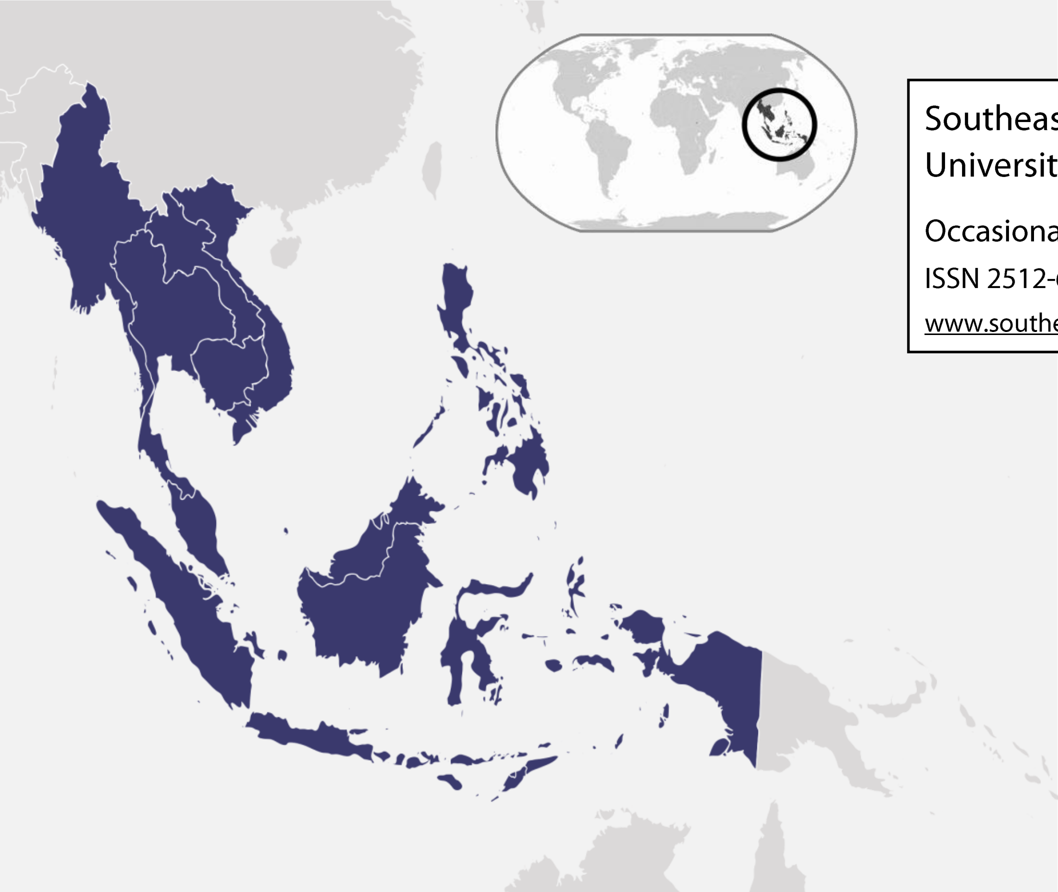

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Why Competitive Connectivity Is Environmentally Unsustainable. The Environmental Implications of Southeast Asia's Race for Infrastructure Modernization

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Abstract:

This paper examines the environmental sustainability of infrastructure projects in Asia. It focuses on two types of energy infrastructure: The construction of dams and the building of coal-fired power plants for the production of electricity. Based on an analytical framework informed by historical institutionalism, the paper argues that the current implementation of major energy infrastructure projects by the leading donors including China, Japan and South Korea is driven by path dependencies. It is influenced by the experiences of these countries at the time of their own economic take offs and the legacies of the developmental state. These path dependencies explain why these projects suffer from a severe lack of environmental sustainability.

Keywords:

Connectivity, infrastructure, sustainability, Southeast Asia, historical institutionalism

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1. Introduction

In the last decade connectivity has become the new panacea for accelerating economic growth in both least developed countries (LDCs) and emerging economies that are on the verge of catching up with the industrially advanced nations of the Global North. While the concept of connectivity is wide and also includes institutional and people-to-people connectivity, its core concern is physical infrastructure, that is, the construction of sea ports, airports, railways, roads, bridges, oil and gas pipelines, power plants and supply lines, dams and special industrial zones. ASEAN, with its Masterplan of ASEAN Connectivity, published in 2010 and amended in 2016, pioneered the current connectivity boom (Fünfgeld 2019a; Müller 2019), although external powers such as China and Japan had already begun earlier to provide infrastructure to Southeast Asia. Yet when in 2013 Chinese President Xi Jinping announced the gigantic Belt and Road Initiative (BRI), a multi-decade mega-infrastructure development project of approximately US$1 trillion linking China with Europe, an unprecedented race for infrastructure development in Asia ensued. Two years later, Japan embarked on a Quality Infrastructure Program and India, the US and the EU also launched infrastructure schemes in Asia, albeit markedly trailing China and Japan in terms of resource allocation. Riding on their coattails, even smaller countries such as South Korea, Thailand and Malaysia became infrastructure providers.

