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SPECIAL PLACES

This year's John Simpson Memorial Lecture, given by Eleanor Rawling, explored the landscapes of Gloucestershire seen through the poems of Ivor Gurney, particularly memorable, she claimed, for the "clarity and distinctiveness" of his images inspired by the streets of old Gloucester, the river banks and meadowlands of the Severn, and the high hills and scarp edges of the Cotswolds.

The talk was sprinkled with selections from various poems, complemented by identifiable locations with unique descriptions, but also with meaningful references to his feelings and emotional attachment to such places. Her recently published book, *Walking Gloucestershire with Ivor Gurney*, which I'd bought earlier in the year, had stirred me into visiting these places, some I'd never been to before despite having lived many years in Gloucester.

I started exploring the Minsterworth bank of the Severn, not long after a bore had passed (Figure 1, with Gloucester's Robinswood Hill appearing in the distance). Here was a serene landscape, green, damp and low, with willow at the water's edge. No traffic noise but a warm southerly wind forcing the apples to fall from riparian orchards. Old Gloucester varieties in abundance, reminiscent of Gurney's time, over 100 years ago.

When I first started teaching on the landscape course in Cheltenham, a colleague Martin Spray took me to Ravensgate Hill overlooking that town, my first view of the amazing Cotswold edge and the Vale of Gloucester. I knew little of Gurney then, but I could well understand the

Figure 1 Severnside orchards at Minsterworth, Grid Ref: SO778166

powerful attraction of the landscape. Martin was an ecologist and that's what he taught, but he was much more: he brought culture, ethics, play and poetry into his landscape contemplations. It was here we first discussed Appleton's prospect-refuge theory. That viewpoint (Figure 2) was then, and still is, a very special place to me. What is it that makes it special? Can it be about first impressions of natural beauty in such a vista, or how you are feeling in the moment, maybe the anticipation of new surroundings. And nostalgia: Martin died a couple of years ago and this place inevitably evokes special memories for me.

I have taken level one landscape architecture students along the Cotswold Way to Ravensgate Hill annually for more years I care to remember. It's a good place to orientate new recruits to the local geography. Here landscape science can be introduced: geology and landform, vegetation and landuse. But not just these sciences — trying to evoke the *genius loci*, I'll recite some poetry, sometimes Ivor Gurney's *Up There* which recalls times past: the many archaeological finds of Roman Britain.

On Cotswold edge there is a field and that
Grows thick with corn and speedwell and the mat
Of thistles, of the tall kind; Rome lived there,
Some hurt centurion got his grant or tenure,
Built farm with fowls and pigsties and wood-piles,
Waited for service custom between whiles.
The farmer ploughs up coins in the wet-earth time,
He sees them on the topple of crests gleam,
Or run down furrow; and halts and does let them lie
Like a small black island in brown immensity,
Red pottery easy discovered, no searching needed…
One wonders what farms were like, no searching needed,
As now the single kite hovering still
By the coppice there, level with the flat of the hill.

It's a useful introduction to other ways of perceiving and appreciating landscape as in this extract he talks mainly of history, but also ecology and biodiversity. People develop a type of attachment to some places bringing a uniquely personal sense of place, involving meaningful connections with and intense caring for these landscapes. Poets and artists have a singular kind of appreciation of 'being in place', but the experience is available to everyone. One visitor to this sublime site (the so-called 'walking Englishman') posted the following on his blog:

"As I climbed Ravensgate Hill I could sense a WOW moment. The more I climbed the more the views to the west, north and east revealed themselves and they were simply fantastic. With the sun now out from its milky cloud canopy the Vale of Evesham looked stunning, as did the mountains beyond. I sat on a bench, took lunch and enjoyed a brilliant refreshment break taking in the magnificence of it all. There is no better place than Britain in summer and I was looking at its beauty as I rested. A gentleman approached me and stopped to talk a while. We both revelled in the view we were enjoying and he told me the story of how JR Tolkein took inspiration from this view and used it for the structure of Middle Earth in his Lord of the Rings trilogy. After learning that I said farewell and resumed my walk, in the rich knowledge that I not only know more about wild flowers but also about British classical literature too. Walks have surprising revelations." [from http://www.walkingenglishman.com/cotswolds05.html]

Figure 2 View north to Cleeve Common from Ravensgate Hill, Grid Ref: SO978184

It is a classic viewpoint, framed by the Cotswolds escarpment to the east, the Malverns in the west and Cheltenham sitting snugly in an embayment off the Vale of Gloucester. The Vale of Evesham mentioned in the piece is further north. In a world of Google imagery, virtual and augmented reality and artificially intelligent cloned images all available on our screens at a touch or a swipe, there is a case we can do without nature immersion. But a growing body of research points to the beneficial effects that exposure to the natural world has on health, reducing stress and promoting healing. Ivor Gurney had severe mental problems and, once admitted to Dartford hospital, London, he never returned to his beloved Gloucestershire landscapes. We can only speculate what effect a return visit to his 'special places' might have had. We all need our own special places to ground us both physically and psychologically. Discover them, visit them, cherish them, conserve them.

Robert Moore

THE URBAN HEAT ISLAND EFFECT
Can it be mitigated through retrofitting?

Phoebe Hunt

In the year 2050, the United Nations (2018) projects that 60% of the global population will be residing in urban areas. Along with this demographic shift, there is a prediction of a 1.5°C global temperature rise, a scenario where London might experience temperatures similar to those felt in Barcelona (Buchholz, 2022). As cities undergo rapid vertical and horizontal expansion, covering most green spaces with impermeable surfaces, depleting the tree canopy cover and constructing densely packed buildings, all contribute to the exacerbation of the phenomenon known as the Urban Heat Island (UHI) effect (Battista et al, 2023), raising questions with regards to the effectiveness of strategic planning.

This article explores the potential of retrofitting Blue & Green Infrastructure (BGI) to mitigate UHI effects in two distinctive urban environments: Singapore and London. It aims to provide a comprehensive understanding of how cities can use BGI retrofitting to enhance urban resilience, sustainability and to improve the wellbeing of their citizens (Akbari and Akbari, 2005). BGI is a promising alleviation strategy used to address overheating in urban areas (Ananyeva and Emmanuel, 2023). One method by which it is notably effective is the implementation of vegetation. This can provide shade, which in turn prevents heat reaching road surfaces, which then produces a cooling effect through the process of evapotranspiration (Windborne et al, 2020). Furthermore, blue infrastructure, such as large rivers and lakes, reduces local air temperatures by 3.3°C, which greatly improves the thermal comfort for the city communities and is also a very notable mitigation strategy for UHI (Jacobs, 2020).

Urban Heat Island (UHI) effects

The UHI is defined by the World Meteorological Organisation as 'a microscale to mesoscale atmospheric warming effect associated with cities' (2023). Climate change has produced many implications globally, one of the most significant being the matter of extreme temperature change. The Earth's atmosphere, globally, could rise by 4°C by the end of the 21st century (World Meteorological Organisation, 2015). With this rise in temperature and extreme weather events, our cities urgently need to adapt.

The UHI effect was first discovered almost 200 years ago by British scientist Luke Howard, when he observed that the city of London was warmer than its surrounding rural fringes (1818). Now, UHI is one of the most investigated climate change related phenomena in cities around the world (Vujovic et al, 2021).

The UHI effect has witnessed a significant amplification over the past century, due to an increase in impervious surfaces, a modification of urban geometry, the low albedo (the proportion of reflected sunlight) of urban materials, the heat generated from anthropogenic activities and, inter alia, the absence of vegetation (Battista, op cit). Furthermore, this urbanisation is an issue which affects the microclimate of a city. The microclimate refers to a specific site, which differs from the climate of the surrounding area (The Oxford Dictionary, 2012). This change in microclimate is due to the conversion of vegetated areas into artificial and impermeable surfaces, which is a threatening phenomenon known as soil sealing (Environment Agency, 2023). Moreover, buildings are often made from materials that have a low albedo, which in turn causes a rise in temperatures through the absorption of sunlight and subsequent containment of heat between buildings. The albedo of a surface is measured from 0-1. Light-coloured surfaces return a large part of the sunrays back to the atmosphere (high albedo), while dark surfaces absorb the rays from the sun (low albedo) (Norwegian Polar Institute, nd). This is particularly noticeable during hours of darkness in which surfaces release heat gradually throughout the night (Urban Green-Blue Grids, nd). Additionally, this becomes more evident in tropical climates due to the high humidity of countries close to the equator, such as that of Singapore (Meteorological Service Singapore, 2010).

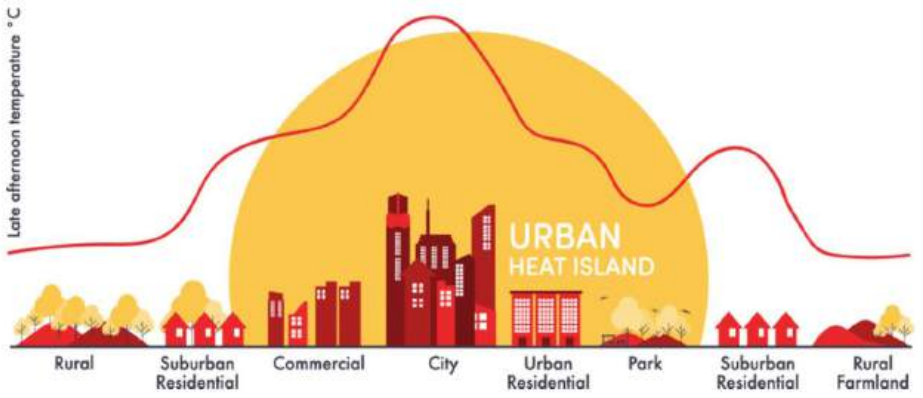

Fig 1 Temperature differences in city vs rural countryside, WMO

The UHI in cities has numerous negative effects on ecosystems and human health (Amnuaylojaroen et al, 2022). It indirectly intensifies climate change dynamics and increases people's personal energy consumption (Antoszewski, Swierk and Krzyzaniak, 2020). This is due to the use of additional water supplies and air conditioning units (Akbari, op cit). Moreover, climate change creates heat-related disasters such as heatwaves, droughts and wildfires (Marando et al, 2022). The number of cities exposed to temperatures of 35°C and above is expected to triple by 2050 (ARUP, 2023).

