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ANTHROPOCENIC BEACHES. DIAGNOSIS AND PROGNOSIS OF HUMAN FOOTPRINT.

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Double Degree in Tourism and Business Administration

Faculty of Tourism

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Abstract

The Balearic Islands constitute one of the most visited tourism destinations worldwide, receiving up to 16.5 million arrivals annually. Constant flows of tourists during decades have left an irrefutable ecological print in beaches, drastically boosting climate change effects. Governments and beach municipalities opt for sustainable tourism policies to address this problem. However, empirical and scientific proof continuously evinces the obsolescence of this standpoint. Beach shoreline is steadily regressing, and oceanographic studies augur a loss of 80% of the sandy area across the whole archipelago. In addition to that, alarming sea-level rise, wave runup, beach disappearance, and water temperature rise should be expected by the end of the century. This report attempts to diagnose and gather evidence of the negative impacts beaches are suffering due to the anthropogenic effects as well as the lack of effective existing beach management legislations. Furthermore, the adoption of degrowth policies is not only proposed but urged as a means for Anthropocene alleviation. This denunciation is focalised in the case of the Balearic Islands, a small archipelago located in the Mediterranean Sea.

Abstracto

Las Islas Baleares constituyen uno de los destinos turísticos más visitados a nivel mundial, recibiendo hasta 16,5 millones de llegadas anuales. Los flujos constantes de turistas durante décadas han dejado una huella ecológica innegable en las playas, aumentando drásticamente los efectos del cambio climático. Los gobiernos y los municipios de playa optan por políticas de turismo sostenible para abordar este problema. Sin embargo, las pruebas empíricas y científicas demuestran continuamente la obsolescencia de este punto de vista. La orilla de la playa está sometida a una recesión constante, y los estudios oceanográficos auguran una pérdida del 80% de la superficie arenosa en todo el archipiélago. Además de eso, un alarmante aumento del nivel del mar, el aumento de las olas, la desaparición de las playas y el aumento de la temperatura del agua deberían esperarse para finales de siglo. Este informe intenta diagnosticar y recolectar evidencia de los impactos negativos que las playas están sufriendo debido a los efectos antropocéntricos, así como la falta de legislación efectiva de gestión de playas. Además, no sólo se propone la adopción de políticas de decrecimiento, sino que se instan como medio de mitigación de los efectos del Antropoceno. Esta denuncia se focaliza en el caso de las Islas Baleares, un pequeño archipiélago situado en el Mar Mediterráneo.

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I. Introduction

The rapid and aggressive development humankind has experienced during these last centuries has led to several global consequences disrupting the biosphere's stability. Rockström et al. (2009) asserts that human pressure on planetary boundaries is so large that abrupt full-scale environmental breakdown can no longer be excluded. In fact, human contribution to climate change is estimated to fluctuate between 93%-123% during the period 1951-2010 due to the emission of greenhouse gases (GHG) (Knutson et al., 2017). This increasing social metabolism -which has been feasible on account of the massive use of fossil fuels- has entailed planetary-scale changes in the different strata of Earth, prompting the use of a new term among the academia to describe it, i.e., the Anthropocene. According to Steffen et al. (2007), the Anthropocene refers to the "current epoch in which humans and our societies have become a global geophysical force". Similarly, Castree (2018) describes it as "an epoch in which the collective impact of human activities is sufficient to significantly alter the conditions of life on planet Earth".

The anthropogenic effects are particularly grave in specific hotspots of the biosphere, being coastal zones one of them. Coastlines and beaches are of incalculable ecological value as they interconnect terrestrial and marine environments, providing adequate conditions for many species of biota to flourish and reproduce (Dodds and Holmes, 2018). Although they have been proven to be resilient to intensive land, sea, and air action, beaches are not prepared to tolerate human action, which tends to be more abiding and sudden (Mas and Blázquez, 2005). In fact, anthropogenic impacts on beaches have caused severe erosion, urbanization, eutrophication, and overexploitation of natural resources, among others (Newton et al., 2012).