However, the altruistic and benign developmental rhetoric accompanying these schemes can only thinly conceal ulterior donor motives. Competitive connectivity, a "development war" between Japan and China in the view of the Singaporean *Business Times*, is part and parcel of an ongoing geopolitical game in which infrastructure investments are strategies to generate soft power, to increase political and economic clout in the neighborhood and simultaneously deny rival powers a foothold in these countries (Hartley 2015; Rüland & Michael 2019). Yet the primacy of geopolitics with its inherent rationale to complete projects quickly, at low-cost and without the vexing conditionalities of Western and multilateral donors raises severe doubts about the sincerity of donors' mantra-like assurances that they will provide "green" infrastructure. While reports abound that much of the region's current infrastructure hype comes at the expense of serious social collateral damage such as mass relocation, loss of livelihood for farming and fishing communities, joblessness, state repression and captivity in the poverty trap (Rüland 2019), this paper argues that many projects also ignore internationally tested best practices to make infrastructure environmentally sustainable. Projects are deemed "sustainable," if they address "the needs of the present without compromising the ability of future generations to meet their own needs" (Rigg 2016: 164). Based on a framework informed by historical institutionalism, I explain the ensuing environmental hypocrisy as path dependent behavior of developmental states reflective of their own experiences of infrastructure modernization at the time of their economic take off several decades ago. This adds an alternative theoretical perspective to studies that regard Southeast Asia's environmental dilemmas mainly as the result of a neo-liberal paradigm permeating developmental decisions.[1]

The remainder of the paper is organized as follows: The next section develops an analytical framework, followed by one tracing the developmental paradigms that the key protagonists

[1] For an example, see the thoughtful book of Rigg (2016).

of Southeast Asian infrastructure development pursued in the past. This is succeeded by an examination of infrastructure projects supported by different donors and their environmental effects. The penultimate section highlights the influences of the developmental state concept on these projects, before the last section concludes the piece with some generalizing observations.

2. Analytical Framework and Methodology

The subsequent analysis is based on a theoretical framework informed by historical institutionalism. The latter's strength is that – while not ruling out the possibility of ideational change – it can well explain well why ideas, identities, norms, knowledge and policies can be persistently reproduced over long periods of time and thereby establish path dependencies. Pivotal for this ability is historical institutionalism's "long durée" perspective, that is, its underlying belief that history is "crucial to understand[ing] contemporary events" (Stubbs 2008: 453). It implies that such events are shaped by ideas, norms and identities (Hall & Taylor 1996: 938). Formative for these ideas, norms and identities are institutions, which operate as moral and cognitive templates for interpretation and action. Institutions mold individual as well as collective ideas, norms, identities, self-images and preferences (ibid.: 939). By endowing beliefs, behavior and preferences with legitimacy, with successive experiences and events seemingly confirming their plausibility, and reflecting existent power relations, institutions tend to create change-resistant ideational and behavioral path dependencies. Although historical institutionalists have modelled a variety of conditions under which different sets of actors may challenge ideational and behavioral path dependencies (Mahoney & Thelen 2010; Schmidt 2010), the most common cause for change is "critical junctures," normally crises or external shocks. Crises and external shocks tend to undermine the credibility of ideational orthodoxies, that is, extant worldviews and the patterns of behavior derived from them, and pave the way for new paths of ideational development, identities and – consequently – behavior and agency (Legro 2000).

Inspired by this line of reasoning, I argue in this paper that the implementation of infrastructure projects by major connectivity protagonists in Southeast Asia is strongly affected by their own experiences as developmental states. In different periods, Japan, China and South Korea have gone through a process of rapid socioeconomic development which has catapulted them to the status of advanced industrial nations (Japan, South Korea) and an economy due to achieve this status in the near future (China). Even though the Chinese government in particular frequently stresses that the BRI seeks to avoid imposing China's developmental model on others, actors implementing BRI projects are conditioned by it, either inadvertently because they are socialized in the Chinese path to development or because they consciously seek to dissociate themselves from Western practices of development cooperation. The Chinese criticism focuses on the conditionalities of Western donors, which is denounced as unacceptable interference into the internal affairs of other countries. Also the other Asian infrastructure providers in the region have been socialized to varying degrees by structurally similar state-led, top-down, and at least temporarily authoritarian models of development and think and act accordingly.

This paper is primarily concerned with the environmental impact of infrastructure projects conducted by developmental states in Southeast Asia's economically less advanced countries.

It examines two types of environmentally sensitive projects, that is, dam building and coal-fired power plants. As the energy sector accounts for about 50 percent of Asia's infrastructure needs (Li & Gallagher 2019: 4) and through their inherent contradiction of economic growth orientation versus environmental sustainability requirements, dams and coal-fired power plants are *crucial* cases (Gerring 2007), which promise sufficient empirical evidence to test the paper's key argument. The paper is informed by field work in Southeast Asia, which has been conducted regularly since the beginning of the connectivity drive in the region. It rests on interviews and informal conversations with government officials, diplomats, academics and journalists in Cambodia, the Philippines and Indonesia. Additional sources are legal documents, NGO reports, newspaper articles, project evaluations, speeches by high-ranking government representatives and the meanwhile abundant BRI-related scholarly literature.

3. A Template of Action: The Developmental State

To varying degrees, all competing Asian donors in the field of energy infrastructure are conditioned by the legacies of the developmental state. In a nutshell, developmental states can be characterized by the intention to kick-start rapid industrialization as the overwhelming priority and to achieve this objective by state intervention and regulation of markets; rapid economic growth; advancements in productivity and international competitiveness; the absence of any commitment to equality, social welfare and environmental sustainability; the presence of a strong, authoritarian state which tightly controls civil society; close interaction between state elites and the business sector and a largely uncritical belief in technological progress (Johnson, 1982, 1995; Önis 1991; Leftwich 1995).

The developmental state concept stood in a mutually resonating relationship with authoritarian versions of Western modernization theory, which posited that development dictatorships constitute the fastest and most effective way to leapfrog stages of development and compressing a process that took two hundred years in the West to a few decades (Newman 1963; Löwenthal 1963; Huntington 1968).[2] As this implies belt-tightening and hardships for major segments of the population - conditions that will inevitably provoke resistance - successful late development was seen as relying on a strong state able to ruthlessly execute its developmental agenda.

