs.usgs.gov/circ/circ1182/pdf/12Everglades.pdf Last consulted on May 22, 2019

[19] See https://www.miamiherald.com/opinion/editorials/article219304995.html, Last consulted on May 21, 2019

[20] Oliver-Smith, A. *et al. Climate Change, Disasters and Development in Florida*. In press

[21] See Anthoff, D., Nicholls, R.J., Tol, R.S.J. and Vafeidis, A.T. (2006) *Global and regional exposure to large rises in sea-level: a sensitivity analysis* (Tyndell Centre for Climate Change Research working papers, 96) Norwich, UK. Tyndell Centre for Climate Change Research 31pp.

[22] See: National Oceanic and Atmospheric Administration (NOAA) (2017) *Global and Regional Sea Level Rise Scenarios for the United States*. Technical Report NOS CO-OPS 083 url: https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf Last consulted on May 28th 2019

responsiveness, but probably also because of cultural specificities, which can act as invisible barriers, distorting the perception and hindering adequate reaction.

Venice:

Risks

In Venice, the main stake seems to be: "Save the landmark." It is the principal leitmotif of local and international publications. Even more so since the listing of Venice as a World Heritage Site in 1987 by UNESCO, which forces the Italian Government to take measures to insure its protection[23]. But as Antonella Marsico *et al*. (2017) demonstrate[24], it is not only Venice that is jeopardised by sea level rise, but the whole highly[25] populated, industrial and touristic Northern Adriatic region. Indeed, Marisco's maps shows that even with IPCC ARS 8.5[26] minimum scenario of 0,53 m. rise of mean sea level by 2100, 4.616 km2 would be flooded, and the coastline would move back as far as 60 meters.

Preparedness

After the damaging November 1966 acqua alta, Venice began to study answers to flooding. Pressure increased when the city was listed among World Heritage Sites. Institutions at state, regional and local level have the mission to deal with it, but they seem to have been "treading water" because of ill-adapted legislation, poor coordination and corruption[27]. Academic institutions have been producing abundant research on the subject, faculties have included "ambiamento climatico" and "aumento del lively del mare" in their curricula. Concrete measures are being taken, at large scale with the still unfinished Modulo Sperimentale Elettromeccanico (MoSE) project[28], at local scale with the renovation of the canals and of building foundations. An environmental approach is also developed, notably with the works of the biologist Davide Tagliapietra[29] and engineer Alberto Barausse[30].

Responsiveness

One might well doubt if the MoSE will help. First, because one may question if it will ever be completed. Second, because, as Jeff Goodell (2017) observes[31], the MoSE was initially designed to face high tides of more than 110 cm and up to 270 cm, but not to face sea level rise. In 1987 and the UNESCO listing however, the project was adapted to what was then a "pessimistic scenario" of a 30 cm increase of mean sea level by 2100. But since then, pessimistic scenarios became more pessimistic, many foresee a 50 cm increase by 2050.

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[23] See UNESCO's Convention Concerning the Protection of the World Cultural and Natural Heritage, and more specifically Article 4 (url: https://whc.unesco.org/en/conventiontext/ Last consulted on May 23, 2019

[24] Antonella Marsico, Stefania Lisco, Valeria Lo Presti, Fabrizio Antonioli, Alessandro Amorosi, Marco Anzidei, Giacomo Deiana, Giovanni De Falco, Alessandro Fontana, Giorgio Fontolan, Massimo Moretti, Paolo E. Orrú, Enrico Serpelloni, Gianmaria Sannino, Antonio Vecchio & Giuseppe Mastronuzzi (2017) *Flooding scenario for four Italian coastal plains using three relative sea level rise models*, Journal of Maps, 13:2, 961-967

[25] 853.000 inhabitants for the Provincia di Venezia in 2012, according to official Italian statistics url: https://ugeo.urbistat.com/AdminStat/it/it/demografia/popolazione/venezia/27/3. Last consulted on May 23, 2019)

[26] Url: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_summary-for-policymakers.pdf

[27] For more detail, see Molinaroli *et al.* (2018) Op. Cit.