Nowadays it is not uncommon to see coastal areas repeatedly falling victim to large concentrations of population. This occurs especially in the regions of Europe and South, Southeast and East Asia, where density rates can triple the worldwide average value (Small and Nicholls, 2003). In Europe, the stand-out countries are Spain and Italy, where 69% and 55% of the population gathers within 15 km from the sea; however, these values increase to 94% in both cases when referring to a scope of 50 km (Eurostat, 2013). It becomes undeniable that coastal areas are tremendously preferred among individuals to settle down, which has resulted in an accumulation of human-induced pressures (Newton et al., 2012) that on many occasions exceed the carrying capacity of the ecosystem itself.

Tourism does certainly not help to improve this situation. As one of the main contributors to global GDP, its relevance to economic development is overwhelming, especially in tourism-dependent regions. Such is its significance that in 2019 this sector grew faster than the global economy (3.5% versus 2.3%) and created 10.3% of all global economic activity (World Travel and Tourism Council, 2020). International tourist arrivals reached the 1.46 billion mark in 2019

and 51% of them took place in Europe, especially in the Southern and Mediterranean region (20.8% of global arrivals). Moreover, Spain presented one of the highest European values with 5.5% of global international arrivals (UNWTO, 2020). Note that this data evinces the establishment of a mass tourism tendency, most of which is concentrated in the Spanish coast.

The tourism activity has damaged coastal zones mainly through its sun-and-beach model, probably the most popular within the industry. This tourism typology has triggered changes in land-use practices, overexploitation of natural resources, pollution, extermination of endemic flora and fauna, and has pushed beach carrying capacity as well as the environment's resilience to its limits. However, these devastating anthropogenic impacts have come about due to the practice of mass tourism, which is considered to be the culprit of the most extreme effects on the biosphere (Khairat and Maher, 2012). The presence of beaches among the top five vacation destinations for tourism (Wolch and Zhang, 2004) has certainly facilitated this situation since it has transformed them into a primary resource to produce economic and social value (Houston, 2013). Beaches are indeed excellent coastal attractions to seduce tourists from all over the world, who inject money into the local economy and help boost it (Alves et al., 2014). As a result of this, beach municipalities have strained to obtain quality certifications to enhance the image and quality of their sand and sea water. This interest has also splashed the academia, with plenty of reports delving into beach management systems and certifications, i.e., ISO, Blue Flags... (see Yepes, 2005; Yepes, 2007; Chen and Teng, 2016; Dodds and Holmes, 2018; Merino and Prats, 2022). However, it is worth noting that quality management systems are created to attract tourists, and the yearly massive number of tourist arrivals is responsible for a large drop in the quality of coastal recreational waters and its sustainability (Hardy et al., 2002). It might seem paradoxical then that municipalities are so keen to implement them to draw tourists in, especially because it simultaneously harms beaches' socio-economic value (it affects recreational experience of tourists). Peña-Alonso et al. (2017) stress those inadequate management practices -in addition to coastal development- as one of the main responsible agents for the decrease in beach quality. On the other hand, Feeny et al. (1990) and Chen and Teng (2016) highlight the huge problematic lying underneath their consideration of common property resources. Either way, considering current trends, tourist beach carrying capacity is foreseen to decrease up to 83% of current values by 2050. Nevertheless, that value is expected to escalate when climate change is considered (López-Dóriga et al., 2019).

It is evident that the academic world has deeply delved into this matter trying to find conclusive answers. Also governments and institutions have addressed the topic of beach management through policies based on sustainable development (e.g., UNEP, 2030 Agenda). Nonetheless, ecological economics and political ecology advocates are sceptic towards their feasibility and denounce that after four decades of international environmental policy -and social awareness-, major threats like climate change, biodiversity loss, and resource

depletion still remain unabated (see Kallis, 2011; Gómez-Baggethun and Naredo, 2015; Fletcher et al., 2019; Hickel, 2020a; Fletcher et al., 2021).

