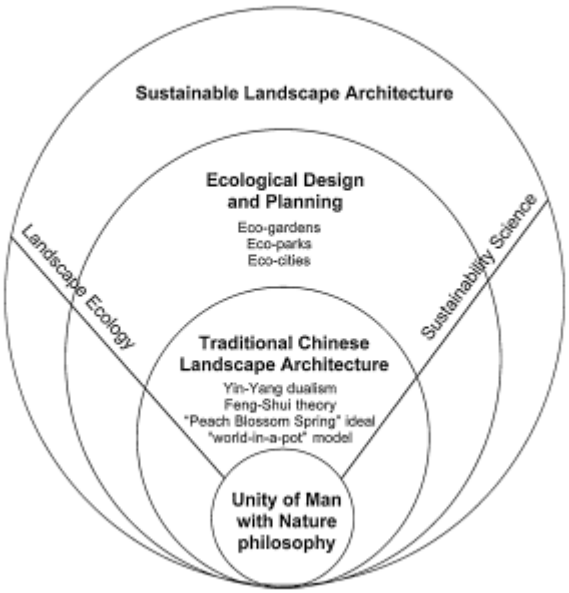
Could Sustainable Landscape Architecture Solve China's Smog?

By means of the documentary medium, journalist Chai Jing has recently broadcast the issue of the 'haze' (or smog) which is polluting the skylines of major cities across China. Titled 'Under the Dome', it is essentially addressed towards Jing's daughter, aiming to answer her questions such as: 'what is the haze?'; 'where does it come from?' and 'what can we do about it?'. In response, the video-based investigation reveals that the haze is an accumulation of fine particles arising from oil and coal consumption causing visible pollution in the atmosphere - and that the ideal solution is to reduce consumption to below 2 million tons (Jiahua Guo, 2015). However, the piece simultaneously makes clear that the petrochemical industry in China is currently inflexible and reluctant to reduce emissions, meaning that other measures must be taken in the meanwhile. One potential alternative as proposed in the following research is the large-scale implementation of ecocentric urban design and landscape architecture across the affected cities. This would build upon proposals like president Xi Jinping's 'ecological civilisation' or 'sponge cities' whilst being grounded in ancient Chinese philosophies like the "unity of man with nature" and "world-in-a-pot". This move towards cleaner, greener cities holds the potential to sequester haze-causing pollutants and counteract the smog.

Figure 1: Chengdu as shown in 'Under the Dome' (Jiahua Guo, 2015)

China's rapid industrialisation on such a significant scale over the last few decades has drastically altered the form of cities, favouring a compact and convenient built environment over a once spiritually-inclined and nature-based aesthetic. One particularly captivating moment in the documentary occurs when Chai Jing showcases the results of a 40-day continuous photography project in which 46 professionals captured the haze across Tianjin, Shenyang, Chengdu and Lanzhou (Jiahua Guo, 2015). This city-specific visual aid defines the scope of the issue by pointing solely to the urban landscape. Jing elucidates in the documentary that the primary cause of atmospheric pollution in China is an accumulation of PM (particulate matter) 2.5 emitted via inner city vehicles. However, it is also made clear by the photographs that a second underlying factor is playing into the materialisation of the haze: modern, industrialised Chinese cities lack the ecological defences (vegetation, wetlands and other green space) that once would have flourished across the land. Figure 1, for example, shows Chengdu, clouded by the haze, featuring back-to-back blocks of flat concrete buildings. This highlights the idea that today's nature-depleted cityscapes are left increasingly vulnerable to the effects of pollutants like PM 2.5 because of a lack of ecosystem services. Ecosystem services are 'supporting', 'provisioning', 'regulating' and 'cultural' aids facilitated by the presence of flora and fauna, especially within urban hubs (M.E.A, 2005). In the case of present day China, it is the loss of regulating services - namely pollutant sequestration and climate regulation - which is further enabling the development of the smog.