And, indeed, almost all current providers of energy infrastructure went through this type of state-led authoritarian development during their phase of economic take off. Cases in point are imperial Japan, Maoist China and Park Chung-hee's South Korea, to a lesser degree Thailand under Sarit Thanarat and his successor Thanom Kittikachorn and Malaysia under Mahathir Mohamed. Authorities in these states did not hesitate to use force and even to commit serious human rights violations when they felt the need to crush recalcitrant opposition perceived as obstructing or retarding modernization. Any kind of activism that took issue with the disastrous environmental record of rapid industrialization, was discredited as anti-developmental and suppressed by authorities (Hirsch 1993: 145). Social and environmental damage were thus relegated to a temporary, though inevitable by-product of development. That rapid late development produced winners and losers was taken

[2] For an overview and critical assessment, see Rüland & Werz (1985).

for granted. As long as it resulted in aggregate collective gains, measured in GDP growth rates, industrialization and mass employment, the negative social and environmental fall out and individual suffering were to be tolerated. The losers of this process, displaced persons, farmers, fisherman, unskilled laborers, the urban poor and indigenous people, were largely left alone in coping with the massive disruptions to their lives. Yet when it came to environmental damages such as air and water pollution, even the better-off strata were exposed to the downsides of rapid modernization.

For the sake of fast development, governments and development planners responsible for the mega-projects of late developers did not shy away from taking enormous risks. Where these went out of control, they resulted in exceptionally high death tolls and the destruction of the livelihood sof millions. Maoist China, the most ruthless developmental state, was responsible for the worst dam disaster in history, killing more than 171,000 and displacing 11 million when the Banqiao dam collapsed in 1975.[3] The more than 87,000 dams[4] China built after the Revolution including the world's largest, the Three Gorges Dam, have produced a long list of environmental harms including the heightening of earthquake risks, landslides and soil erosion, massive water pollution due to submerged mines, dumps and factories,[5] the loss of agricultural lands and losses in biodiversity due to major changes in the ecosystem. Many of these dams urgently need renovation.[6] In the eyes of environmentalists, the dams built along the Yellow River and the Yangtze River are ecological disasters.[7] In Japan, too, the developmental history is marked by environmental calamities. It was marred by severe pollution incidents, including the Ashio copper mine, mercury poisoning in Minamata and arsenic air and water pollution caused by a refinery in Toroku, to name some of the worst cases.

The region's smaller infrastructure providers also have dismal environmental records, including Thailand with its notorious Pak Mun Dam or Malaysia with the Bakun Dam in Sarawak.[8] In Thailand's Eastern Seaboard Project the construction of heavy industrial complexes has contaminated surrounding areas with toxic waste (Dawei Development Association 2014). Indiscriminate road and dam construction has facilitated illegal logging and accelerated processes of deforestation with severe effects on the climate, aggravating floods in the monsoon season, prolonging droughts in the dry season and negatively affecting the livelihood of agricultural communities and indigenous people (Hirsch 1993: 136; Tinh & Hung 2019: 72).[9]

Moreover, the desperate need for cheap energy and abundant coal deposits prompted developmental states to build scores of technically sub-standard coal-fired power plants, the CO_2 emissions of which massively contributed to prohibitively high levels of air pollution. While the latter was particularly severe in Japan's early industrialization in the first decades of the twentieth century and subsequently in the reconstruction period after the Second

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[3] *International Rivers*, 8 February 2013.
[4] *Assam Tribune*, 28 February 2015.
[5] *East Asia Forum*, 28 September 2013.
[6] *International Rivers*, 8 February 2013.
[7] *The New York Times*, 19 March 2005.
[8] *In These Times*, 20 October 1997; *Interpress Service*, 2 December 1994 and 24 November 2000.
[9] *The Diplomat*, 21 June 2017; *East Asia Forum*, 25 September 2018.

World War in the 1960s, it reached dangerously high levels in cities such as Beijing, Seoul and Bangkok between the 1970s and 2000s. In Beijing fine particles, known as PM 2.5, rose to nearly thirty times the level that the World Health Organization considers safe.[10]

More recently, the legacies of the developmental state and their increasingly unbearable environmental concomitants have provoked a re-thinking among Asia's economic frontrunners Japan, China and South Korea, but also economically less advanced countries such as Malaysia and Thailand. All of them – partly due to international pressure, partly due to local protests (Rigg 1991, Hirsch 1993; Forsyth 2007) - have begun to elevate environmental policies to a domestic priority and to avoid environmentally damaging projects. Yet despite these paradigmatic policy changes at home, Asia's infrastructure donors to varying degrees continue to export environmentally unsustainable infrastructure to neighboring developing countries. The subsequent sections assess the environmental effects of these practices and analyze why they are widespread in the region.

4. Infrastructure Development and Environmental Sustainability in Southeast Asia

This section examines the environmental effects of infrastructure projects in the fields of energy production with a focus on dam building and coal-fired power plants, two project types with particular potential for controversy. It shows that donors engaged in the same type of environmentally unsustainable projects that took place in their own phase of rapid modernization and what this means for the environmental sustainability of the current infrastructure modernization drive.