This report attempts to diagnose and gather evidence of the negative impacts beaches are suffering due to the anthropogenic effects as well as the lack of effective existing beach management legislations. This denunciation will be focalised in the case of the Balearic Islands, a small archipelago located in the Mediterranean Sea. Consequently, the rest of the paper is organized as follows. First, a contextualisation of the current beach situation and their vulnerability to human footprint -with special focus on tourism as a principal threat- is exposed. Second, a brief description of how the investigation has been constructed is presented, i.e., the methodology. Then, current beach management legislation will be contrasted with scientific and empirical proof -and forecast- of environmental depletion in the Balearic beaches. The next section proposes and discusses degrowth as an instrument for Anthropocene alleviation. Finally, some conclusions gathering all the ideas exposed in the previous sections are developed.

II. Methodology

The dependence of the Balearic Islands to tourism incomes makes them highly vulnerable to modifications in beach conditions, which can eventually lead to a problem in beach availability. For this reason, the archipelago constitutes an excellent example on how climate change can affect a destination not only ecologically, but also at a social and economic level. Nevertheless, the dynamic nature of the sandy ecosystems difficults obtaining precise, accurate and cost-effective data to study the evolution of anthropised beaches. Consequently, in this investigation, factors such as resource, time, and economic limitations have been considered.

The following research paper is founded upon an exhaustive bibliographic review consisting of both academic papers and grey literature. In addition, a comparative study of the most relevant laws applicable at both national and regional level has been carried out. At the national scope, the *1988 Coastal Law* (Ley 22/1988) and its later modification, the *2013 Law on the protection and sustainable use of the coastline* (Ley 2/2013) will be revised. Regionally, changes and updates in rulings are more frequent. However, the *Management Plan for the Tourist Offer* (Decreto 54/1995) and the *Plan of Intervention in the Tourist Areas* (Plan de Intervención en Ámbitos Turísticos de Mallorca, 2020) stand out. In order to evince the unsustainability of the current beach management legislations, a qualitative research on the archipelago's beach conditions has been undertaken. Furthermore, knowledge about the academic fields of environmental economy and sustainable tourism have been applied. Secondary data has been utilised in the elaboration of this report.

III. The case of the Balearic Islands

The Balearic Islands are one of the most visited Mediterranean tourist destinations thanks to its perfect combination of ocean cliffs as well as rocky and sandy coasts. This small archipelago of 5000 km² located in the western Mediterranean Sea is composed by the islands of Mallorca, Menorca, Ibiza, Formentera, Cabrera, and plenty of other islets surround the area. Nevertheless, only the four largest islands are inhabited and therefore open to mass tourism and its effects. Consequently, from now on Cabrera will not be included when referring to the Balearic Islands.

Since the tourist boom in the 60s, the Balearics have had to adapt to exaggerated numbers of tourist arrivals in a very short period. The sudden introduction of foreign capital made them focus on tourism specialization, especially the sun-and-beach model, which triggered a rapid and intense transformation of its coastlines through the construction of coastal tourist resorts (Pons et al., 2014). As a result of this, urbanised land incremented from 32.3 km² in 1956 to 309.8 km² in 2006 (1% versus 6.2% of the Balearic's surface) (Pons and Rullan, 2014). The socio-economic structure change also became evident thanks to the dramatic shift in locals' occupation: while agriculture occupation dropped from 40% to 1%, the service and construction sectors increased from 37% to 83% in a matter of 60 years (Murray, 2012). Today, the influence of this industry in the destination is huge, accounting for approximately 45% of its total GDP (Excelltur, 2019). Given that the Balearic Islands receive up to 16.5 million tourists annually (GOIB, 2019), it is not surprising that McElroy (2003) considers them to be among the most relevant tourism islands worldwide. The vast weight this industry represents for the Balearic economy has clearly shaped the management approach chosen by institutions and beach municipalities over the decades. In fact, the Balearic Islands constituted the Spanish autonomous community with the largest investment in tourism excellence plans during 1992 and 2006, accounting for €43,5M (Beas, 2012).