Elevated ozone levels (which are a consequence of this change in climate) escalate cardiorespiratory mortality and morbidity (Marando, op cit). This reality is reflected in estimates revealing that 61,000 individuals died due to extreme heat alone in Europe in 2022 (ARUP, op cit). Consequently, increased heat stress causes a decline in the productivity of workers and subsequently the performance of the economy (Amnuaylojaroen et al, op cit). Intensive weath-

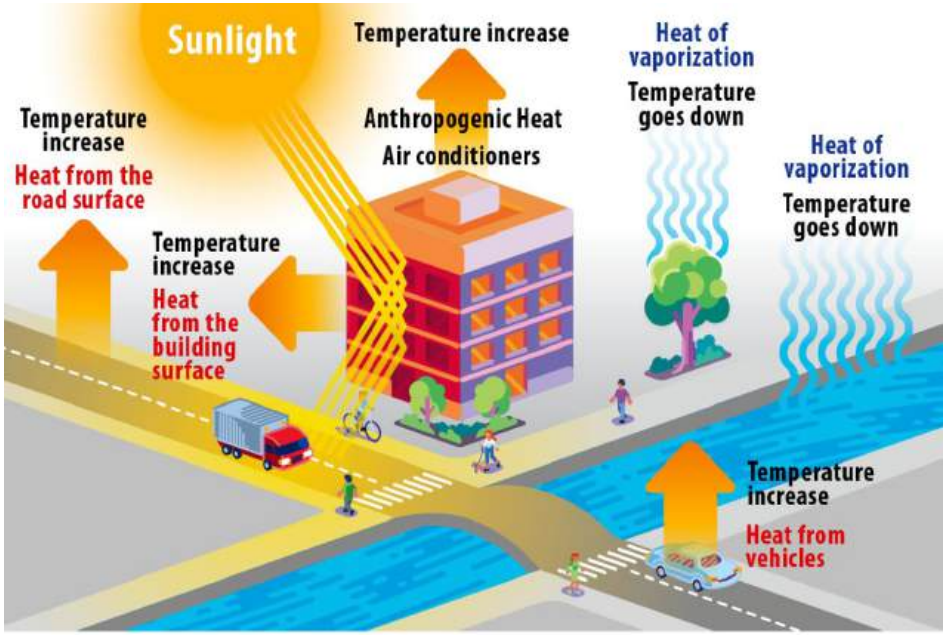

Fig 2 Contributing factors towards UHI, Pavement technology

er conditions affect people's cognitive ability, which is reinforced by recent research that 37% of heat-related deaths are due to human-induced climate change (WHO, 2023). Unfortunately, populations most affected by increased urban temperatures include the elderly, young children, low-income communities and people in poor health (Amnuaylojaroen, op cit). Over the span of two decades, heat-related fatalities among individuals aged 65 and above have surged by more than 70% (WHO, op cit). This alarming increase can be attributed to their heightened vulnerability and/or pre-existing health conditions, which are exacerbated by the intensifying heat (US EPA, 2014).

The University of Reading has developed a software technology called UHeat, which uses artificial intelligence (AI) technology along with satellite images to see the significance of the UHI effect in cities measured over time. This then offers opportunities for designers and software developers to rapidly provide solutions to the problems encountered by these cities. Data published by ARUP (op cit) indicates that in many cities across the world, the hottest spots had less than 6% vegetation cover and the coolest had over 70% tree canopy coverage, which were found almost entirely in parks. This data can be used to assess the extent to which communities are exposed to UHI and how it affects people's health. Potential solutions can then be extrapolated from the newly acquired data to improve human health.

BGI used to reduce UHI effects

Increased heat stress has long been an issue in cities, predating the discovery of the UHI effect. Ancient Rome's orthogonal layout was influenced by that of ancient Greece (Ambler, 2014). However, the Romans differed from Greece with their civic spaces. These typically are large open plazas, surrounded by important buildings, which forms the religious and economic heart of the city (ibid). These spaces contained water from aqueducts, in the form of fountains and baths. This was imperative for a healthy lifestyle in ancient Rome and these complexes were built and funded by the state for public use, reflecting the recognised need for thermal comfort in historic cities (ibid).

A prime example of this work is the Baths of Diocletian, public baths in ancient Rome. This complex took up 13 hectares of land and was said to be able to hold up to 3,000 people (Ching, Jarzombek and Prakash, 2017, pp 214–218). The space contained many different rooms, one of significance being the frigidarium. Derived from the Latin word frigus, meaning cold, this room represents the increasing popularity of cold baths in the 4th century, which is most likely a result of the reduced vegetation in the city (ibid). Today, similar structures are still used with urban water features and lido swimming pools integrated into cities. Lidos are defined by the Oxford Dictionary as 'a public open-air swimming pool or bathing beach' (op cit). They are often integrated into coastal cities, such as that of Plymouth, which has a semi-circular lido 50m in diameter, with fountains and a fantastic vantage point looking over the sea (Plymouth Active, 2023). These structures withstand time, demonstrating that the pursuit of improved thermal comfort remains essential to contemporary life.

The Romans skilfully incorporated green spaces into their cities using courtyards, known as peristyles (Ward-Perkins, 1994). These blue-green spaces, integrating courtyard

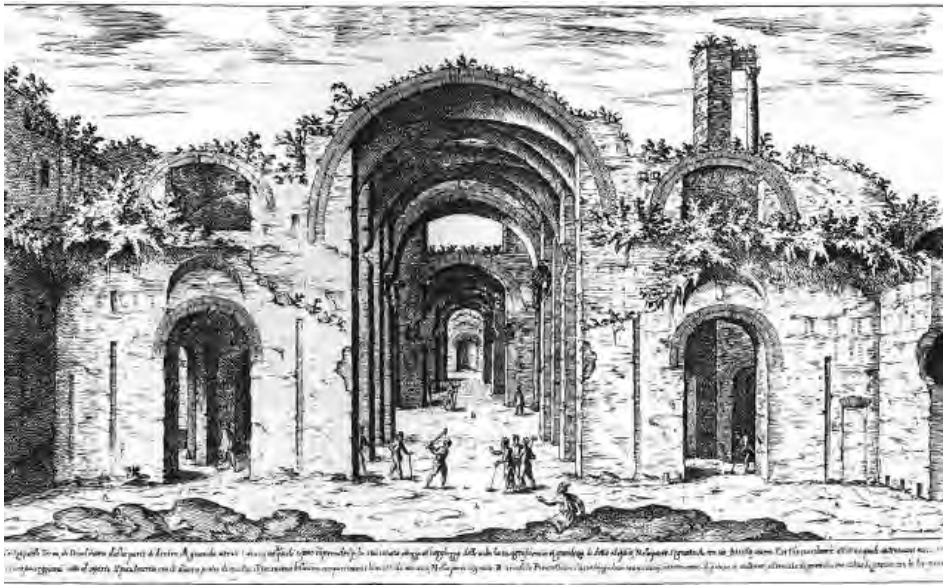

Fig 3 Baths of Diocletian, Etienne Dupérac, Wikimedia Public Domain

fountains, were used to regulate house temperatures and contained aromatic green plants like rosemary to perfume the air, and playing a pivotal role in alleviating the heat within urban homes. Retaining shaded areas was beneficial in reducing surface temperatures, showcasing the Romans' clear foresight in climate-sensitive urban planning (Songer, 2022).

Open spaces used in conjunction with green spaces allowed for a successful way of cooling ancient Rome, through a combination of architectural street design and BGI. Villas owned by affluent Romans used walkways that were both shaded and uncovered, to provide convection currents through the spaces; linking fountains and water features with green gardens provided shade and cooled air flow (ibid). Large fountains like those at Piazza Navona and the Trevi Fountain were not purely ornamental but served a practical purpose in cooling the air (Adapt, 2017). Recent studies show that the presence of such fountains can result in a reduction of up to 3°C in the immediate surrounding airspace (Jacobs, op cit). Outstandingly, these historic fountains remain operational today, which further reflects their lasting efficacy.

Urbanisation during the industrial revolution and 20th century urban growth has affected urban form today. This has worsened the UHI effect in cities due to strategic loss of BGI, creating hard landscaped gardens, use of off-street parking and plastic vegetation which has replaced natural grass. This has increasingly aggravated the UHI problem we now have today (Ponraj et al, 2017).

How does BGI help?

In recent research to date, the most successful method of UHI mitigation is the implementation of urban BGI into cities (Adapt, op cit; Akbari, Pomerantz and Taha, 2001; Battista, op cit; Vujovic, op cit). BGI can include various strategies such as adding green roofs to existing buildings, establishing green walls on structures, incorporating permeable pavements, creating urban green spaces and introducing water features like fountains or artificial lakes (Norton et al, 2015).

Fig 4 Plymouth Lido overlooks the English Channel, Creative Commons Attribution

Green infrastructure has two main roles in reducing UHI – the first being shading. The impact of shade is evident in the perceived temperature, which can be notably lower – by 10-15°C – compared to exposed areas under direct sunlight (Urban Green-Blue Grids, op cit). In general, a 10% increase in green coverage is associated with a significant reduction of 0.5°C in air temperature (ibid). This becomes particularly significant when considering the correlation between temperature and electricity demand in cities, where demand increases by 2–4% for each 1°C rise in temperature (Akbari, Pomerantz and Taha, op cit).

Secondly, green infrastructure has evaporative cooling properties through evapotranspiration, which is the evaporation of water from leaves, which then lowers the surrounding air temperature. As shown by a recent study in the Lancet, increasing city tree coverage to 30% could have prevented 2644 excess deaths in 2015 (Lungman et al, 2023). Furthermore, BGI can lead to a reduction in temperature of 1.07°C, even up to 2.9°C in some cities (Marando, op cit). These findings emphasise the multitude of benefits of integrating green infrastructure into urban landscapes, not only for temperature regulation but also for addressing energy consumption and overall environmental sustainability.

The ability for BGI to cool a city depends on many variables: such as the physiological characteristics of a plant, for example transpiration rate, the amount of water evaporated by the leaves, canopy size and tree density, which all have different rates of UHI mitigation levels (ibid). One of the most effective variables is to create urban forest, with monoculture grass being least effective (Morison, 2020).