Figure 2: *Diagram to show how the "unity of man with nature" philosophy feeds in sustainable landscape architecture* (Chen and Wu, 2009)



Therefore, it has become apparent that - aside from decreasing emissions long-term - China must adapt its cities by incorporating urban green space. This would reinstate regulating ecosystem services and contribute to the mitigation of the smog, which is currently causing unprecedented levels of poor respiratory health as well as a plethora of climate concerns as indicated in the documentary (Jiahua Guo, 2015). This nature-based design principle mirrors what is nowadays termed 'urban green infrastructure' - yet it is important to note that this landscape concept is nothing new in Chinese urban design. To elaborate, Chen and Wu (2009) have epitomised China's traditional landscape architecture as being 'rooted in the dialectical philosophy of "unity of man with nature"' and moulded by the visuals of 'peach blossom spring' and 'world-in-a-pot'. These aesthetic ideals connote the symbolic and purposeful incorporation of China's native natural elements within socio-economic hubs throughout history. Ian Mell at the University of Manchester's School of Environment, Education and Development (SEED) has therefore described the route forwards as involving 'landmark sites' which 'replicate the traditional' (The University of Manchester, 2023). To visualise this idea, Figure 2 demonstrates the process of sustainable city creation - or 'eco-cities' - as being rooted in Ancient Chinese values and developed through a modernised lens of landscape ecology and sustainability science. With that in mind, the construction of nature-based infrastructure appears to make sense in China's historical context and would therefore provide an element of 'cultural' ecosystem service via an (ironically, forward-thinking) return to tradition.

In practice, this eco-philosophical approach ties to emerging trends in Chinese landscape architecture such as president Xi Jinping's 'sponge city' proposal. This ecological design concept promotes the construction of vast areas of parkland and wetlands within cities; the idea has arisen more so in relation to flood mitigation but doubles as an interesting launchpad for further green developments in relation to air pollution (Freymann, 2021). This is because 'sponge cities' implement pollutant-sequestering vegetation on a city-wide scale. To visualise, Figure 3 and 4 illustrate two existing 'sponge city' projects in Ningbo and Haikou. In Figure 3, for example, it can be seen that the designer - Yu Kongjian, owner of Beijing-based design firm Turenscape - has introduced dense shrubbery and trees beside major roads. Considering Jing's assertion that inner city smog primarily arises from vehicles, roadside green space is an essential component of any Chinese 'eco-city'. More specifically, Heshani and Winijkul (2022) found that 30-37% of PM 2.5 could be sequestered by high leaf density vegetation at ground level. This indicates the potential of 'sponge cities' and the use of more sustainable landscape architecture in mitigating PM 2.5 - and therefore the haze.

Figure 3: *Ningbo eastern new town ecological corridor - Phase 3* (Turenscape, 2020)

Figure 4: *Before and After - Haikou Meishe River greenway and Fengxiang park* (Turenscape, 2019)

On the other hand, it could be argued that city-specific adaptation in lieu of degrowth and decarbonisation is merely an ineffective side step away from the real issue. One article by The China Wire described the 'sponge city' as a 'clever marketing term' in moving towards 'ecological civilisation', implying that it is predominantly useful as a definitive and influential aesthetic rather than in achieving environmental goals (Freymann, 2021). Maintaining a merely decorative understanding of 'eco-cities' creates the impression that construction is carried out as a sort of socio-political ego boost. This is to say that the limited ecological benefits (30-37% reduction in PM 2.5) are negligible in comparison to the gains in status for China if they are to continue 'green' developments on such a large scale. Therefore, the realisation of sustainable landscape architecture may not be effective in counteracting the smog when compared with the obvious alternative: economic sacrifices (via the petrochemical industries) which would actually reduce pollutant emissions.

Furthermore, 'Under the Dome' conveys the notion that air pollution is a cross-continental issue, not limited by geopolitical boundaries. Therefore, assuming a purely urban design based approach to mitigation would require other highly polluted nations - namely the United States and United Kingdom - to mirror the developments in China. However, the aforementioned China Wire article also implies that China offers very little information on the engineering systems involved in its 'sponge cities' and similar concepts (Freymann, 2021). Therefore, the CCP's extreme securitisation of ongoing projects could void the ability of other countries to recreate their sustainable landscape architecture, and entirely isolate the design. This would mean that a potential route to improved atmospheric conditions in China could stunt depollution elsewhere in the world, simply enhancing global air pollution in the long term.

In conclusion, sustainable landscape architecture, influenced by ancient Chinese philosophy as well as modern 'sponge city' schemes, would be partly effective in reducing levels of PM 2.5 yet cannot solve the smog entirely. Whilst China is in an economic position of power, it would be advisable to continue green developments but is not a gateway to continue petrochemical industry pollution on its current scale. The better move would be to invest the funds currently directed at urban design and landscape architecture projects into a well-researched and efficient transition to clean and renewable energy sources; this would cut out the middleman and eliminate the true cause of China's smog.

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