a. Beach management legislations

The Balearic archipelago, just like every autonomous community belonging to the Spanish territory, is subject to a dualistic legislation. This means that it is being affected by both national and regional scope rules. As a result of this, laws are enacted within jurisdictions in an overlapping scale, meaning that very often rulings impinge on decisions from other spatial scales (Hubbard and Prior, 2018). Furthermore, their status of mature destination has led to plenty of updates during the years, which hinders their comprehension and efficacy. The most relevant legislations concerning the Balearics are thereby going to be briefly explained. In the national context, the *1988 Coastal Law* and its later modification, i.e., the *2013 Law on the protection and sustainable use of the coastline* stand out. On the other hand, in the regional context, the *Management Plan for the Tourist Offer* (from now on POOT, in accordance with the Spanish acronyms) and the *Plan of*

Intervention in the Tourist Areas (from now on PIAT, in accordance with the Spanish acronyms) are going to be revised.

i. National scope

The *1988 Coastal Law* began to lay the foundations for the protection of the Spanish coast through a positive relationship between the economy and the environmental quality. Its application was triggered by the notorious population growth in the country's coastal areas, which make up to 24% of the Spanish littoral. According to the Ley 22/1988, population density increased from 12% to 35%, values that were tripled in the summer months and tourist locations. Consequently, this law targeted at "the identification, protection, use and policing of the maritime-land public domain and especially of the seashore". Alongside with the protection of the coasts, the *1988 Coastal Law* strove to ensure free transit of individuals within a range of six metres from the littoral. To achieve it, a figurative line of 100 metres from the coast -although it could vary to 20 metres in specific conditions- divided the land belonging to the beach and the so-called interior land. Whereas the first was considered to be a public space (and thereby no unauthorized construction could take place), the second could be subject to a private management. This attempt to protect public spaces led to a long list of forbidden actions: constructing residence buildings, erecting fences or enclosures, dumping waste, exploiting underground deposits, laying high voltage lines, or even advertising. Private owners whose properties were located inside the public area were given a right of occupancy valid for 30 years, with a possible extension of another 30 years (Ley 22/1988). These measures arose both social and political reactions within the Spanish territory, especially in the coastal municipalities (Negro et al., 2014). In the case of the Balearic Islands, the shoreline percentage subject to this delimitation and its subsequent consequences was 33.64% (20m) and 66.36% (100m) for Mallorca, 15.69% (20m) and 84.31% (100m) for Menorca, 11.53% (20m) and 88.47 (100m) for Ibiza and, lastly, 3.38% (20m) and 96.62% (100m) for Formentera (Torres, 2010).

It is essential to realise that plenty of private owners were affected by this absolute exclusion of public domain privatization. Since its endorsement in the late 80s, many properties -often from foreigners- that had been legal at the time became illegal. The law's legal and technical complexity originated a large criticism movement since it led to expropriation, demolition and public domain delimitation conflicts (Torres, 2010). According to López-Gutiérrez et al. (2016), the main inefficacy was adapting the fixed border of 100 metres to a changing shoreline, which implied having to move the line from time to time as well. This evidenced a poor management and a feeling of legal insecurity among property owners arose, whose claims were gathered in the Auken Report (Auken, 2009) by the European Parliament and forced a reform in 2013.

Then, the *2013 Law on the protection and sustainable use of the coastline* reviews its predecessor and softens the 100 metres boundary to 20 metres.

Furthermore, it highlights the unacceptable lack of application of the previous legislation and the subsequent devastating environmental situation that this originated. According to Negro et al. (2014), three primary points were improved by the revision: legal reliability for private owners, balance between economic development and conservation of the ecosystem, and creation of jobs and wealth. In fact, the new law offers a more precise definition of the sea-land border, considers the risk of regression of some sections, takes into account the effects of climate change -and the consequent sea-level rise- on the shoreline, differentiates between urban and natural beaches, and addresses the property ownership and transfer in a deeper manner compared to the previous one. With regard to this last point, neither new buildings nor modifications in existing ones can be undertaken in the protected area; in addition, private owners can extend their right of occupancy up to 75 years (compared to the previous maximum of 60) (Ley 2/2013).