Forests have a lower albedo than crops and grassland and the size of the effect depends on the vegetation cover and climate zone (ibid). Greater London is 21% urban forest, a significant impact on the city's thermal comfort (Greater London Authority, 2023), but not, however, a uniformly distributed canopy throughout the urban landscape. Instead, it gives rise to 'hot spots' – areas characterised by alarmingly low vegetation cover (ARUP, op cit), an uneven distribution displaying the need for a more strategic and equitable approach to urban forestry (ibid).

The prevalence of impervious surfaces in cities frequently results in a shortage of water within urban areas. Urban blue infrastructure can be defined as the water systems that link the city, such as rivers, lakes, fountains, ponds, which are often strategically planned to contribute to both human wellbeing and urban ecosystems (Norton, op cit). The cooling effect that water has is largely influenced by the size of the waterbody (Jacobs, op cit), findings that highlight the nuanced relationship between water features and temperature moderation, emphasising the potential for strategically incorporating water elements, particularly fountains, as effective tools in UHI mitigation.

Retrofitting into existing cities

Retrofitted BGI refers to the incorporation of water and green elements into existing urban environments, as a deliberate intervention to mitigate

Fig 5 BGI in cities and its benefits, Delphi Group

issues related the UHI effect (Penningtonslaw.com, 2021). Instead of implementing BGI in new developments, retrofitting involves integrating these features into established urban landscapes that may already be experiencing elevated temperatures and other environmental challenges (ibid). This approach acknowledges the evolving nature of cities and seeks to address the challenges posed by UHI effects in established urban areas. Retrofitted BGI is often part of broader urban planning and sustainability efforts (Greenplan.gov.sg, 2023; Happold et al, 2020), to improve the quality of life, enhance resilience to climate change and create more sustainable and liveable urban spaces. Singapore's zero-energy building was a very successful retrofit in 2009 (Pei Ling, 2012). The building has many different plants on its exterior to test their heat absorbing capabilities.

The role of local governments plays a critical part in the governance of climate change mitigation strategies and in turn UHI mitigation (He et al, 2021). Many policies do not prioritise or require the adoption of these mitigation measures, which in turn impedes the progress of implementing effective strategies. Several people do not realise the implications associated with UHI, therefore making it challenging to begin mitigating efforts (Wang et al, 2020). Notably, the successful implementation of policies, as exemplified by Singapore, serves as a compelling demonstration of effective governance.

Economic challenges

Retrofitting can be expensive and logistically challenging, for example fitting a green roof (vide Susdrain.org, 2013). From this retrofit, there

Fig 6 Singapore retrofit, Pei Ling

Fig 7 Green roof, Ruislip, susdrain.org

have been many notable benefits to biodiversity, with more bees in the area and improved air quality, although the underground rail/tube services needed to be uninterrupted while the labour was carried out. Moreover, these strategies require significant finances and human resources, making some unviable, conversely having to implement smaller scale interventions which limits their impact. These budget constraints can be felt in both low-income countries and higher income countries (Mumtaz, 2021, Casiano Flores, Vikolainen and Crompvoets, 2021). Furthermore, the safety associated with retrofitting BGI into existing city structures is a financial barrier, which can be mitigated by raising awareness.

In a study carried out by Shao et al (2022), the green development index (GDI) of Asian countries was measured. The table data shows that Singapore is the highest rank and is a leader in green development. As anticipated, the income level of the country mostly determines the GDI of the country. This is due to BGI being a strategy that affluent countries can implement more successfully than lower income countries (Mumtaz, op cit).

'Green and blue' challenges

A separate constraint of introducing BGI into cities is that having more

trees within the city can reduce wind speed, thereby increasing humidity. Additionally, the cooling effects of plants on building facades can only be felt within a four metre range, with little impact at greater distances (Bustami et al, 2018). Furthermore, trees can release allergens. All living plants release biogenic volatile organic compounds, or BVOCs. Figure 8 shows popular urban plant species emission rates (Churkina et al, 2015). Trees under urban heat stress tend to produce more pollen and BVOCs than trees in a rural setting. These compounds can cause disease in people, such as asthma and other cardiovascular ailments and it is particularly broad-leaved trees that tend to produce higher levels. Trees also have lower growth rates in stressful settings, thus reducing the ecological services they provide (Otto et al, 2021). The trees listed in the table are very common within UK cities and more caution needs to be taken when selecting for urban settings.

Finally, while large water bodies can reduce city temperatures, smaller bodies of water can make cities hotter. In a study comparing the sizes of such in urban neighbourhoods under different conditions to simulate changing seasons, the results showed that smaller waterbodies evaporate and the vapour remains trapped at street level, increasing the humidity and consequently the temperature of streets, which in turn increases the risk of heat-related illness (Ampatzidis, Cintolesi and Kershaw, 2023). This can be demonstrated in the case study of Singapore, with annual relative humidity of 83.9% (Meteorological Service Singapore, op cit). Bridging these gaps is essential to alleviating UHI effects in cities. Appropriate choice of vegetative species and water body size is one way and it if is not done correctly it could only worsen the problem (Churkina, op cit; Ampatzidis, Cintolesi & Kershaw, op cit).

Importance of policy

Looking forward, nature-based solutions from BGI should be established and integrated into climate change policies. Nature-based solutions (NBS) can be applied on both small and large scales, ranging from small green spaces on buildings and green corridors, to larger wetlands and forests, overall sheltering cities (World Bank, 2021). These solutions help to reduce risks such as flooding, erosion, landslides, drought and extreme heat (Browder et al, 2019). Since the COVID-19 pandemic, NBS investments have increased sharply between 2018–20, when the total number rose by 35% (World Bank, op cit). This recognition has led the UK to introduce schemes such as Biodiversity Net Gain (BNG), a policy which is 'an approach to development…that leaves biodiversity in a measurably better state than before the development took place' (Natural England, 2021).

In a metastudy, 97 research articles were synthesised and showed that policy and technology are often developed in isolation of one another, thus making decision-making slower and having limited harmonious effects on solving UHI issues (Degirmenci, 2021). There are three stakeholder groups that play a key role in the mitigation of UHI within cities: the government, city administration such as city planners and the communities residing within the city, groups that need to work together in order to coherently provide effective UHI policies.

Case studies

London and Singapore stand among the seven global capitals identified as 'extreme urban heat island hotspots'

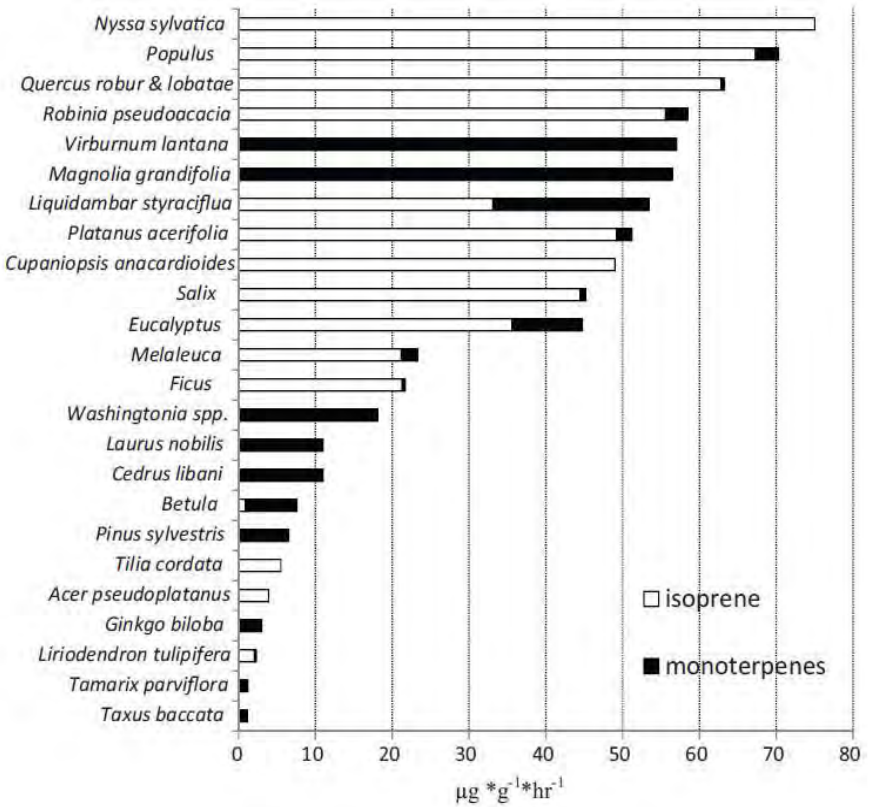

Fig 8 Popular urban trees ranked by BVOC emission, Churkina

alongside Cairo, Los Angeles, Madrid, Mumbai and New York (ARUP, op cit), making them significantly relevant and comparable case studies. Singapore was further chosen owing to its geographical location being close to the equator, where climate change effects are most noticeable, and to Singapore's greening policy. Additionally, England and Singapore both have an island status. These case studies have been specifically chosen to demonstrate the success and challenges faced with the implementation of BGI mitigation strategies for UHI.

SINGAPORE

Southeast Asia is particularly vulnerable to extreme heat, due to its high population density, welfare dependency, low adaptive capability and hot and humid tropical climate (Amnuaylojaroen, op cit). Between 2000 and 2019, estimated heat-related deaths were approximately 489,000 per year globally (WMO, 2023). During this period, Asia and Europe experienced the most significant death toll, accounting for 45% and 36% respectively (WMO, 2023), which reinforces the choice of case

studies investigated.

Singapore has a significant UHI effect – heating up twice as much as the global average, at 0.25°C over the past decade. This could lead to the island's average daily temperatures reaching 37°C by the end of the century (ARUP, op cit). The greatest UHI hotspot was located within the central business district in Singapore. This area had 92% hard impermeable surface and only 6% vegetation cover. This, along with high density of buildings and people, caused a UHI of 6°C. This is aggravated by Singapore having more air conditioning units per capita than anywhere else in southeast Asia (Sahakian, 2014, pp 97-120). This was then compared to the Upper Peirce Reservoir Park where 88% of the land is covered with water and the remaining 12% with vegetation, therefore being 6.5°C cooler than the central business district (ARUP, op cit).