[28] Url: https://www.mosevenezia.eu/?lang=en last consulted on May 23, 2019

[29] Tagliapietra, Davide & Sigovini, Marco & Volpi Ghirardini, Annamaria. (2009). *A review of terms and definitions to categorise estuaries, lagoons and associated environments*. Marine and Freshwater Research. 60. 497-509. 10.1071/MF08088

[30] Url: http://www.lifevimine.eu/en/index.php Last consulted on May 23, 2019

[31] Godell, J. (2017, Dec. 5) *Rising Waters: Can a massive barrier save Venice from drowning?* Yale Environment 360 Url https://e360.yale.edu/features/rising-waters-can-a-massive-sea-barrier-save-venice-from-drowning

Regarding the protection of the cultural heritage, the existing situation is daunting, because mean sea level is already higher than the waterproof stone that forms the base of the constructions, and the city suffer from worsening floods. On the other hand, the uniqueness of Venice and its international positioning as inescapable hub of ancient and contemporary art attracts sponsors and donors worldwide and the environmental approaches which reconnect with the Venetian tradition of working with nature rather than against it might open the way to a more global and complex approach of the issue.

Invisible barriers

As Molinaroli *et al.* (2018)[32] insist, corruption and extreme political imbroglio stop useful initiatives from developing and drain away financial resources. They add that because public administrations wouldn't resort to public participation and area-based management, locals grew demotivated. Indeed, as Mitchell (2017) insists[33], maintenance of the levees and of the canals went on for as long as Venice was independent, and Venetians acted as a community. When their exclusive competence and responsibility to manage their environment was assigned to external agents[34], such as the Italian Government or even the UNESCO, the Venetians no longer cared.

Miami:

Risks

"Save the assets" is the motto of in Miami. The Union of Concerned Scientists estimated in 2018 that, only for Miami Beach, $6.4 billions of real estate value could be lost by 2045, causing a loss of $91 millions of property tax[35]. What about under-privileged neighbourhoods and their inhabitants? In 2013, Miami Dade County had a population of 2.6 million, with a poverty rate of 21%, which places it on the poor side of US counties and increases their vulnerability. Other crucial stakes are of course saline water intrusion in the fresh water aquifers[36] and contamination of sea water by polluted soils.

Preparedness

Despite abundant publications as of the late 1980es[37] very little was done in Florida regarding climate change and flooding for almost 3 decades. Denial regarding climate change, or blind trust in the ability of technology come up with answers, seem to have prevailed. In the last decade, things started to change. Public authorities adapted their agendas, new agencies were created[38], with new officials, like the chief resilient officer[39]. New

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[32] Molinaroli *et al.* (2018) Op. cit.

[33]Mitchell, Katherine D., *Cultural Heritage and Rising Seas: Water Management, Governance, and Heritage in Venice and Amsterdam* (2017). UVM Honors College Senior Theses. 161. Url: http://scholarworks.uvm.edu/hcoltheses/161 Last consulted on May 28, 2019

[34] Incidentally, it is interesting to note that choice collective arrangements and monitoring are two of the Elinor s' Design principles illustrated by long enduring common pool resource institutions

[35] Union of Concerned Scientists (2018) *Underwater: Rising Seas, Chronic Floods, and the Implications for US Coastal Real Estate*. See https://www.ucsusa.org/sites/default/files/attach/2018/06/underwater-analysis-full-report.pdf Last consulted on May 28th 2019

[36] See https://www.bloomberg.com/news/features/2018-08-29/miami-s-other-water-problem Last consulted on May 27th 2019

[37] In 1982 NASA published its Global Habitability report. Url:
Url:https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19820025024.pdf Last consulted on May 22, 2019

In 1985 the World Meteorological Organisation (WMO) published its first report on the assessment of the role of carbon dioxide and of other greenhouse gases in climate variations in 1986. Url:
https://library.wmo.int/index.php?lvl=notice_display&id=6321#.XOWG2S2ZPow Last consulted on May 22, 2019

[38] For a comprehensive synthesis of these agencies and their actions, see Molinaroli, E, *et al* (2018) Op. Cit.