The environmental curse of hydropower

One of the most tangible transformations of mainland Southeast Asia's infrastructure following the developmental state model is the building of dams for the generation of hydropower. Hydropower is celebrated by financiers, contractors and governments as a renewable, clean and cheap energy source with poverty-alleviating effects.[11] Dams built for electricity generation – they argue - can also be used for water storage, water consumption, irrigation and flood control.[12]

It was China that commenced the dam building spree in mainland Southeast Asia. In 1993, it began constructing a cascade of seven dams on the Mekong in Yunnan, the two largest of which, the Xiaowan and the Nuozhadu dams, went into operation in 2010 and 2012.[13] China also blasted and dredged upstream rapids of the Mekong in order to facilitate river shipping (Pichamon 2014: 712).[14] Eleven more mainstream dams are planned along the lower reaches of the Mekong in Laos and Cambodia. The first of these dams, the Thai-financed Xayaburi

[10] *Jakarta Globe*, 12 May 2016.
[11] The latter are attributed to direct and indirect effects. Direct effects include the availability of cheap energy and higher agricultural incomes due to improved irrigation and better flood control, indirect effects job increase as a result of industrialization and related economic growth.
[12] *Federal News Service*, 23 September 2010; *Thai News Service*, 2 August 2016; *Energy Monitor Worldwide*, 11 August 2018.
[13] *International Rivers*, December 2014.
[14] *The Nation*, 3 November 2017.

Dam in Laos, started operations in October 2019.[15] Forty-six additional dams have been built along Mekong tributaries, while another fifty-four are under construction.[16] The majority of them have been built in Laos, which plans to construct 140 dams by 2040, transforming the country into the "battery of Southeast Asia."[17]

More dams are on the planning boards in Myanmar along the so far undammed Salween River and the Irrawaddy, where in 2011 the huge Chinese-financed Myitsone Dam was suspended by Myanmar's government due to popular protests.[18] Yet more than 80 percent of the electricity generated by these dams is not used in the energy-strapped host countries, where large parts of the rural population have no access to electricity, but exported to neighboring countries such as China, Thailand and Vietnam. Laos, in particular, is making the export of electricity the mainstay of its economy.[19]

Already now, dam building has caused serious environmental damages, which are expected to intensify with the commissioning of new dams. This is caused by erratic fluctuations of water flows, severely reduced sedimentation and substantial losses of biodiversity. Even worse, all three types of environmental degradation have highly negative repercussions on the livelihoods of some 60 million people living in the Lower Mekong Basin, negating the poverty-alleviating effects of hydropower averred by its promoters.

Unnaturally low downstream water levels have been recorded for 1993, 1997, 2004, 2013, 2016 and 2019. They occur whenever upstream reservoirs are filled up. Filling reservoirs reduces downstream water flow and water quantity (Pichamon 2014: 712). Filling operations take place after the completion of the construction work, during test runs and in the process of maintenance, which is due every few years in order to prevent the siltation of turbines.[20] For maintenance, a reservoir's water must be discharged and later, after the work has been finalized, filled up again. In summer 2019, maintenance of China's upper-Mekong Jinghong Dam resulted in the release of torrents of water, which flooded parts of Thailand and Laos, with dire consequences for agriculture, fisheries and local people's livelihoods.[21] The great Mekong floods of 2008, inundating large parts of Northeastern Thailand, Luang Prabang and Vientiane in Laos, were also blamed on Chinese dams, discharging water after heavy downpours (ibid.: 712).[22] In 2016, Chinese water releases – benevolently intended to mitigate the effects of the worst drought recorded in 90 years in the Lower Mekong Basin countries,[23] according to Chinese authorities, or less altruistically designed to improve navigation on the Mekong, as presumed by the NGO International Rivers - caught people living along the river by surprise, destroying harvests and river bank vegetable gardens.[24] Drops in downstream

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[15] *Radio Free Asia*, 19 October 2019.
[16] *CNN*, 14 November 2018.
[17] *The Nation*, 25 February 2019.
[18] *The Diplomat,* 1 January 2016.
[19] *The ASPI Strategist*, 6 August 2019.
[20] *Mizzima*, 20 February 2015.
[21] *The ASPI Strategist*, 6 August 2019.
[22] *Financial Times*, 18 July 2014.
[23] *Thai News Service*, 12 December 2016.
[24] *Thai News Service*, 9 May 2016.

water levels such as the historical lows of 2016 and 2019[25] compound droughts caused by the El Niño phenomenon and massive shortfalls in monsoon rains.

Mainstream dams also greatly affect the flow of sediments. As sediments contain important nutrients, they are important for soil fertility and thus crucial for the rice cultivation in the Lower Mekong region, Southeast Asia's rice bowl. More than 50 percent of Vietnam's rice harvest comes from the Mekong Delta region.[26] Dams block the flow of sediments, which accumulate in the dam reservoirs and negatively affect water quality.[27] The reduction of sediment flows is dramatic, having already more than halved between 1990 and 2014.[28] Research by the Stockholm Environment Institute predicts that by 2040 the sediment load will have been reduced by 97 percent in case all eleven Mekong mainstream dams are built.[29] Losses in sediment flows will thus greatly impact on the region's rice production, compromise food security, negatively affect the income of the rural population, reduce income from rice exports and force countries in the Lower Mekong Basin to import basic food stuffs.