ii. Regional scope

In 1995, the approval of the POOT in Mallorca (1997 for Ibiza and Formentera) implied a solid protection for tourism areas -37 in Mallorca, 11 in Ibiza and 3 in Formentera- since future urbanistic expansions were paralysed. Influenced by a conservative predecessor law (Rullan, 2010), the POOT established a density cap in touristy zones of 100 inhabitants/ha (Blasco, 2004), which could not be legally surpassed. Furthermore, it defined a boundary of 7.5 m²/user, below which a beach was considered to be saturated (Mas and Blázquez, 2005). Basically, the POOT's main objectives were to protect the coastline from excessive urbanisation, to renovate obsolete tourism accommodation and to establish quantitative criteria to determine the reception capacity of the touristy areas (Blasco, 2004). Nevertheless, the constant increase in tourism offer -and consequently urbanisation- due to the third tourism boom affecting the Balearics triggered the failure of this legislation. In fact, accommodation offer diverted towards a residential model, out of the tourism administration's reach (Rullan, 1999). In light of this situation, two new laws were approved in 1999: the *General Tourist Act* (Ley 2/1999) and the *Guidelines for Special Planning* (Ley 6/1999), which prioritised economic profit rather than environmental and coastline protection (Rullan, 2010).

On the other hand, the PIAT (2020) tried to readdress the problematic between tourism and social and environmental contentment in the island of Mallorca. This project, aware of the damage mass tourism has inflicted to residents, strives to compensate them and minimize the touristification in residential areas. Furthermore, it advocates for a high-quality and fair sustainable tourism and differentiates saturated and mature zones. Then, areas such as Playa de Palma-s'Arenal, Peguera, Santa Ponça or Magaluf -among others- are considered to be mature and saturated, whereas Cala Ratjada, Port d'Alcúdia, Can Picafort, and Font de Sa Cala are indeed mature but not saturated. Although

it promotes a sport and cultural tourism, construction of new golf courses and rural hotels is not permitted. In line with its forerunner, it establishes -less strict- density caps: 120 inhabitants/ha in touristy areas and 1.47 m²/user in beaches (PIAT, 2020). In addition, it sets a limit of tourist beds of 430,000 for the island (Hosteltur, 2018), which contrasts with the almost 280,000 places that were occupied in 1992 (Moreno, 2019), evincing tourism upward evolution. In order to tackle the congestion of beaches, the plan settles a maximum number of parking slots in remote beaches corresponding to a ratio of one parking slot per every four potential users (PIAT, 2020).

b. Anthropogenic impacts on beaches

Predictions of the state of the Balearic beaches at the end of the century are not encouraging at all. Climate change -boosted by anthropogenic impacts- is starting to inflict serious damage on the sandy ecosystems and the situation is not foreseen to get any better.

Sea-level rise (SLR) has surely engrossed most attention and concern of scientists due to its -both current and predicted- devastating impacts on beaches and coastlines. Sandy platforms are extremely relevant to coastal ecosystem protection (Lee, 2008), and the increase of sea water level makes them suffer from erosion, submergence, saltwater intrusion -even in groundwater reservoirs-, major vulnerability to extreme weather events (Nicholls and Cazenave, 2010), and the disruption of the whole intertidal ecosystem (Alongi, 2008). Caused by ocean thermal expansion and glacier melting (IPCC, 2013), global mean sea-level has been incrementing by 1.1-1.3 mm/yr⁻¹ since the early 20th century (Marcos and Tsimplis, 2008), which constitute the largest values in, at least, 2700 years (Kopp et al., 2016). In the Mediterranean region, however, mean SLR has been of 0.6 ± 0.1 mm/yr during the period 1948–2000 (Gomis et al., 2012; cited in López-Dóriga et al., 2019).

This upward trend is far away from any change. According to Agulles et al. (2021), the Mediterranean Sea level is going to keep rising in 0.50-0.67 m for the period 2080-2100, depending on the amount of GHG emissions (RCP4.5-RCP8.5). This marine phenomenon is especially worrying in storm conditions. In an extreme scenario, wave runup will be deeply conditioned, creating waves from 1.80 (southern Mallorca and Ibiza) to 4.20 m (North of Menorca) height, compared to the current 0.2 and 0.6 m, respectively. The most recent example affecting the archipelago is storm Gloria in 2020, which showcased winds up to 140 km/h, heavy precipitation and flash floods, and historic waves up to 8 m height that intensively lashed the coastline (de Alfonso et al., 2021). It is essential to note that even though the increment in the water level is expected to be very homogeneous across the Balearics, this will not be the case for wave runup, which will act merciless in those unsheltered coastal areas, especially in the North of Menorca and Northeast of Mallorca (Agulles et al., 2021).