[39] To know more about CROs, see https://www.100resilientcities.org/what-is-a-chief-resilience-officer/ last consulted on May 23, 2019

zoning plans were drawn. The service sector saw the multiplication of actors. Academic institutions adapted curricula and developed research. Coordination between all these actors was provided for with the creation of The Southeast Florida Climate Change Compact[40]. As for fieldwork, so far, it consists mainly in raising street level, raising sea walls, upgrading water drainage systems, beach sand replenishment, dune build-up, etc. These measures, and their potential effects, are timid if compared with the Venetian MOSE or with the Dutch flood defence, but similar measures would not serve in Miami, because of the porous nature of its soil.

Responsiveness

Miami's awakening to the reality of sea level rise is not simple. The new public and private agencies spent a lot of time debating on definitions and projections. At an institution level, the Climate Change Compact produced guidelines, but even administrations fail to implement them. Indeed, between 2008 and 2016, new zoning plans covered most of the areas of Miami Date County that should be directly impacted by sea water rise. A non-exhaustive list of these plans comprises:

- Coconut Grove Waterfront and Spoil Island Master Plan (2008)
- Museum Pak Master Plan (2008)
- Virginia Key Master Plan (2010)
- Downtown Miami Masterplan (October 2009)
- Miami Beach Strategic Plan (2011);
- Port Miami 2035 (November 2011);
- City of Miami Beach Stormwater Management Master Plan (2012);
- Overtown Mobility Plan (2014);
- The Underline Framework Plan (December 2015);
- Neighborhood Revitalization District (May 2015);
- PlanNoBe proposed North Beach Master Plan (2016 draft);
- Mana Wynwood SAP (2016);

But remarkably, out of these twelve plans, only three (PlaNoBe, Port of Miami and Miami Beach SWMMP) mention sea level rise. Of those three, only two (PaNoBe and Miami Beach SWMMP) describe measures to address it. Basically, the strategy consists in rising urban zones above water before water rises above urban zones. Academic institutions focus mainly on design, technical and engineering solutions[41] when there seems to be major educational and cultural deficiencies.

The physical measures show limits. Beach sand replenishment is a Sisyphean task. Sea walls induce erosion and scouring, they also constitute basins once they are overflown. Rather than adapting to sea level rise, these two measures protect private property and business at the detriment of public good. Street rising turns private properties into basins, which require pumping when it rains. When they don't fail, pumps spill pollution into the ocean. Geologist Harold Wanless[42] says that these measures are "just the tiniest little Band-Aid for a cost of hundreds of millions of dollars, and they certainly won't get us to the middle of the century[43]." He isn't the only expert who has doubts about their effectiveness: Dutch sea level rise expert Henk Ovink called Miami

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[40] Url http://southeastfloridaclimatecompact.org Last consulted on May 28, 2019

[41] For an illustration Url: https://climate.miami.edu/built-environment/ Last consulted on May 23, 2019

[42] For a more detail on Professor Wanless analysis of the Southern Florida situation, Url: https://arboretum.as.miami.edu/_assets/pdf/wanless.pdf

43 Excerpt from an interview by Kamp, D. (2015) Can Miami Survive Global Warming? Vanity Fair Nov. 10, 2015 Url: https://www.vanityfair.com/news/2015/11/miami-beach-global-warming Last consulted on May 23, 2019

the "New Atlantis[44]." Despite all of that, interesting social work is made with disadvantaged communities to reduce their vulnerability and increase their preparedness and responsiveness to flooding[45].

Invisible barriers

As in Venice, "non-physical" factors complicate this already challenging picture. These non-physical factors are political, like climate scepticism at the head of the nation and of the state, and the consequent muzzling of administrations, or election deadlines which do not facilitate long term perspective. They are structural, with a system based on individualism, private interest and private property. They are economical, with a booming tourism and real estate business which masks the problem, and with a tax system grounded on real estate. They are social, with a high poverty level, and high social disparities[46], which in turn cause high social vulnerability. They are cultural, with blind confidence in technology[47], or with the concept of a war between man and nature, which the presentation of the "Miami Beach Rising Above" project during the Philip Levine Mayoral Office (2013-2017) exemplified: « The goal of these actions is to leverage existing resources to develop a mutually-beneficial solution that helps **combat** [emphasis mine] sea level rise challenges in Miami Beach and other coastal municipalities[48].»