Singapore has an ambition to become 'a city in nature'. There are some key strategies to achieve its vision: expanding nature parks, intensifying nature in gardens and parks, restoring nature to the urban landscape, strengthening the connectivity between Singapore's green spaces and enhancing animal management (Greenplan.gov.sg, op cit). This is strengthening Singapore's commitments to the 2030 sustainable development agenda and the Paris agreement, positioning the city to be net zero by 2050. Its greening strategies can be traced back to 1963, when the Prime Minister Mr Lee launched the first nationwide tree planting campaign (Nparks.gov.sg, 2023). The city now is 47% green space and over 30% is covered by tree canopy (Ruefenacht and Acero, 2017).

Singapore has installed blue infrastructure, mainly for landscaping purposes, which indirectly helps to improve the thermal comfort of the city. Water is considered a cool sink, as it does not heat up as rapidly as the surrounding air (ibid). Due to high amounts of radiation in the tropics, it is vital that the characteristics of surfaces can be changed to positively contribute to the urban climate, such as implementing ponds on roofs (ibid). The Bras Basah Mass Rapid Transport (MRT) station, established in 2010, was designed to create a visual link to the outside world for commuters. Adhering to Singapore's rigorous thermal transmission regulations, the station has an innovative approach. A water film circulates over the glass roof, carrying away the heat that rises to the top of the interior canyon. This heat is then released through evaporative cooling as the water cascades over waterfall walls, contributing to an efficient thermal regulation system (WOHA,2020).

Singapore has a green incentive scheme, enforced by the government as part of its policy. This scheme aims to 'accelerate the adoption of environmentally friendly building technologies and building design practices through cash or gross floor area incentives' (Bca.gov.sg, 2021). It requires all new buildings and existing ones to undergo major retrofitting to meet the environmental minimum sustainability standard.

Despite the challenge of land constraints, Singapore is a high-income city-state, which has managed to incorporate strict planning that has prioritised the environment. The country has decided that it is against 'pollute first and clean up later'. This commitment to policy shows how a densely populated city can achieve a high quality of life, while improving its economy and maintaining a sustainable environment for present and future generations (ibid).

Fig 9 Supertrees in Singapore's gardens by the bay

LONDON

The UHI effect in London sees temperatures reaching 4.5°C higher than its rural surroundings (Rhodes-Webb, 2023). A pivotal moment in 2022 marked the issue of a national emergency by the government, as England experienced unprecedented temperatures reaching 40.3°C.

A survey conducted by ARUP highlighted significant hotspots, particularly in Kilburn and South Hampstead, reaching 4.5°C during night-time (Fig. 10). These residential zones, characterised by over 60% hard, impermeable surface cover and 38% vegetation, which presents a stark contrast to Regents Park, which was 7°C cooler with 89% vegetation and 1% water. This substantial temperature difference emphasises the crucial role of integrating BGI in urban planning. Alarmingly, over the summer of 2022, 950,000 individuals in London, including 82,000 elderly and 142,000 children, experienced UHI spikes of 4°C, emphasising the urgent need for effective mitigation strategies.

Fig. 11 shows the percentage tree cover within London boroughs. There is significance between Arup's data on UHI and the distribution of tree canopy cover. It is notable that the areas of extreme heat are found in areas of low canopy cover.

A study conducted in 2014 measured the significance of Kensington gardens and Hyde park in London in mitigating London's UHI. The study lasted five months, to determine the

extent to which green space lowers night-time UHI. Hyde park had a 3°C cooling effect within a radius of 200m, with up to 4°C cooling on some nights. (Doick, Peace and Hutchings, 2014). The study showed that UHI in London is predominantly a nocturnal phenomenon, whereby UHI temperatures at night can exceed 10°C in some areas with little vegetation cover (ibid).

London has thermal comfort criteria within the local city plan for 2036. This plan requires 'all major developments to contribute to the urban greening factor' in policy G5 (Happold, op cit; Pipe et al, 2021). This also seeks to increase tree canopy cover of London by 10% by 2050 as per policy G7: 'London's urban forest and woodlands should be protected and maintained and new trees and woodlands should be planted in appropriate locations to increase the extent of London's urban forest' (ibid).

Since 2016, London has cut air pollution in half and invested £30m for green space and tree planting across the city. This provides shade and makes the city greener and cooler for people. Moreover, £1.4 million has been invested to clean water and rivers, which will in turn reduce the city's UHI effect (London.gov.uk, 2023a).

London has more than 8 million trees, covering around 21% of the city's land area (Greater London Authority, op cit). In a commitment to enhance environmental conditions, the mayor has pledged to increase tree canopy cover by 10% before the year 2050 (London.gov.uk, 2023b). Complementing this effort, London has introduced initiatives encouraging community involvement in greening projects, such as the Rewild London fund and Greening Great Britain. These endeavours seek to inspire community engagement in cultivating those green spaces they possess. London's 'Plant a Tree Scheme', initiated to promote public participation in improving the city's thermal comfort, has allocated £3.1 million to its tree planting since July 2022 (London.gov.uk, 2022). While these initiatives are primarily small-scale interventions, they are effective policies which will help London become resilient to future UHI effects.

Blue infrastructure implementation is linked to the Thames restoration, which is a five-year programme to improve the water quality across the Thames River in London. The vision is for the river to become healthier, letting parts flood to relieve flooding risks and create more carbon sinks by additional wetland areas (Thames21, 2024). Additionally, the quality of river and lake swimming water is to be improved, with the Water Framework Directive requirement all water bodies in the UK to reach a good ecological status by 2027 (Tinto, 2023). This is a positive recognition by the London government in improving the quality of water within its city which will in turn address thermal comfort issues.

Finally, London uses 'cool roof' technology to integrate blue infrastructure cooling into the city. From a study conducted on London office buildings, water on the roof can reduce the surface temperature by 2°C and the local air temperature within buildings by 2-3°C (Kolokotroni, Gowreesunker and Giridharan, 2013).

The overall success is that London has managed to incorporate BGI into buildings via retrofit, improving local biodiversity and reducing the UHI effect (Susdrain.org, 2013). There are many good practice guides to implementing BGI into neighbourhoods, such as the London Wildlife Trust (2012), where some improvement is being made, but the fundamental

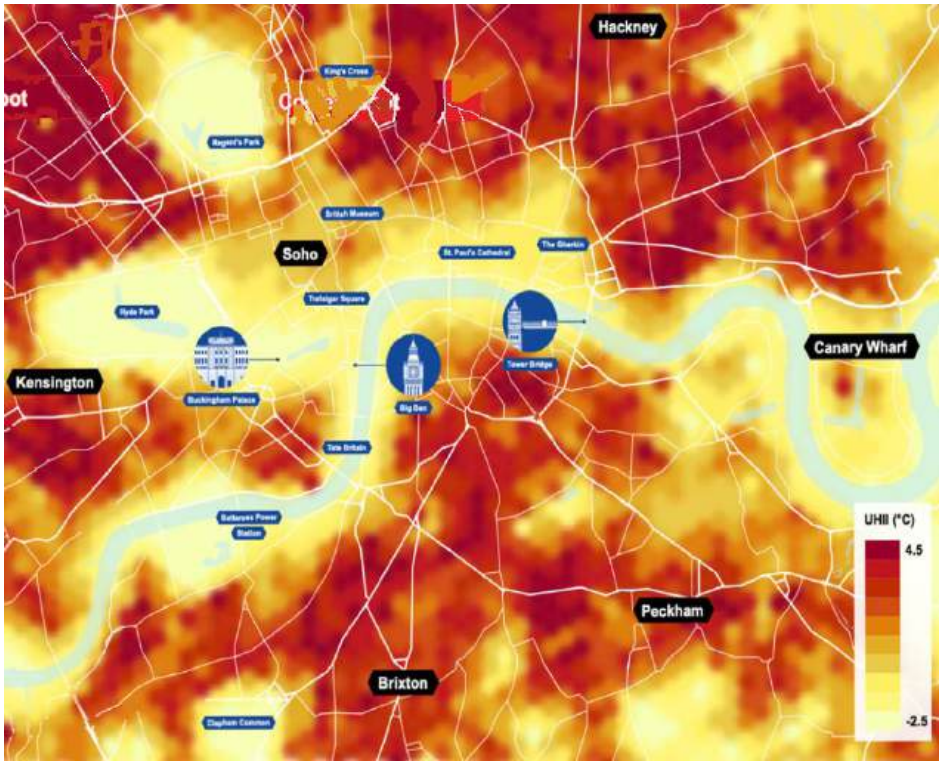

Fig 10 Temperature variation across London, ARUP

issue is that this is guidance rather than policy, which is where London differs from Singapore as Singapore has adopted a much more rigorous policy (Green Future, op cit).

Discussion

The research has shown that retrofitted BGI has significant impacts on the effects of thermal comfort and UHI. The findings illustrate that heating of cities is a phenomenon which has been previously dealt with in ancient civilisations, 100s of years prior to human-induced climate change (Iza, 2019). The loss of tactical planning and an increase in the use of low albedo materials is causing the thermal comfort of cities today to be worsened, Higgins (2009), pp 88–89; Songer, op cit). By using ingenious use of green spaces, water features, civic spaces and thoughtful urban planning, modern cities can strategically integrate BGI today. As we confront the contemporary challenge of UHI, exacerbated by urbanisation, adopting these historical insights becomes imperative. Combining time-tested methods with innovative approaches will contribute to resilient and sustainable urban environments, mitigating the adverse effects of UHI for generations to come.