One of the first noticeable consequences of SLR are changes in beach shapes, especially in the form of shoreline regression. Es Trenc, one of the most valued and popular natural beaches of Mallorca, has suffered a regression of 13.5 m in 65 years (Marí, 2021). Playa de Palma, another outstander of the Majorcan coast, is expected to lose between 7 and 14 m of its shoreline (Olaizola and Ferrer, 2007). In the case of Menorca, the beach that has suffered the largest surface loss is Cala Blanca, with a regression of 52.7 m in 60 years (Pons, 2020). Furthermore, shoreline regression and thereby sediment transport dynamics are also influenced by human-made infrastructures. A clear case is Sa Ràpita (Es Trenc's sister beach). Martín et al. (2016) studied the effects on the beach shape of the construction of a marina in the 70s and discovered that, while the shoreline next to this harbour has risen at a rhythm of 0.5 m/yr, the rest of the beach disappears at an average of 0.19-0.34 m/yr. In fact, by the end of the century mean coastline retreat in the Balearics will range between 9.19 and 11.7 m in a moderate scenario and between 33.3 and 35.4 m if extreme weather conditions are considered (Agulles et al., 2021). Note that this entails the complete disappearance of some beaches: if the former scenario is considered, between 37 and 254 out of 869 beaches will be completely flooded by that time. However, the range increases up to 72-314 for the latter. Either way, estimations predict that in almost all locations 80% of the sandy area will disappear (Agulles et al., 2021).

It might seem that SLR and its direct consequences constitute primary events to worry about exclusively. Nonetheless, plenty of additional anthropogenic actions already have -and will continue to have- an impact on the Spanish archipelago. For example, alterations in marine biota. Anthropogenic GHG emissions boost climate change, which, at the same time, increases the surface temperature. According to IPCC (2013), GHGs have been responsible for a global mean surface warming between 0.5 and 1.3 °C during 1951-2010. This, of course, also affects oceans, which have suffered a global temperature increase of 0.13°C per decade over the last century (NOAA, 2022). As a result of this, marine ecosystems are being realigned. It is thought that jellyfish reproduction benefits from anthropogenic pressures such as global (water) warming (Brotz et al., 2012); at the same time, warmer waters could expand hunting grounds of apex predators like sharks (Carrington, 2021), making them approach more to the shoreline. These events would surely affect beach availability, since authorities would have to close them to avoid accidents, eroding recreational experience of tourists. In fact, Rodríguez (2019) estimates that a no-action scenario towards jellyfish blooming would entail fifteen days per month of beach closure in the Balearics by 2050. On the other hand, a further negative effect of water temperature rise in the Mediterranean Sea is the acceleration of *Posidonia* seagrass' extinction (Jordà et al., 2012), which is already alarmingly damaged by tourism activity. This endemic seagrass plays a key role in balancing ocean acidification (Hendriks et al., 2014), a phenomenon especially delicate in islands with small watersheds like the Balearics (Duarte et al., 2013). Furthermore,

Posidonia meadows act as carbon sinks (Duarte et al., 2005), protect the coast from erosion and increase water quality and transparency, fundamental features for tourists (Barbier et al., 2011). Despite its irrefutable ecological value and legal protection (Decreto 25/2018), between 13% and 50% of Posidonia seagrass has already disappeared, and the remaining meadows might have lost shoot density by 20% during the last two decades; consequently, their carbon sink capacity is projected to have been thinned by between 11% and 52% in the last 50 years (Marbà et al., 2014).