The combined effects of markedly lowered water levels and the loss of silt and mud transported by the river especially during the monsoon season also have dire consequences for the Mekong Delta, one of the world's three most vulnerable deltas to climate change.[30] It has contributed to a sinking of the delta, increased soil erosion and, in particular, progressive intrusion of salt water. According to Vietnamese scholars, salt water has intruded into the Mekong Delta up to 40 km, with devastating effects on the region's agriculture and aquaculture.[31]

The Mekong is the second most biodiverse river in the world, next only to the Amazon. Biologists counted over 1,300 species of fish, among them some of the largest freshwater species.[32] At least 50 percent of the Mekong fish species are migratory, travelling long distances upriver and up the tributaries for spawning. The mainstream dams and the dams along the tributaries block fish migration. The result is a rapid annual decline of fish stocks between 26 and 42 percent[33] and, ultimately, the extinction of many species. Technology-affine dam proponents counter environmentalists' concerns by referring to the installation of fish-friendly turbines and fish ladders.[34] However, as a report by the Washington-based Stimson Center shows, the effect of the fish ladders will be limited at best. While there are few so far,[35] they are not designed to manage a biomass of up to 30 tons per hour and to cater

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[25] *Thai News Service*, 9 May 2016 and 2 August 2016

[26] Dekila Chungyalpa, Director, World Wildlife Fund (WWF), in a Hearing of the East Asian and Pacific Affairs Subcommittee of the Senate Foreign Relations Committee, *Federal News Service*, 23 September 2010.

[27] *Mekong Watch*, 14 March 2016.

[28] *Energy Monitor Worldwide*, 11 August 2018.

[29] *CNN*, 14 November 2018; *The Diplomat*, 26 August 2019.

[30] Dekila Chungyalpa, Director, World Wildlife Fund (WWF), in a Hearing of the East Asian and Pacific Affairs Subcommittee of the Senate Foreign Relations Committee, *Federal News Service*, 23 September 2010.

[31] *The Weather Channel*, 1 August 2019.

[32] Dekila Chungyalpa, Director, World Wildlife Fund (WWF), in a Hearing of the East Asian and Pacific Affairs Subcommittee of the Senate Foreign Relations Committee, *Federal News Service*, 23 September 2010.

[33] *Asian Correspondent*, January 2018.

[34] *The Ecologist*, 16 January 2016.

[35] Brian Eyler in a *CNN* interview, 14 November 2018.

to fish species of varying sizes and swimming techniques. According to the report's authors, such mitigation technology simply does not yet exist (Eyler & Weatherby 2019: 8).

Fish stocks are further endangered as dams change the water quality and thus reduce aquatic plants and insects in the river, depriving fish of an important source of food.[36] Moreover, dams cause temperature differentials: water from the reservoirs is much colder than water further downstream, affecting the behavior of fish species by changing their reproduction and migration activities.[37]

Most affected by the changes in water level is the unique and fragile ecosystem of Lake Tonle Sap in Cambodia, one of the world's richest freshwater habitats.[38] The lake is connected to the Mekong through the Tonle Sap River. Every year in the monsoon season, flood water from the Mekong intrudes the Tonle Sap River, flowing up the river and feeding the lake which expands to five times its dry-season size (Eyler & Weatherby 2019: 5). With the water fish enter the lake which provides Cambodians with 75 percent of their protein intake (ibid.: 3). The water floods forests and grasslands adjacent to the lake, with its rotting organic material one of the most important sources of food for fish (ibid.: 7). If due to the dams wet season water levels decrease, this part of the lake is no longer inundated, depriving fish of food. At the end of the monsoon season, the water leaves the lake and drains into the Mekong Delta, with the river nutrients boosting the latter's agriculture. This "pulse" of the Mekong is seriously jeopardized by the two mainstream dams planned in Cambodia, the Sambor and Stung Treng dams, and dams in the so-called 3S-river system (Mekong tributaries Srekong, Srepok an Sesan) (ibid.: 3). Changes in the Tonle Sap River system have been observed since 2013, with decreasing water levels and increasing water pollution.[39] In 2016, the water level recorded for the Tonle Sap River was at a 50-years low.[40]

The reservoirs of dams will also flood other key biodiversity zones[41] outside the Mekong Basin. Dams at the Salween including the Hat Gyi, the Tasang and the Weigyi dams are expected to submerge wildlife sanctuaries in Myanmar's Kayin State, teak forests and national parks,[42] thus markedly reducing the rich biodiversity surrounding the project sites.

The worst-case scenario of dam building ignoring the guidelines of the World Dam Commission and international best practices is the collapse of structures such as that of the Thai-Korean-built Xepian-Xe Nam Noy Dam in Laos after heavy rainfall in July 2018. While the casualties caused by the mishap are only a fraction of the 1975 Chinese disaster mentioned above, the incident mirrors practices of the developmental state and foreshadows the perils inherent in hazardous infrastructure development. The collapse hit downstream villages with massive flooding, with at least twenty-six deaths, hundreds missing and more than 6,000 families displaced.[43] Civil society advocates and independent experts rated the

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[36] *Mekong Watch*, 14 March 2016.

[37] *The New York Times*, 19 March 2005; *International Rivers*, January 2014.

[38] *Futurity.org*, 18 December 2018.

[39] *The Nation*, 16 November 2015.

[40] *The News Service*, 9 May 2016.

[41] Aviva Imhof, Campaigns Director, International Rivers, in a Hearing of the East Asian and Pacific Affairs Subcommittee of the Senate Foreign Relations Committee, *Federal News Service*, 23 September 2010.

[42] *Mizzima Business Weekly*, 11 June 2015.

[43] *The Guardian*, 26 July 2018; *The Diplomat*, 2 August 2018.

collapse as an essentially man-made disaster, caused by poor environmental impact assessments, flawed environmental and social safeguards that did not meet international standards and an inadequate public consultation process.[44]

China, Japan and South Korea in Southeast Asia: Going green by dumping brown?[45]

Due to its high CO_2 emissions, coal-based energy is polluting and, according to the International Energy Agency, was the largest contributor to the growth of CO_2 emissions in 2018. Yet as coal is a cheap fuel source, global coal-fired power capacity has nearly doubled to 2,024 gigawatts (GW) since 2000. According to Carbon Brief, a UK-based website specializing in climate science, climate policy and energy policy, an additional 236 GW is under construction and 336 GW is planned. Much of the growth occurs in Asia, where thirteen of the leading twenty countries for coal expansion are located. Coal-fired capacity is expected to grow globally by more than 50 percent in the near future, irrespective of the fact that the price for renewables is declining and becoming more competitive than coal in the medium-term future (Chen & Schmidt 2017: 4; Institute for Essential Services Reform 2019: 24).