Integrating trees into urban environments is essential for mitigating UHI effects. Singapore, nestled in the tropics, faces UHI amplified by high temperatures and humidity. There-

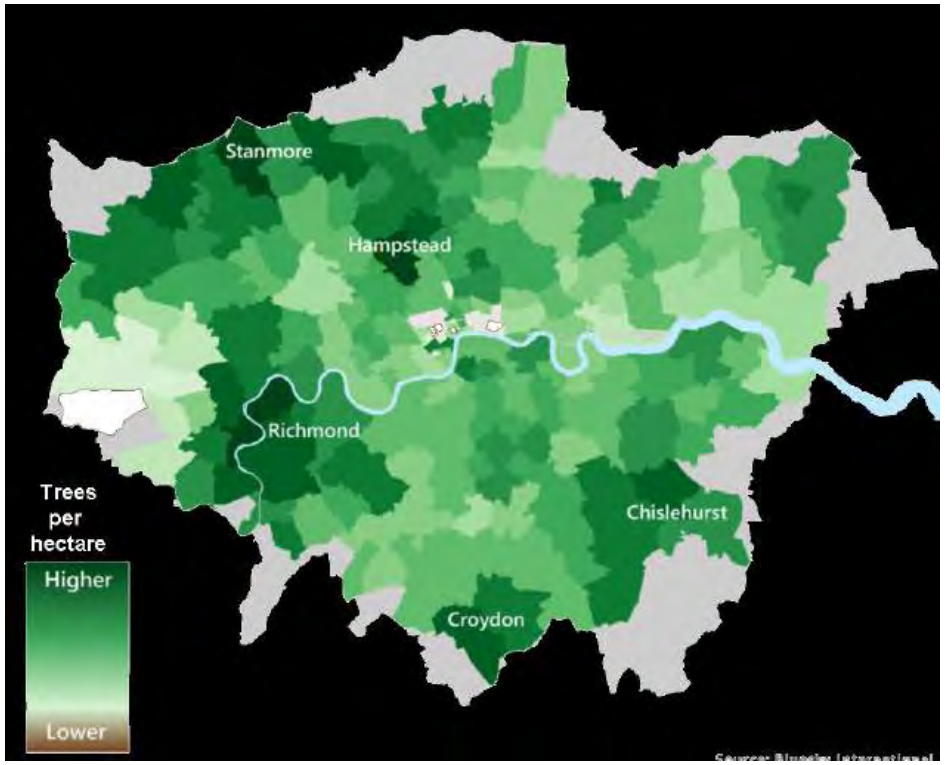

Fig 11 Percentage canopy cover in London boroughs, Knight Frank

fore, shade is provided by canopy cover, where the city now is 47% green space and over 30% is covered by tree canopy. The city's BGI retrofitting focuses on maximising greenery, with initiatives like rooftop gardens, vertical green walls and extensive park networks (Gardensbythebay.com.sg, 2019; WOHA, 2020). The 'city within nature' vision integrates blue infrastructure such as rain gardens and permeable pavements (Greenplan.gov.sg, 2023). Striking a balance between nature and urbanisation, Singapore's BGI retrofitting exemplifies how a compact, densely populated city can include green spaces and water elements to mitigate UHI.

London's rich historical diversity and temperate climate present distinct UHI challenges (ARUP, op cit). The city's BGI retrofitting emphasises revitalising brownfield sites, creating green corridors and incorporating sustainable drainage systems (London.gov.uk, 2023a). Thames River restoration projects and the retrofitted Ruislip green roof showcase London's commitment to marrying history with modern environmental priorities (Thames21, op cit; Susdrain.org, 2013). The retrofitting strategies in London illustrate the adaptability of BGI to diverse urban structures, emphasising the importance of context-specific interventions (ARUP, op cit; London.gov.uk, 2023a).

Economic factors influence the success of retrofitting. Singapore invests in innovative green infrastructure, viewing it as a long-term investment in the city-state's liveability (Greenplan.gov.sg, op cit; Green Future, op cit,). London aligns BGI retrofitting with broader urban regeneration projects, emphasising the economic benefits of improved public spaces (London.gov.uk, 2023b). Balancing economic considerations with environmental goals remains a common challenge in both cities (Toxopeus and Polzin, 2021). The use of blue infrastructure is equally as important as green infrastructure, although the data to support this is lacking and there are more gaps in the research with reference to blue infrastructure in cities. In Singapore's case this is due to the high humidity of the climate, making the use of blue infrastructure harder to implement correctly, along with the government's policy to become a 'city within nature' which is more focused on improving its green infrastructure (Nparks.gov.sg, 2023). In London's case this is due to the policies in place which focus more on the canopy cover across the city rather than the application of blue infrastructure to address the cities UHI effect (London.gov.uk, 2023b).

Retrofitting a building without limiting its use presents difficulties. Cities' existing layouts are complicated, making achieving the desirable outcome of retrofitting problematic (Thiagarajan, Newman and Zandt, 2018). Furthermore, the implementation of BGI takes time to establish its benefits, as recognised by the Singapore case study and their 'city within nature' starting in 1963 and only now are they receiving the benefits from the BGI that has established overtime (Nparks.gov.sg, 2023).

Providing the improvements that BGI brings has highlighted numerous ways that both landscape architects and urban planners should consider their methods of design. But there are negatives to introducing BGI into cities: the expense of some retrofit BGI solutions, the release of allergens from trees and the potential of smaller water bodies contributing to the heating of city streets. This highlights the importance of filling the gaps within the research of UHI and selecting the best methods of improving thermal comfort in cities dependent on geographical location and financial situation.

The most significant finding from this study is the fact that policy plays the largest role in the mitigation of UHI. Implementation of nature based solutions into policy will enhance biodiversity, improve air quality and create more resilient urban environments, fostering a sustainable and healthier coexistence between urban development and the natural world. This will in turn help to incentivise the private sector into implementing BGI into schemes, by choice and education (World Bank, 2021).

Conclusion

In conclusion, retrofitted BGI can very successfully mitigate the effects of UHI in cities. Landscape architects play a crucial role in designing urban spaces that incorporate BGI. However, the strategic placement of BGI to effectively mitigate the impact of rising city temperatures is not always prioritised. This article has revealed the practical applications of BGI and highlighted its profound significance for the future of our cities, our collective wellbeing and the broader health of our planet. By recognising the pivotal role BGI can play in creating sustainable, resilient urban environments, we pave the way for informed decisions that can positively shape our cities. The comparative review of BGI retrofitting in Singapore

and London highlights the diverse yet effective strategies employed by these cities to mitigate UHI (Greenplan.gov.sg, 2023; London.gov.uk, 2023a). Both showcase the adaptability of BGI to distinct urban contexts, emphasising the need for holistic, context-specific approaches. The integration of technology, community engagement and economic considerations is paramount for successful BGI retrofitting, providing valuable insights for cities globally striving to create sustainable, resilient urban environments in the face of UHI challenges (Bca.gov.sg, 2021; Green Future, 2015).

Creating landscape-led design, with BGI, is the future of UHI mitigation and furthermore the creation of climate resilient cities. There are still many substantial challenges in the delivery of retrofitted BGI. Overcoming the complexity of city layouts, the choice of correct vegetation, improving the awareness of UHI mitigation to improve safety and minimise the financial barriers are all challenges faced today (Thiagarajan, Newman and Zandt, 2018). This research underpins the significance of UHI on human wellbeing, emphasising the need for our cities to adapt, which is critical for their survival (Ananyeva and Emmanuel, 2023) but there are gaps within UHI research, whereby questions are raised which need to be researched further, such as more blue infrastructure which is significantly outweighed by green infrastructure. The data from ARUP and Reading University is helpful in providing major 'hot-spots' in cities, but the mitigation strategies suggested are weak and not always targeted to the specific city and provide more general solutions.

The long-term implications of BGI needs to be addressed for modern day solutions, such as the longevity of schemes and their maintenance (Toxopeus and Polzin, 2021). Furthermore, we need to understand how to further engage the community with initiatives, such as that of London, to get the community to recognise the importance of UHI mitigation, giving communities a sense of ownership and understanding of sustainability (London.gov.uk, 2023a).

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Biographical note

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GREEN INFRASTRUCTURE IN PLACEMAKING
Its implication on cultural dynamics in English and Balinese villages

Bayley Blyther

Green Infrastructure is a multi-faceted concept (GI) encompassing various definitions. According to the National Planning Policy Framework (NPPF), GI can be described as "A network of multi-functional green and blue spaces and other natural features, urban and rural, which is capable of delivering a wide range of environmental, economic, health and wellbeing benefits for nature, climate, local and wider communities and prosperity" (GOV.UK, 2013). GI has evolved into a vital tool for planning communities, enriching the practice of placemaking and offering more detailed and functional approaches to planning openspaces. The urgency to address the interconnected challenges of climate change, biodiversity loss and public health has become increasingly apparent on a global scale. The UN Secretary-General António Guterres has emphasised the imperative to limit global heating to 1.5°C, stressing the critical state of our planet (United Nations, 2023). In the UK, alarming rates of nature depletion and the decline of native species further underscore the need for comprehensive solutions. Additionally, in the post-COVID era, the public health landscape has drawn attention to disparities in access to natural spaces, highlighting the importance of environments that foster community wellbeing and active lifestyles.

Better placemaking is proposed as a key strategy to address these crises, creating environments that respond positively to climate, biodiversity and public health challenges. High-quality GI emerges as a pivotal element, offering a nature-led design approach promising biodiversity gains, nature recovery and climate-resilient development. However, as we explore the intersection of GI and cultural dynamics, a pertinent question arises: can culture align with and enrich the values of green infrastructure, or does it perceive these interventions as disrespectful or irrelevant?

Contemporary urban areas, teeming with life and diversity, have become crucibles where the demands of burgeoning populations intersect with the call for environmental responsibility. It is within this dynamic context that this research aims to unravel the intricate interconnections between placemaking, green infrastructure & the nuanced fabric of culture. Bali, Indonesia, and England, each a canvas with its distinct hues and textures, serve as the evocative landscapes for this exploration. Bali, with its lush tropical beauty and vibrant cultural traditions, stands in stark contrast to the historical terrain of England, rich with architectural legacies, a tapestry woven over centuries. These geographical extremities are not chosen arbitrarily but as deliberate representations of diverse cultural, geographical and historical contexts, enabling a comprehensive understanding of how green infrastructure resonates within unique landscapes.

As villages grapple with the challenges of the 21st century, understanding how green spaces contribute to the cultural vibrancy of small-town landscapes becomes not only an academic pursuit but a pragmatic necessity for fostering sustainable, resilient and culturally rich urban environments. Through case studies in both Bali and England, this research seeks to elucidate the diverse ways in which GI is integrated into placemaking initiatives and how these interventions influence local cultural dynamics, offering valuable insights to the fields of urban planning, landscape architecture and cultural anthropology.

Definitions

GI has evolved as a multifaceted concept encompassing a range of natural and semi-natural features, including parks, green spaces, urban forests, wetlands and sustainable drainage systems. Its primary purpose is to enhance environmental quality, improve human wellbeing and contribute to sustainable urban development (Benedict & McMahon, 2002). GI plays a pivotal role in shaping the physical, social and cultural dimensions of urban and rural spaces.