It should be noted that climate change is not a sole agent damaging the ecosystems in question. Direct anthropogenic actions such as litter accumulation or mechanical sand cleaning techniques also imply dangerous alterations in the beach biota. Due to their popularity, the Balearic Islands suffer from a seasonal increase of waste accumulation in their beaches that escalates up to 4.7 times during the peak season (Grelaud and Ziveri, 2020). As one of the main entry points of waste into the ocean, beaches play a crucial role for marine environment safety. On the other hand, effects of mechanical cleaning devices on the sand often tend to go unnoticed. However, Roig i Munar (2004) demonstrates that while they allow to provide clean and hygienic environments for tourists, its negative impacts on the littoral exceed the positive ones. More precisely, they boost modification and destruction of beach-dune systems and their formation process as well as loss of biological diversity and beach morphologies, among others.

IV. Degrowth: a step towards Anthropocene alleviation?

The previous section constitutes evidence that sustained practice of mass tourism has resulted in an absolute exhaustion of beaches' carrying capacity and resilience. During decades, governments' dominant response to this dilemma has been the transition of tourism into a sustainable business model (Fletcher et al., 2019) (e.g., PIAT), understanding sustainability as a balance between the environment, economy, and society (UNWTO, n.d.). Interestingly, this neoliberal approach perceives those dimensions as independent and replaceable, entailing that environmental preservation can be achieved through economic growth. Nevertheless, empirical proof continuously demonstrates the obsolescence of this capitalist idea. Economic growth has not decoupled from throughput (energy or material use and CO₂ emissions) as predicted (Jackson, 2009) and environmental decline keeps accelerating (Gómez-Baggethun and Naredo, 2015), evincing the incompatibility between continued growth and sustainability (Hickel, 2020a).

In light of this situation, scientists and ecological economists are increasingly claiming for a change towards degrowth strategies. Understood as a process of social and political transformation that aims at intentionally reducing throughput while improving life quality (Kallis et al., 2018), degrowth points at growth itself as the problem that must be addressed (Fletcher et al., 2021). It is important to clarify that degrowth does not stand for a reduction in GDP, but

instead a reduction in material and energy throughput (Hickel, 2020a). At the end of the day, however, throughput degrowth will ineluctably imply a smaller economy, i.e., GDP degrowth, which is not tantamount to negative GDP (Kallis, 2011). In addition, Dorninger et al. (2021) stress the need for a reduction in exclusively high-income countries, which are the irrefutable culprits of that excess consumption that is driving ecological breakdown. While the global North is responsible for 92% of excess global CO₂ emissions, it is the South -where resources are mainly extracted from- who suffers its most cataclysmic consequences (Hickel, 2020b). It is essential to note here that degrowth in the North will not only act as a means of ecological alleviation but also confront social inequality in the South (Blanco-Romero, 2019), allowing those countries to focus on developmentalist policies for human well-being, self-sufficiency (Hickel, 2020a) and ecological protection.

Degrowth must be applied in all levels of society and economy, tourism included. Transitioning to degrowth will entail sustainability in both the social and environmental dimensions (Schneider et al., 2010). However, to be like that, degrowth must go beyond walking away from capitalism; it must actively align with planetary boundaries (Fletcher et al., 2021). Plenty of degrowth defenders have proposed conceptual pathways for the tourism transition. It is the case of Fletcher et al. (2019), who stress the need of distancing from private production forms, capital accumulation, and commodification of natural resources. Similarly, Hall (2010) points out the importance of a shift towards qualitative instead of aggregate quantitative development. Additionally, Büscher and Fletcher (2017) advocate degrowth in tourism through more sustainable patterns of production and consumption. At an individual level, alternative travel manners that create a lower ecological footprint are proposed, e.g., backpackers, who usually spend substantial time between destinations (Andritotis, 2018; cited in Fletcher et al., 2019). Further day-to-day individual choices such as reuse, cycling, car-sharing, vegetarianism, veganism, and decentralized renewable energy cooperatives would also be degrowth-oriented (D'Alisa et al., 2013). Note that while proposals on “how to degrow” are not unified yet, there is a solid consensus on the need of implementing changes at the State level (Victor, 2010), i.e., the re-politisation of the sustainable tourism discourse (Fletcher et al., 2019).