Discussion: What made Venice so long enduring?

Let us at once dismiss that it might have been an amazingly favourable set of circumstance, it would be hard indeed to believe that it might have lasted so long. Environmental determinism, should also be ruled out, because if Venice developed in the laguna, earlier settling in the same environment, such as Spina and Ammiana[49] on the West side of the laguna didn't. History shows however that the Venetians held a strategic and naturally protected position on the Middle Ages trade routes. But it also shows that it took them daunting efforts to live and flourish there. From these premises, living in the sea required technologies and competences, social consensus, excellent governance and resource management.

Premises

The humble premises of Venice are essential. Indeed, the first settlers did not come to live in the laguna as conquerors, but as runaways. They preferred the dangers of the sea to those of the barbarians. But once the danger had gone, the settlers never returned to the mainland. Why?

If, fleeing from a dreadful enemy, you placed yourself under "something's" protection, and if this "something" really scared you enemies off, you would probably be at once grateful, respectful and fearful, and soon you would establish some sort of ritual. This view was shared by French archaeologist Salomon Reinach (1858-

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[44] See http://www.miaminewtimes.com/news/dutch-sea-level-rise-expert-miami-will-be-the-new-atlantis-a-city-in-the-sea-7628340 Last consulted on May 27, 2019

[45] Such as the workshops organised by the Cleo Institute and the Miami Dade Office of Resilience. See https://www.cleoinstitute.org/cleo-event-calendar/2019/4/10/sea-level-rise-strategy-workshop Last consulted on May 27, 2019

[46] For more on this, see: http://www.miamidade.gov/planning/library/reports/2007-socio-economic-overview.pdf Last consulted on May 27, 2019

[47] "If, 50 years ago, I had shown you an iPhone and an iPad, and how FaceTime works, you would have thought I was insane. So, 10, 20, 30 years from today, humankind will come up with amazing, innovative ideas that will create an even greater level of resiliency for coastal cities." Philip Levine, Miami Beach Mayor (2013-2017) quoted by Davide Kamp (2015) Can Miami Beach Survive Global Warming. Vanity Fair. Nov. 10, 2015. See: http://www.vanityfair.com/news/2015/11/miami-beach-global-warming Last consulted on May 27, 2019

[48] this page is no longer available on the official Miami Beach website (https://miamibeachfl.gov). But it can still be found through this link: https://www.arcgis.com/home/group.html?id=85b8180f390341dda4903f8d1fc90c4b#overview Last consulted on May 30, 2019

[49] for more on submarine archeology in the Venice lagoon, see the works of Ernesto Canal (1924-2018) or more recently Prof. Carlo Beltrame (https://www.unive.it/data/persone/5591312#)

1932), who saw in "La Sensa" the Christian re-appropriation of a pagan propitiation and reconciliation ritual[50]. The ritual lasted as long as the Republic did[51], reminding Venetians that their union with the sea must always be renegotiated. It is the basis of the Venetians' concepts of power, community and property. Human power is limited by forces beyond mankind. In the sea, the individual is helpless, but the community can navigate. If you live on the sea, you know you can't own it.

Technology and Competence

The Venetians had to develop specific technologies in fields such as marine environment construction, shipbuilding, fresh water harvesting. They also had to develop competence in fields such as hydrology and navigation. And because they had to secure their food supply, they also became strategists and masters in the art of war. They used these technologies and competences with nuance. They managed their unstable sea environment through constant monitoring and careful maintenance. When needed, however, they would actively intervene on it, not to dominate it or to transform it, but to keep it in what they saw as an optimum natural state. Similarly, the Venetians dealt with a challenging geo-political environment with active and astute diplomacy, in order to maintain an favourable equilibrium in the "game of powers." But when needed, they were ready for war. Maintaining these equilibria was extremely costly. It required a social consensus and an excellent governance.