Alarmed environmentalists thus urgently demand the early and complete phasing out of coal-fired power plants. While some industrial countries such as the UK, France, Ireland, Denmark and Sweden have indeed announced an immediate or early exit from coal (Fünfgeld 2019b), this has not been the case for countries with a high percentage of coal in their energy mix such as China and Japan – or outside Asia - Eastern European countries, Spain and Turkey. The two Asian economic power houses pursue different strategies to cope with high pollution levels. China has embarked on a dual strategy to reduce its CO_2 emissions from coal-fired power plants: on the one hand replacing coal with renewable energies like hydropower (though with the adverse effects discussed above), wind and solar energy and, on the other, increasingly using what euphemistically is called "clean" coal technologies. By contrast, Japan has restarted embracing coal power again after the Fukushima nuclear disaster, albeit that it is also developing technologies that massively reduce CO_2 emissions. Technologically ahead of China, Japan seeks to commercialize carbon capture and utilization (CCU) technology by 2023 and carbon capture and storage (CCS) by 2030 as strategies to make coal power clean.

As a cheap source of energy, coal is particularly attractive to Southeast Asia's poorer and energy-starved, albeit rapidly growing economies. While Western donors including the World Bank have started withdrawing from financing coal-fired power plants (Global Environmental Institute 2017: 4), China, Japan and South Korea provide the funding and technology they need and can afford (Li & Gallagher 2019: 2). Overtaking Japan, China has now become the largest financier[46] and exporter of coal equipment globally (Chen & Schmidt 2017: 4).[47] Analysts have registered more than 240 coal projects,[48] which China is implementing under its Belt and Road scheme in Southeast Asia and beyond. To make power generation affordable for Southeast Asian clients, until very recently the majority of Chinese-

[44] *South China Morning Post*, 16 August 2018.
[45] Headline of the *East Asia Forum*, 25 September 2018.
[46] Major public financiers are the China Development Bank and the China Export-Import Bank. See Li & Gallagher (2019: 2).
[47] *The Diplomat*, 24 September 2016.
[48] *Yale Environment 360*, 3 January 2019.

financed and -built plants used subcritical, low efficiency plants.[49] While Chinese projects are more competitive in terms of costs, Japanese projects are less polluting.[50] However, under international pressure, both have started to increasingly export power plants with "supercritical" and "ultra-super-critical" technologies. Depending on the type of coal used, these technologies can reduce carbon emissions by some 20-30 percent compared to "subcritical" technologies, according to the International Energy Agency.[51] By contrast, high efficiency low emission (HELE) technology such as carbon capture and storage (CCS) – according to industry associations - reduces emissions by up to 90 percent,[52] but this technology is so far in operation mainly in North America.[53] Moreover, the technology is controversial because its risks and trade-offs are not yet fully understood.[54] Reductions of CO_2 emissions are thus modest at best.

Southeast Asian countries with a rapidly expanding coal sector are Vietnam, Indonesia, Cambodia and the Philippines.[55] In Vietnam, despite major efforts to advance solar power,[56] coal will replace hydropower as the main source of energy generation by 2020.[57] Its share in the country's energy mix will increase from 49 percent in early 2020 to 55 percent in 2025.[58] In 2011, the government announced plans to build ninety new coal-fired power plants by 2025.[59] While it recently stipulated that all new coal-fired power plants must use supercritical or ultra-supercritical technology,[60] in the past, most power plants have been equipped with outdated, inefficient and polluting technologies from China.[61] As a result, and as a concomitant of lax emissions rules, greenhouse gas emissions grew three times faster than the country's economy between 1991 and 2012.[62] Other pollutants are particulate matters, toxic gases, coal ash and acid rain. Water pollution and soil contamination by toxic waste have also been diagnosed for Vietnamese coal-fired power plants. Apart from causing serious health problems (with pollution-related premature deaths projected at 21,200 by 2030), coal-fired power plants adversely affect the livelihood of local people through involuntary resettlement, loss and degradation of agricultural land, loss of jobs and loss of biodiversity (Minh et al 2017: 21-37). A well-documented example of the pollution of outdated technology is the 1,240 megawatt, Chinese-built Vinh Tan-2 plant in southern Vietnam[63] which,

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[49] US-based energy scholars claim that between 2001 and 2016 about 60 percent of Chinese-financed, coal-fired power plants overseas used low-efficiency, sub-critical coal technology. Ibid.

[50] *Reuters*, 23 October 2014; *Politico*, 8 December 2015.

[51] *Mongabay*, 15 March 2017. In a study on Indonesia, Cameron & Tilburg expect lower reductions in the order of 10-13 percent due to the use of inferior lignite or non-bituminous coal (Cameron & van Tilburg 2016: 4, 6).

[52] *People's Daily*, 10 May 2019.

[53] Available at the website of the World Coal Association, https://www.worldcoal.org/reducing-co2-emissions/carbon-capture-use-storage, (accessed 22 January 2020). See also *Yale Environment 360*, 8 September 2014; *Mongabay*, 15 March 2017.

[54] For a critical assessment, see *Climate Change News*, 2 October 2012 and *The Conversation*, 23 August 2017.