V. Conclusions

Many have tried to look away from the massive ecological breakdown that is awaited in the upcoming years. Thanks to the arduous work of scientists and researchers, however, impacts of the climate crisis on beaches have been detected and can be prophesied. And predictions are anything but favourable.

Balearic beaches are not prepared to bear the uninterrupted and aggressive violation of their carrying capacity. Although beach management has been regulated by law for over three decades now, their condition is deplorable,

which evinces the clear failure of rulings to protect them from human presence. This could be attributed to the lack of unified legislation for the whole archipelago despite the evident similarities among the islands. For example, Menorca didn't count with a POOT but with different and adapted measures. At the same time, the PIAT is just applicable to Mallorca, excluding the other islands from its scope. In addition, legislation updates often softened -rather than strengthen- environmental preservation mechanisms (e.g., the *1988 Coastal Law* vs. its modification in 2013, POOT vs. PIAT). In other words, they prioritised high-quality experiences to draw tourists in instead of ecological well-being. Note that providing a high-quality beach experience demands continuous human action (e.g., urbanisation of the space, sand reallocation) to offer infrastructures and services that exceed tourists' demands. However, this activity exacerbates human-induced pressures on the biosphere, triggering aggravated climate crisis consequences such as those previously discussed in the third section of this paper. It is crucial to comprehend that a social metabolism that feeds on the use of natural resources -particularly depletable ones- alongside with the notion of infinite growth can never be sustainable -or feasible- in a finite planet (see Meadows et al., 1972), and the same happens with beaches and coastlines.

Consequently, beach management in mature destinations like the Balearic Islands needs to be urgently readdressed in line with degrowth policies. It is time to outpace quality management systems (see Yepes, 2007), which are clearly not sufficient to preserve the ecological richness of the sandy ecosystems. With regards to degrowth, primary focus points can be the limitation of tourist arrivals, available beds in a destination, and cruise traffic as well as the implementation of alternative tourist activities (Salvador, 2019). In other words, de-touristification strategies should be investigated, attempting to reconfigure touristy activities in a way that they benefit both local ecosystems and communities (Blanco-Romero, 2019). Note that this implies the abandonment of market mechanisms since those affect unequally the most vulnerable segments of the population (Kallis, 2011). Instead, the transition must be conducted at the State level, meaning that polluters' dutiful attitude towards the biosphere must be guaranteed by laws and regulations. Individual action is important; it drives changes in society. However, it is absurd to expect that all individuals will change their habits when governments and large corporations are averting their gaze.

It is worth recalling here the positive influence degrowth would also exert over society equity. It might seem that leading -capitalist- governments are indeed currently striving to implement strategies that attempt to paralyse and revert the imminent catastrophic phenomenon. Nevertheless, this sounds extremely paradoxical when considering that, while developed countries blame poverty as the main culprit for ecological depletion, they do not allow underdeveloped regions to grow their economy. Instead, they focus on boosting their own GDP through the plunder of Southern ecosystems and the appropriation of the South's fair share of atmospheric commons (Hickel, 2020a). Accordingly, implementing degrowth policies would entail a fairer trade for those resource exporters, acting

as a social equity mechanism which would allow the global South to focus on developmentalist policies with regards to human, economic, and environmental protection.

In conclusion, scientific and empirical evidence show an alarming diagnosis and an even worse projection of the ecosystem's state by the end of the century. This situation entails that the approach adopted to manage the ecological crisis (i.e., beach management legislations) is scandalously ineffective to protect the Balearic coastlines from the Anthropocene. Consequently, a structural change towards the adoption of degrowth policies is required and the role of politics needs to be reconsidered. Until then, the biosphere will never be capable of sustaining the current -and expected- growth rate, and therefore sustainable tourism will never be feasible. In light of this situation, and considering that not much is yet known about the real effect degrowth would have on the current socioeconomic model, it is foreseeable that further research will be carried out on how economy, society and environment (the three sustainability pillars considered by the UNEP) could be affected by the enactment of these strategies.

VI. References

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