GI also encompasses water-related elements known as blue infrastructure and aligns with the concept of nature-based solutions, which involves natural and modified ecosystems addressing societal challenges while benefiting human wellbeing and biodiversity (Natural England, 2023).

Effectively designed and managed green infrastructure enhances the quality of urban and rural environments, making them greener, healthier and more resilient to climate change. It also contributes to carbon sequestration and reduces flood risks (ibid). The Town and Country Planning Act (Green Infrastructure) (Amendment) Bill, introduced in 2019, amends the Town and Country Planning Act 1990 by

1. a presumption in favour of planning permission for developments that can demonstrate:
   a. at least 55% of designated land is dedicated to green infrastructure.
   b. a commitment to sequester at least 20% of CO_2 emissions generated by the development.
   c. assurance that the green infrastructure will persist for the entire lifespan of the development plus an additional 50 years.
2. asserting that the presumption becomes stronger if the development includes a mix of indigenous trees, to be maintained throughout the development's life, which are highly efficient at carbon sequestration.
3. providing guidance how these criteria can be effectively demonstrated.

According to the Landscape Institute (LI), GI, sometimes referred to as blue-green infrastructure, stands as one of the foundational elements of landscape practice. It encompasses carefully planned networks of natural features integrated within and between communities. These features include open green spaces, waterways and vegetative systems. When designed, managed and executed thoughtfully, GI has the capacity to deliver a wide range of benefits, from establishing sustainable transportation connections to mitigating the impacts of climate change.

GI is at its most effective when it serves multiple functions. It contributes to climate change mitigation and adaptation, enhances public health and wellbeing, manages water quality and quantity, fosters biodiversity, combats air pollution and enhances the aesthetics of urban and rural areas. It is a multifaceted approach that offers indispensable benefits for both nature and communities (Landscape Institute, nd).

In summary, all definitions share common themes; they also have unique emphases. The LI focuses on green infrastructure's role in delivering ecosystem services, public health and economic development. Natural England emphasises its contribution to climate adaptation, mitigation and ecological cooperation. Town & Country Planning highlights the multi-functional nature of green and blue spaces and their integral role in sustainable communities. These organisations approach green infrastructure from different perspectives but ultimately seek to promote its integration into planning and development to benefit the environment and communities in the UK.

While the benefits of GI are well-documented, there is a noticeable gap in the literature regarding its alignment with cultural values. How do communities perceive these interventions? Are there instances where GI is considered disrespectful or irrelevant to local cultures? Exploring cultural dynamics is essential for understanding the social acceptance and integration of green infrastructure within diverse communities.

Green Infrastructure in Placemaking

Placemaking is a multifaceted concept that envisions the built environment as a catalyst for positive responses to environmental and public health crises. The literature on placemaking emphasises the creation of places that benefit both the natural world and human communities, fostering wellbeing, encouraging active lifestyles and enhancing the overall environment (Kent, 2011). The integration of GI into placemaking processes is instrumental in creating vibrant and sustainable communities. GI contributes to the creation of attractive and functional spaces that enhance residents' quality of life (Ahern, 2007). Placemaking, as a holistic approach to urban design, emphasises the significance of local culture, heritage and community engagement in shaping the built environment (Jacobs, 1961; Project for Public Spaces, 2013). GI serves as a catalyst for placemaking by fostering social interactions, cultural expression and environmental stewardship (Francis, Giles-Corti, Wood, & Knuiman, 2012).

In the case of Balinese villages, the presence of Tri Kahyangan temples defines cosmic territories, influencing green infrastructure placement and reflecting the sacred-profane continuum (Belanger, 2017). In English villages, GI is designed to promote healthy living, strengthen resilience against environmental threats, encourage active lifestyles, create living landscapes and enhance living spaces (Cheltenham Borough Council, 2009). These goals underscore the diverse cultural contexts and objectives of green infrastructure.

Balinese Hinduism and Cultural Identity

Balinese culture is deeply rooted in Hinduism, which influences various aspects of life, including architecture, spatial planning and cultural practices (Geertz, 1973). The concept of *tri hita karana* emphasises the harmonious balance between humans, nature and the divine, shaping the cultural foundation of Balinese villages (Subagia, 2016). *Desa adat*, a traditional village framework, embodies the Balinese Hindu quest for balance and influences urban planning (Suryaningsih, 2018) with profound implications for green infrastructure implementation. Within Balinese villages, specific spaces hold ritual significance, exemplified by *pampatan agung* (Hobart, 2004), playing a crucial role in cultural and religious practices, affecting land use and spatial organisation. Any GI initiatives must navigate these ritual roles to ensure compatibility with cultural norms and practices (Samadhi, 2022), emphasising the active participation of *desa adat* members in urban design processes. This participatory approach highlights the importance of involving the local community in green infrastructure planning and implementation.

The current Indonesian urban planning system faces challenges related to centralised models and a lack of competent planners (Suryaningsih, op cit) such that Balinese villages require a more localised approach to green infrastructure implementation, considering the diverse cultural contexts and preserving cultural continuity amid modern development pressures.

Cultural Dynamics in English Villages

In English villages, the historic significance of places like Puri Gianyar influences the physical appearance of surrounding buildings, emphasising the importance of integrating green infrastructure in ways that preserve cultural continuity and heritage (English Heritage, 2009).England faces challenges in providing sufficient access to green space, particularly in dense urban areas like London (Taylor, 2011) since the constraints of urban densification necessitate innovative solutions for green infrastructure integration.

Transformative Placemaking

Placemaking emerges as a transformative concept that transcends traditional urban design, encapsulating both an overarching idea and a practical, hands-on approach to enhancing neighbourhoods, cities and regions (Project for Public Spaces, op cit). At its core, it inspires communities to collaboratively reimagine and reinvent public spaces, positioning them as the pulsating heart of every community (Dhagey, 2022). This exploration delves into the multifaceted nature of placemaking, emphasising its role in strengthening the connection between people and the places they share.

As a collaborative process, placemaking goes beyond mere urban design enhancements, fostering creative patterns of use and placing a deliberate focus on the physical, cultural and social identities that shape a place and contribute to its continuous evolution (Kestutis Zaleckis et al, 2023). The essence of placemaking lies in its ability to maximise shared value by involving the community in shaping the public realm, with community-based participation being central to its effectiveness, capitalising on local assets, inspiration and potential (Project for Public Spaces, op cit).

The impact of placemaking is evident in the creation of quality public spaces that significantly contribute to the health, happiness and wellbeing of the community. In the UK, over 13 million people desire cleaner, quieter and more spacious living environments, often found in the countryside. To address these concerns, urban planning increasingly focuses on 'placemaking,' aiming to create vibrant, inclusive and sustainable

communities aligning with residents' desires (Hayward & McGlynn, 1993). It becomes a process that nurtures a sense of belonging, fostering a collective vision that transcends the ordinary (Chen, 2016). Communities are encouraged to see afresh the potential of various public spaces, ranging from parks, downtowns, waterfronts, plazas, neighborhoods, streets, markets, campuses, to public buildings (Project for Public Spaces, op cit).

In conclusion, placemaking stands as a dynamic and inclusive approach to urban development, emphasising the significance of community collaboration in shaping vibrant public spaces (Akbar & Edelenbos, 2021). It goes beyond the superficial aspects of design, acknowledging the intrinsic connection between people and the places they inhabit. The collective vision generated through placemaking transforms physical spaces and nurtures a sense of community, contributing to the overall wellbeing of individuals and the vitality of the places they call home.

The contemporary understanding of placemaking emphasises the dynamic nature of places, seen as entities continually shaped by ongoing social activities and daily meanings (Sen & Nagendra, 2019). This perspective underscores the profound influence of users in shaping the character and essence of a place (ibid). Placemaking is redefined as a social activity, a dynamic and interactive process where the collective actions of individuals contribute to the constant evolution of space (Project for Public Spaces, op cit).

The conceptual foundation of placemaking draws a nuanced distinction between 'space' and 'place' (Healey et al, 2001). 'Space' denotes the physical environment, while 'place' extends beyond, encapsulating the relational dimension through social practices by various stakeholders. The transformation from 'space' to 'place' is contingent upon the recognition and engagement of individuals, a sentiment echoed by Franz et al (2008). The significance of places emerges through acknowledgment and use by people, elevating a mere space into a meaningful place with social and cultural connotations (Healey, op cit). In summary, placemaking operates at the nexus of space and place, where spaces gain significance through social practices and user recognition.

Balinese Architecture

Characterised by intricate carvings, tiered pagoda-like structures and lush gardens, it reflects a harmonious blend of religious and aesthetic elements. Traditional Balinese houses often feature open pavilions, intricately carved doors and thatched roofs (Figure 1). Temples, an integral part of Balinese architecture, showcase rich ornamentation and symbolic sculptures. The spatial layout emphasises a connection with nature, incorporating courtyards and water features. Modern Balinese architecture continues to honour these cultural roots while adapting to contemporary design trends, although some have failed. The Bali Beach Hotel at Sanur, symbolising the onset of the tourist boom, starkly contrasts with the local surroundings. Its Modernist architecture (Figure 2), described as unimaginative, reflects a departure from the traditional Balinese aesthetic. The International style it adopts clashes with the island's architectural heritage, raising concerns about the potential degradation of local values.

However, since the early 1970s, a conscious effort has been made to preserve the essential character of Balinese architecture. Many international hotels have embraced Balinese design elements in their chalet-style accommodations, drawing inspiration from traditional pavilions. The Amankila Hotel in Karangasem (Figure 3) serves as a notable example, seamlessly integrating traditional Balinese concepts like limpid pools and colonnades into its design.

Despite challenges, there are instances of inspired designs that respect and incorporate traditional Balinese architecture. The Bali Hilton in Nusa Dua demonstrates a successful fusion of regional forms, extending the range of building types on the island. Its layout and landscaping reflect an awareness of Balinese architectural principles, contributing to a harmonious integration of the resort with its natural surroundings.