[55] *The Diplomat*, 24 September 2016.

[56] *Mongabay*, 2 December 2019.

[57] *The Diplomat*, 25 January 2017.

[58] *The ASEAN Post*, 28 May 2018.

[59] *Mongabay*, 26 May 2017.

[60] Ibid.

[61] *The Diplomat*, 25 January 2017.

[62] *Mongabay*, 26 May 2017.

[63] For additional examples, see Minh et al (2017).

completed in 2014, has dramatically increased pollution in the local area.[64] Peaceful popular protests were suppressed by the police, with seven demonstrators subsequently jailed.[65]

Indonesia, too, seeks to rapidly expand coal-based energy generation to support its economic growth. Up to 2024, extended from the original target of 2019, the government of President Jokowi plans to add 117 coal-fired power plants to the country's existing fifty plants. This would account for almost 60 percent of the envisaged 35 GW increase in electricity output (Cameron & van Tilburg 2016: 7). With an anticipated 60 percent share of Indonesia's energy mix, up from 36 percent in 2000, the country would be trapped in a high-carbon economy for decades to come.

Yet – like Vietnam - due to resource constraints, Indonesia has only recently been adjusting its lax emissions standards (Koplitz, Jacob, Sulprizio, Myllyvirta & Reid 2017: 1470) and started moving towards supercritical and ultra-supercritical "clean" coal technologies. It was not until 2012 that the country's first supercritical coal-fired power plant in Cirebon, Central Java, became operational. While 21 percent of the new plants will still use subcritical technology, 43 percent will be equipped with supercritical and only 16 percent with ultra-supercritical technology. For 20 percent the technology is still undefined. Like most other Southeast Asian countries, Indonesia thus is expanding coal-based energy with only limited pollution controls with Chinese, Japanese, South Korean and in a few cases, European, support. "Clean" coal technology will thus only modestly contribute to Indonesia's envisaged reduction of carbon emissions by 29 percent from the projected 2030 levels. Even worse, the expansion of coal-based energy generation will further stimulate domestic coal production, a process likewise rife with environmentally highly degrading effects (Fünfgeld 2016: 87).

Moreover, as in the Vietnamese case, popular protests against the many manifestations of coal-related environmental degradation – ash rains, water and air pollution and mercury pollution as documented by the Indonesian NGO Walhi – have been criminalized by investor companies and suppressed by violent police action (Fünfgeld 2019b: 230).

Coal also accounts for 48 percent of Cambodia's power supply and over 40 percent in Malaysia and the Philippines,[66] whereas in Thailand it will be reduced from 25 percent to 12 percent in coming years.[67] Two major coal plants (Krabi, Thepa) have been removed from its energy development plan, while another (Thak Sakae) has been shelved.[68] Yet, like Chinese and Japanese investors, the Electricity Generating Authority of Thailand (EGAT) and other energy producers such as Banpu Power and Ratchaburi Electricity Generating Holding also shift coal-based energy generation to neighboring countries due to increasing community resistance at home. Such relocations usually worsens the emission performance of these plants: if the power plants were built in Thailand, the stricter Thai policy and regulatory regime would lead to the installation of better and cleaner coal technologies, but at the same time would drive up the costs of investment and of the power generated.[69]

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[64] See Koplitz, Jacob, Sulprizio, Myllyvirta & Reid (2017: 1473).
[65] *The Diplomat*, 25 April 2019.
[66] *Southeast Asia Globe*, 8 October 2019.
[67] *Mongabay*, 2 December 2019.
[68] Ibid.
[69] *East Asia Forum*, 25 September 2012; *Jakarta Globe*, 25 February 2016, 24 March 2016, 10 August 2016, 6 October

In Southeast Asia, so far, only economically more advanced Malaysia operates ultra-supercritical coal-burning technology. It spent more than US$1.4 billion on each of the Manjung 4 and 5 power plants. [70] Southeast Asia is thus becoming the region with the fastest increase of coal-fired power plants, a development which does not bode well for mitigating the adverse effects of climate change. Given the fact that ultra-supercritical technologies can only modestly reduce CO_2 emissions, environmentalists are concerned that the efficiency increases are negated by the rapidly rising number of coal-fired power plants.[71] For them climate goals can only be accomplished if coal-based energy production in the region is markedly reduced and eventually completely phased out.

5. The Legacies of the Developmental State

The infrastructure projects in the energy sector studied above ignore existing experiences and best practices in this field of infrastructure development. Many of them display traits characteristic of the developmental state. Like in the donor countries' own phase of developmental take off, they serve in the first place to accelerate industrialization. Business leaders and development planners both in donor as well as recipient countries regard energy security as a key prerequisite for the expansion of the industrial sector and as a factor to attract foreign investment. They share the belief that in order to have a tangible effect on a country's economic performance, infrastructure must be provided fast. Therefore, it is rational for them to refrain from long project gestation periods, including consultation and interaction with affected communities and time-consuming social and environmental impact assessments.

Both project types – dam building as well as coal-fired power plants – are dominated by state-owned enterprises and financial institutions or private companies with close government relations. Chinese state-owned enterprises involved in dam building include, *inter alia*, Sinohydro Corporation and the Three Gorges Corporation and the likewise state-owned China Development Bank and the China Export-Import Bank as major financiers. Companies with close government relations are SK Engineering & Construction Co. (South Korea), the Electricity Generating Authority of Thailand International (EGATI), the Ratchaburi Electricity Generating Holding Public Company, CH. Karnchang, PTT Group (all from Thailand) and Mega First Corporation Berhard and the Leader Group (both from Malaysia). In the coal-fired power plant business we find Japanese giants Marubeni and Sumitomo as important providers of technology. Major financiers are the China Development Bank, the China Export-Import Bank, the Industrial and Commercial Bank of China, Citic, Ping An Insurance Group and the Japan Bank for International Cooperation, but also Singaporean banks like UBS, DBS Bank and Oversea-Chinese Banking Corporation (OCBC) have been mentioned.[72]

2016 and 13 April 2018.