Social consensus

The Venetians were like the rowers on a "galeazza[52]," rowing in the same direction at the same pace. As Elisabeth Crouzet-Pavan (1997)[53] insists, the myth or miracle of Venice consisted at once of the impossible longevity of the Venetians in the sea, their surreal city, and the stability of their institutions, which the Venetian institutions exploited to reinforce consensus.

Governance

Governance also played a crucial, with three remarkable qualities: long term vision, provision, pragmatism. These qualities are stand out in many episodes of Venetian history, as when the Doge Enrico Dandolo used the 4th crusade to bring down Constantinople, or when Venice decided to divert rivers out of the laguna to stop silting. Abundant documentation shows that the Venetians have always been aware that the survival of their City, in the face of submersion, required constant and towering action.

Resource management

Resource management played a key role in Venice's longevity. Because of Venice's permanent need of fresh water and wood. As Appuhn (2009) demonstrates, the question of wood shortfall was a permanent concern. It brought the Venetians authorities to overcome their reluctance to interfere in mainland affairs, in order to enforce as of 15th century, forestry management based what would now be called sustainable exploitation. The Venetians understood that the optimum of private agents operating on high discount rates, was to cut forests clear and convert them into field or pasture, whereas the continuous flow of wood they needed meant low discount rates, which could only be expected if the forest were either communal or state owned. They also understood that they had a limited supply area, and that therefore, the forest must be allowed to replenish. To ensure this, they created "commons" when in the rest of continental Europe and England, enclosure of commons had already been ongoing for a long time. I would argue that, very interestingly, as their knowledge of forestry developed, the Venetians progressively implemented almost all of the eight design principles which, according to Elinor Ostrom, are illustrated by long enduring common pool resource institutions[54].

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[50] Reinach, S. (1906) *Le Mariage avec la Mer* IN Cultes, mythes et religions, t. II, p. 206-219, Ernest Leroux, Paris Url: https://fr.wikisource.org/wiki/Le_Mariage_avec_la_mer Last consulted on May 30, 2019

[51] It was reestablished in 1966

[52] XVI Century Venetian boat

[53] Crouzet-Pavan, E. (1997). Op. cit

[54] Ostom, E. (1990) *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge University Press

As a reminder, these principles are: 1) Clearly defined boundaries; 2) Congruence between appropriation and provision rules and local condition; 3) Collective-choice arrangements; 4) Monitoring; 5) Graduated sanctions; 6) Conflict-resolution mechanism; 7) Minimal recognition of right to organise; 8) Nested enterprises[55].

Conclusion

Venice is the result of an alliance between man and sea. As their dominance over the Mediterranean declined, the Venetians developed awareness of their finite environment and of resource scarcity. They passed another alliance, this time with the Forest. Because of where the Venetians came from, their culture fostered community rather than individuality, common goods rather than private ones, complexity rather than simplification, soft approaches rather than hard ones.

Miami did not rise from the same premises as Venice. The forces that created Miami were similar to those that defeated the Venetian Republic. And if, like the early Venetians, the Seminoles had no better choice but to live in the Everglades, the white settlers, who came after them and triggered the spectacular development of Miami, did not come because they had no better choice. On the contrary, Julia Tuttle, William Brickell, John S. Collins, the Lummus brothers, Henry Flagler, Carl Graham Fisher, etc., had all the possible choices. They did not have to adapt to this environment, they came to adapt it to their visions. The "Magic City" developed at the cost of its resource, the Everglades and their fresh water. The values of conquest, domination and transformation of nature go in a different direction. They brought the world in an environmental deadlock. And that environmental deadlock now particularly threatens both Venice and Miami.

On which forces should Venice and Miami rely for their future?
On the forces of an alliance between man and nature, which carried Venice for a thousand years? Or on the forces of the domination of man over nature, which, a little more than a century, have imperilled both Venice's and Miami's future?

Maybe the old lady and the enfant gâté should share their stories.

[55] It would be extremely interesting to analyze Appuhn's research from this perspective