The rise of shophouses (*ruko*) in response to the expanding tourist industry adds a unique dimension to Balinese architecture (Fig 4). While seemingly influenced by traditional Chinese shophouses found throughout southeast Asia, the *ruko* remains very distinctly Balinese. Notably, the placement of family temples (*sanggah*) on the roof adheres to traditional principles, showcasing a thoughtful marriage of old and new. In navigating the delicate balance between catering to tourism needs and preserving cultural identity, the call for architects and developers to consult Balinese building experts becomes crucial. This collaborative approach aims to safeguard the island's architectural traditions and ensure that new developments contribute positively to Bali's unique cultural and visual landscape.

Balinese and English Village Comparison

Balinese villages, known as *desa*, serve a dual purpose, representing both the physical settlement (*tanah desa*) and a religious community responsible for upholding ritual purity. Adherence to local customary laws, denoted as *desa adat*, and active participation in religious ceremonies at village temples fulfill this communal responsibility. The layout of Balinese villages defies local topography, aligning along a *kaja-kelod* axis between the mountains and the sea, guided by spiritual significance. A distinctive *candi bentar* (split gateway) marks the village entrance and the road often takes a sharp S-bend to thwart malevolent spirits. The village centre features a crossroads and an open square (*bancingah*), possibly hosting the main village temple (*pura desa*) or a local prince's palace (*puri*). Public buildings like the local assembly hall (*bale agung*), a drum tower (*bale kulkul*) for community summons and a pavilion for cockfights (*wantilan*) contribute to the village's spiritual and communal life. The Kahyangan Tiga concept involves three temples in Balinese villages – the main village temple (*pura desa*), an ancestral temple (*pura puseh*) and a temple for the dead (*pura dalem*) – symbolising the Hindu trinity of Brahma, Vishnu and Shiva (see Figure 5).

In contrast, English villages feature more organic layouts influenced by historical and geographical factors. Churches at their core reflect Christian traditions, with varying architectural styles representing different historical periods. Unlike Balinese villages, English village layouts lack standardised orientation and can adapt to diverse local geographies. In coordination with Figures 6 & 7, some English villages may have notable entrances, they don't typically incorporate spiritual or symbolic elements like the *candi bentar*. Village centres in England may have a central point, often the village green or square, but its purpose and design can vary widely and may not hold specific spiritual significance. Public buildings in English villages, such

Fig 1 Traditional Bali house entrance

Fig 2 Bali beach hotel at Sanur

Fig 3 Amankila Hotel in Karangasem

as village halls, parish churches or community facilities, serve different purposes but often lack the distinctive architectural elements found in Balinese villages.

In conclusion, while Balinese villages adhere to a spiritual and cosmological orientation with standardised layouts and prominent temples, English villages exhibit greater adaptability influenced by historical architectural styles and varying geographical contexts. The spiritual and communal significance found in Balinese villages is less pronounced in English villages, reflecting the different religious and cultural influences that have shaped their development over time.

GI initiatives in Bali

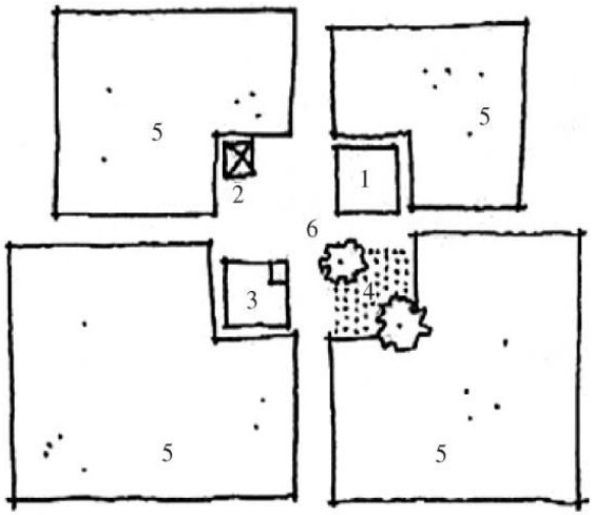
Green infrastructure initiatives in Bali are shaped by a unique blend of cultural, environmental and developmental factors. Balinese villages, with their rich cultural heritage and reverence for nature, provide an intriguing backdrop for the integration of GI. The primary focus of GI initiatives in Bali revolves around preserving cultural identity, enhancing environmental sustainability and fostering community wellbeing. Here in Bali, the cultural significance of GI is deeply intertwined with spirituality and traditions. Elements like the *Tri Kahyangan* temples and the *Sanga Mandala* principle define the cosmic and functional territories in *desa adat*, influencing the placement of built-up areas. This cultural element has profound implications for the implementation of GI, as it seeks to maintain the sacred-profane continuum. GI in Bali aims to resonate with the cultural identity of the village, understanding the socio-economic network as crucial for sustainability and acceptance within the community. Balinese GI initiatives prioritise the preservation of cultural elements and practices are prioritised such as *pampatan agung* highlighting the cultural significance of specific spaces. Community engagement and participation are integral, aligning with the concept of participatory placemaking. GI aims to engage local communities in urban design processes, fostering respect for and appreciation of Balinese traditions.

Community gardens, public art installations and recreational areas aim to enhance the quality of life for both residents and visitors with GI serving as a guardian against overdevelopment, preserving the authenticity of cultural sites and preventing excessive commercialisation.

GI initiatives in Gloucestershire

In Gloucestershire, GI initiatives are driven by a commitment to sustainable development, environmental conservation and community wellbeing. These initiatives are aligned with national planning policy frameworks and are designed to address a range of environmental and societal challenges. GI is rooted in sustainability and conservation. It commits to the National Planning Policy Framework (NPPF), emphasising the conservation and enhancement of the natural, built and historic environment. GI initiatives aim to protect lives, communities, wildlife and economic growth from the effects of development and climate change, including flooding and pollution. Strategies such as natural flood management systems, street trees and sustainable drainage systems are em-

Fig 4 Rukos in Kuta showing temple above



1. Puri (*palace*)
2. Wantilan (*meeting hall*)
3. Pasar (*market place*)
4. Lampangan (*market / open space*)
5. Residential
6. Pampatan agung (*great crossroad*)

Fig 5 Typical Balinese town centre (Regency)

ployed to achieve these goals.

Community health and wellbeing are also prioritised, providing high quality, safe and accessible green spaces that encourage active lifestyles, social inclusion and community engagement with nature. Networks of habitats and green infrastructure minimise impacts on the natural environment, aiming to provide net gains for biodiversity and enhance natural capital on a landscape scale. GI principles are applied not only to new developments but also to the retrofit of buildings. The integration of green infrastructure is seen as a means to build a strong, competitive economy while positively impacting lives through regeneration initiatives. GI enhances sustainability, increases housing value, boosts climate resilience, promotes social inclusion and improves the desirability of local areas.

In comparing GI initiatives in Bali and Gloucestershire, several key differences and similarities emerge. While Bali's initiatives are deeply rooted in cultural and spiritual values, Gloucestershire's approach is more focused on sustainability and conservation. Both regions prioritise community wellbeing, but the emphasis varies. Bali places strong importance on community engagement and participation in urban design, while Gloucestershire highlights the role of green spaces in promoting community health. Additionally, Gloucestershire's initiatives align closely with NPPFs, while Bali's approach is more influenced by local cultural traditions. Both regions acknowledge the importance of biodiversity and natural capital but approach it differently.

Cultural Challenges in Bali and England

The surge in tourism has undoubtedly left an indelible mark on Balinese culture, presenting a complex interplay of both positive and negative consequences. Economic benefits from tourism, fostering growth and employment, have been substantial. Cultural exchange and exposure to diverse perspectives have enriched the social fabric. However, the commodification of Balinese arts and religious adaptations to meet tourist expectations have led to concerns about authentic cultural erosion. Rapid urbanisation for tourism has also contributed to environmental degradation, impacting landscapes integral to Balinese cultural identity. In this context, the integration of green infrastructure emerges as a vital strategy to address cultural and environmental tourism challenges. Carefully designed green spaces be-

Fig 6 Typical English village, Castle Combe

Fig 7 Penglimuran village, a well-preserved traditional village in Bali

come cultural sanctuaries, hosting traditional performances, rituals and communal events. They celebrate cultural practices and deepen residents' connection to their environment. Green infrastructure aligns with sustainable tourism principles, fostering eco-friendly practices, responsible waste management and community engagement, while preserving the authenticity of cultural sites.

Bali faces challenges of rapid urbanisation driven by tourism. Proper integration of GI can offer benefits, including preserving natural beauty, cultural conservation, sustainable tourism development, mitigating environmental impact, community engagement, climate resilience, balancing tourism and local needs, job creation and education. Traditions of placemaking remain resilient amid modernisation, bolstered by a clear commitment to balance life and maintain a connection with nature.

In essence, the integration of green infrastructure in Bali serves as a holistic approach to cultural preservation amid tourism growth. It addresses environmental concerns while actively contributing to the resilience, celebration and sustainable evolution of Balinese culture. Placemaking traditions persist and thrive despite rapid modernisation, driven by the Balinese commitment to balance life and maintain a profound connection with nature.

One of the primary cultural challenges surrounding GI is the uncertainty in its design, implementation and maintenance. While GI is widely recognised for delivering multiple ecosystem services, there is still ambiguity regarding the best approaches to achieve these benefits.

A significant cultural challenge lies in how GI is perceived in planning and development processes. Despite the potential benefits it offers, GI is sometimes considered a secondary or optional component of projects, seen as 'nice to have' rather than a core element. This perception can limit the prioritisation of GI in development plans and diminish its significance in the later stages of project execution.

Another challenge involves addressing socio-economic trade-offs associated with GI. In areas characterised by high inequality, GI initiatives must consider negative impacts and strive to minimise them. Balancing economic development with equitable access to green spaces is a complex cultural challenge that requires careful planning and community engagement.

GI can sometimes be phased out of projects as they progress beyond the design and consultation phases. Where GI is not fully integrated into local authority development plans, it is often seen as a non-essential feature that recedes in importance as projects advance. This cultural challenge underscores the need to emphasise the ongoing relevance of GI throughout all project stages.

Cultural challenges also manifest concerning when and how to apply GI principles in different project stages. While the policy and planning stage was identified as critical, practitioners acknowledge the importance of considering maintenance and monitoring early in the design phase to ensure the longevity of GI projects. This emphasis on long-term management emerged as a vital cultural aspect often overlooked in academic discussions of GI.