[70] *The ASEAN Post*, 6 November 2018.

[71] *The Diplomat*, 24 September 2016.

[72] See *The ASEAN Post*, 6 November 2018. Chinese, Japanese and South Korean banks financed eighteen of twenty-two coal-fired power plants in Indonesia between 2010 and 2017, Singaporean banks backed twenty-one projects in Vietnam and Indonesia. See *Global Risk Insights*, 27 February 2018. However, recently some Japanese banks including Mitsubishi UFJ Financial Group (MUFG), Mizuho Financial Group, Sumitomo Mitsui Banking Corporation (SMBC) and Nippon Life announced a withdrawal from coal projects. See *The Diplomat, 28 July 2018*

Many projects – as is typical for the developmental state - completely disregard social and environmental costs. Both for dam building as well as for coal-fired power plants, a great number of cases have been documented where projects have proceeded without concern for the people living on or near the project sites. Reports of involuntary resettlement without, delayed, inadequate compensation and land grabbing abound (Rüland 2019). Resettlement, which affects thousands in virtually every major project, is a recipe for enduring impoverishment. Environmental impact assessments are defective, lack transparency and exclude or restrict stakeholder participation (Fünfgeld 2019b: 231). Where popular opposition against polluting projects emerges, it faces repression by host state authorities. The Indonesian and Vietnamese cases mentioned in the preceding section are only the tip of the iceberg in this respect.

Very much in line with the logic of the developmental state, energy projects seek to modernize first before coping with pollution and other environmental consequences. Energy security, affordable electricity and the timely provision of physical structures trump environmental concerns. As a result, the serious environmental degradation documented in the preceding two sections, which goes hand in hand with energy-related infrastructure modernization, is a deplorable side effect that must be temporarily tolerated for the sake of economic growth. This rationale corresponds to the seemingly widespread belief aired by Chinese scholars – and probably not only them - that high pollution levels and environmental damage are inevitable concomitants of late development.[73]

Also the uncritical, often even naïve optimism in the advancement of technology known from the developmental state is mirrored in these projects. Cases in point are the belief that modern dam building technology can mitigate losses in biodiversity and save the river fish population. Similar is the claim that "clean" coal technology is able to reduce CO_2 emissions, overcome pollution problems and limit the impact on climate change. However, this will only materialize, if the number of coal-fired power plants declines. As shown above, the opposite is true.

6. Conclusion

Guided by historical institutionalism, the previous analysis of two key sectors of energy infrastructure has amply shown that major financiers and contractors of dam-building projects and coal-fired power plants are reproducing in path-dependent fashion the approaches enabling their own rapid economic growth a few decades earlier. These approaches are informed by the developmental state concept, which has also been adopted by project recipients. Typical of the developmental state are the absolute priority of rapid economic growth and industrialization over environmental and social concerns. For the developmental state aggregate gains count and relegate individual suffering caused by rapid modernization to a backseat. Environmental damage is tolerated in this process and popular movements opposing the deterioration of living conditions as a result of pollution and losses in biodiversity are confronted with state repression.

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and *Nikkei Asian Review*, 20-26 January, p. 27.

[73] Statements by Chinese scholars at conferences and workshops in Brussels (2018), Phnom Penh (2019) and Freiburg (2019).

While infrastructure donors have often denied that they seek to impose their developmental approach on recipient states, the preceding scrutiny of environmentally sensitive infrastructure projects suggests otherwise. There are indications that China is increasingly abandoning its policy of non-intervention, shifting to what Wang Yi, the Minister of Foreign Affairs, calls "constructive intervention with Chinese characteristics" (He 2018: 191). This includes imposing Chinese experiences of late development on their partner countries such as the deeply entrenched belief that development and environmental sustainability are mutually exclusive in the phase of economic take off and that material development precedes environmental sustainability. The Japanese government is even more straightforward: it is convinced that "Japan's experience can be a model for many developing countries in the process of their modernization."[74]

The promotion of their own developmental experiences and thus variants of the developmental state model intensifies with the deepening geopolitical rivalries in the region. China, Japan and even smaller powers such as South Korea and Thailand have joined the Asian infrastructure race in an attempt to increase their soft power and to enhance their direct influence on host countries' governments. By imposing on them their model of economic growth, they too create developmental path dependencies which render host countries dependent on their technology, equipment and managerial expertise. Even worse, there are increasing signs of a downward spiral in project quality because even Japan, a member of the OECD's Development Assistance Committee (DAC), and the Japan-dominated Asian Development Bank are now advocating speedier processes of project planning and implementation (Ministry of Foreign Affairs 2017: 42). Statements like those of the Chinese government which link the BRI to the Sustainable Development Goals (SDGs) are thus mere rhetoric and tend to gloss over the severe environmental damage caused by Southeast Asia's current competitive infrastructure drive (Advisory Council 2019). This does not bode well for the ongoing efforts to mitigate the adverse effects of climate change.

[74] See JICA, "Japan's Modernization Experience as a Legacy for the World, Part 1: JICA Development Studies Program Launched," 16 October 2018, available at: https://www.jica.go.jp/english/news/field/2018/181016_01.html, (accessed 29 November 2019).

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