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Transition pathways of the Greek island Samothraki from an agrarian sociometabolic regime to modern tourism and beyond: a real world lab in sustainability

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We reconstruct the developmental course of a small mountainous Greek island during the past decades in qualitative and quantitative terms. Conceptually, these efforts are integrated by a socio-metabolic system model (Fischer-Kowalski & Petridis 2016). The approaches from the angle of various disciplines (social ecology, land-use science, aquatic science, forest ecology) as well as the transdisciplinary collaborative approaches sought to compensate for the lack of long-term environmental monitoring data. Ultimate goal of this interdisciplinary and transdisciplinary research was (and is) giving scientific support to a local sustainability transition. We briefly describe the following sociometabolic stages of this process.

stage 1: traditional agrarian / foraging (fishing) socio-metabolic regime

Its features dominated up into the 1960s; the island sustained a population of 3-4000 people on livestock herding (sheep and goats), subsistence agriculture and fishing. Technical energy source: wood and charcoal from mountain forests (*Quercus petraea*). Grazing was the dominant land-use. Livestock breeding (mainly goats and sheep) was exclusively based on human manpower: free roaming animals, land management practices like regular burning of weeds on pastures.

stage 2: gradual transition to a modern industrial / touristic regime

Beginning with electrification (local diesel aggregate) and state services (schools, health care, road building, legal institutions, expansion of harbour and ferry services) in the 1960s, the island gradually turns into a (modest, national) tourist destination. Income for farmers/herders lags behind, and is supported by state, and later, EU subsidies. The coupling of subsidies to animal numbers leads to a substantial rise in small ruminants, serious overgrazing and decline in vegetation cover (Fetzel et al. 2018) and biodiversity (Biel and Tan 2014), lack of forest regrowth (Heiling 2019), increase in soil erosion (Panagopoulos et al. 2019) as well as rising demand for

freshwater and a rising generation of wastewater (Skoulikidis et al. 2019a,b).

stage 3: designing a real-world experiment towards a sustainable future for the island

In the face of the Greek financial crisis, with support from Unesco, a team of scientists from various countries engaged in finding pathways to secure a sustainable course for the island's future. Upon their advice, the municipality and the relevant Greek authorities in 2013 signed an application for the island to become a Man-and-Biosphere Reserve by Unesco standards, the municipality granted a local LTER-observatory, the regional authority rejected an industrial wind farm proposal, and Unesco welcomed these efforts. The municipality and grass roots actors use the support from international scientists to find sustainable solutions for problems that have been accumulating.

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