Overall, it becomes evident that a comprehensive approach to GI initiatives must not only focus on ecological and socio-economic benefits but also consider the social inclusivity of these benefits. By recognising the significance of GI throughout all project stages and engaging with various stakeholders, practitioners can overcome cultural barriers and maximise the potential of GI to create sustainable and socially inclusive environments.

Comparative Analysis – GI in Balinese Villages and England

The following comparative analysis underscores the importance of tailoring green infrastructure initiatives to local cultural contexts and fostering community participation for truly sustainable and culturally resonant urban landscapes.

The presence of *Tri Kahyangan* temples defines the cosmic and functional territories in *desa adat*, influencing the placement of built-up areas. John Blyther, an architect and land developer in Bali, emphasises the importance of environmentally and culturally sensitive solutions, aligned with traditional cosmology and orientation. His approach resonates with the aim of preserving cultural identity while integrating green infrastructure.

Elements like *pampatan agung* highlight the cultural significance of certain spaces in Balinese villages. It is important to preserving the geometry of historic rice fields, traditional land titles, agricultural place names and retaining traditional irrigation canals and walkways.

Community Engagement

Nirarta Samadhi's 2001 study emphasises the active participation of *desa adat* members in urban design processes which aligns with the concept of participatory placemaking, suggesting that involving the local community is vital for successful GI implementation.

The challenge in the current Indonesian urban planning system

Fig 8 Proposed development of Taryan Dragon (first stage)

is the need for a more localised approach. Reported greed of developers and local leaders can be discussed as obstacles to preserving cultural heritage in the face of development pressures and how green infrastructure can mitigate such challenges. Local expert recommendations for robust allocation of green common spaces in village centres can be integrated into recommendations for optimising green infrastructure to enhance cultural dynamics in Balinese villages (J Blyther, personal comm).

The *Sanga Mandala* principle determines land uses and function locations. Adherence to this principle influences the allocation of spaces for green infrastructure, guiding a culturally appropriate urban design. Blyther's observations about what Bali and the UK can learn from each other, particularly in terms of policy enforcement and community organisation, can be used to emphasise the exchange of knowledge and practices between the two regions to improve green infrastructure and cultural dynamics.

The GI task force in London has redefined green infrastructure into five objectives, emphasising health, resilience, active living, living landscapes and enhancing living space.

Both Balinese villages and English urban spaces primarily provide amenities such as recreation, outdoor sports and cultural activities. Balinese villages incorporate cultural and religious significance, while England focuses on cultural and civic activities. Blyther's insights on the perfection of Balinese villages from an international perspective reinforce the importance of preserving the cultural and historical character of these villages through green infrastructure.

Fig 9 Existing restaurant at Seseh Beach

Both countries' contexts exhibit disparities in the quality and spatial provision of green infrastructure. England faces challenges in providing access in dense urban areas, while Balinese villages maintain structured spatial organisation.

Innovative solutions such as blurring borders and creating publicly accessible green roofs are evident in England. Balinese villages showcase innovative solutions through the *desa adat* framework and the *Sanga Mandala* principle.

Taryan Dragon Bali Case Study

The proposed Taryan Dragon project in Seseh Beach, Bali, has sparked considerable debate and concern among advocates for the preservation of Bali's natural beauty and cultural heritage. It highlights the importance of responsible and sustainable development practices in maintaining the authenticity of Bali's unique charm (Cemagi, 2023).

The project is a seven-floor development planned for Seseh Beach, marketed as a five-star resort and residence inspired by nature and the arts (Figure 8). While it promises luxury and innovation, it has raised significant apprehension due to the potential consequences it may bring to this pristine beach and its surrounding area (ibid) (Figure 9).

In terms of its potential environmental impact, the construction could lead to the destruction of valuable flora and fauna, threatening the delicate balance of local ecosystems. Increased foot traffic, pollution and the urbanisation encroachment are anticipated to degrade Seseh Beach's natural beauty and biodiversity. The irreversible alteration of the natural landscape poses a significant risk to the area's environmental integrity.

The appeal of its authentic Balinese character offers visitors a chance to immerse themselves in the island's rich cultural heritage, but potentially negatively impacting the local economy. This gradual erosion of Bali's unique cultural identity would be a significant loss for the island and its people.

The project's construction may disproportionately benefit outside investors and overlook local needs and aspirations. Rising property costs, increased traffic, overcrowding and limited access to public spaces could lead to the displacement of local communities. This disruption would not only threaten their traditional way of life but also sever the vital social fabric nurtured over generations.

As concerned individuals, it is crucial to advocate for sustainable and responsible tourism practices that prioritise the wellbeing of local communities, the preservation of Bali's invaluable natural wonders and the respect for cultural heritage. In light of the concerns raised, it is imperative that alternative development plans are considered, avoiding excessive height, overcrowding and the overdevelopment that may result in irreversible damage.

By engaging in public consultations and open dialogues with local communities, environmental experts and cultural preservation organisations, the responsible authorities can ensure the long-term preservation of the natural and cultural treasures that make Bali and specifically Seseh Beach, enchanting for both locals and tourists alike. The case of Taryan Dragon exemplifies the need to carefully evaluate development proposals to protect Bali's authentic charm and safeguard its legacy for future generations to appreciate and enjoy. Bali and the UK can learn from each other, particularly in terms of policy enforcement and community organisation, can be used to emphasise the exchange of knowledge and practices between the two regions to improve

green infrastructure and cultural dynamics (Blyther, personal comm).

Lessons learnt

GI, while universally beneficial for environmental and social health, is perceived and applied differently across cultures. This underscores the importance of local involvement in planning and implementation, as community engagement emerges as a crucial element in both Bali and England. My research also reveals the importance of recognising and respecting the diverse cultural contexts in which GI is situated, and the need to advocate for a flexible and culturally informed methodology in urban planning.

Effective Green Infrastructure implementation requires a multifaceted approach, adaptable to the unique cultural, environmental and social fabric of each community. As cities worldwide grapple with environmental challenges and strive for sustainable development, the insights from this study could guide more nuanced, culturally aware and successful GI initiatives globally.

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Biographical note

This article is an edited version of Bayley Blyther's BA(Hons) landscape architecture dissertation submitted in January 2024.

CELEBRATING RAINFALL THROUGH DESIGN
an exploration of SuDS

Bob Bray

I'd better introduce myself. I'm not from Gloucestershire, I'm from Essex which is different and I'm a landscape architect. Through various strange ways did I get there and whilst I enjoyed doing landscape architecture, I suppose my heart wasn't in putting green stuff around crinkly tin sheds, which was what I was doing for quite a lot of the time. Then I went to a lecture in Coventry University where three very nice American people, two of them engineers and a Scots person, were introducing a new way of managing rainfall. Up to that time I'd been interested in reedbed technologies but also in conservation of little slimy friends, amphibians. I'd done a lot of conservation work in that but this meeting I went to was literally a road to Damascus conversion: I suddenly thought I can do this. All I need is somebody who can add up, to help me, because I've only got ten fingers and fortunately I had friends who were engineers so they were very forgiving.

I'll tell the story using the slides. This is Stroud (Fig 1). This is a co-housing development called Spring Hill. Spring gives it away a little bit. Springs do come out this hill and very fortunately I was able to work on this. We call this talk *Celebrating rainfall through design* and I thought I would try and give you an idea of why or where we have come from in all of this. I'll just read you a quote, from a book which is out of print but it's about the lost rivers of London. It's interesting how William Fitzstephen describes this in 1180: "Close by lies the immense forest in which are densely wooded thickets, covers of game, stags, fallow deer, boars and wild bulls. The tilled lands of the city are not barren gravelly soils but like the fertile plains of Asia which produce abundant crops and fill their tillers' barns with Ceres' sheaves. There's also round London on the northern side in the suburbs excellent springs, the water which is sweet, clear and salubrious, 'mid

Fig 1 Spring Hill, Stroud

Fig 2 Nailsworth clear streamflow

glistening pebbles gliding playfully amongst which Holy Well, Clerken Well and St Clements Well are held to be of most note". Isn't that wonderful?

I went out a couple of days ago and I took this picture in Stroud (Fig 2). Well it's in Nailsworth to be honest and I know the people who live in that cottage and I know that that stream flows all year to a greater or lesser extent but it's always clear, always clean. And that's where we come from and that's where these eulogies to the past come from. However it wasn't long before the thing changed and by 1858 London celebrated the *Great Stink* (Fig 3). And not only a great stink but also cholera and other diseases, waterborne diseases, which were killing people by the thousand. Joseph Bazalgette, a very famous engineer, who created what we now understand to be a lot of London's sewers and the sewer didn't only deal with rainfall but sewage and rainfall, and that was the basis of our drainage approach for probably 150 years or so. It wouldn't be until something happened (I'm missing out a little bits here), something quite dramatic happened in the States when the river Cuyahuga in Ohio caught fire, at least 12 times between 1868 and 1969. The last time it caught fire in 1969 (Fig 4) was sufficient to trigger what then came became called the Clean Water Acts.

What these were concentrating on wasn't to do with flooding; it was to do with water quality. It was realised that the system of collecting water and instantly conveying it with all the filth that's in it straight to a river or a stream was not a good way or the ideal way to deal with this. If any of you were around at the time, there was a very important book called *Silent Spring* by Rachel Carson (1962) which again was making

Fig 3 London's Great Stink (Punch, 1855)

Fig 4 Cuyahuga river on fire (Smithgroup)

people aware of the issues we have with the environment. When I went to Coventry university these ideas had solidified to a great extent in the USA. They had started doing this as far as I can understand somewhere through the 80s really and had developed a number of techniques which they called BMPs or best management practices, and they termed all of this *stormwater management*. Stormwater management meant two things specifically: one was to control the flow and volume but more importantly from their point of view was to clean that water so when the water got to the stream, the creek, the pond, the lake, the water would be essentially clean.

So what I thought I would do is to introduce you initially to a couple of examples of when I went over to the States to see these things, schemes showing how they have done this. We have borrowed their techniques and we have started calling it something else called *sustainable drainage systems* (SuDS) and that term began to be used in 2000.

But let me get back to the United States and this would have been somewhere I think about 1997-8. I went to the west coast and this is in Portland, Oregon (Fig 5), and what was really significant to me was the way the Americans saw this as a complete holistic way of dealing with rainwater. It was to deal with the whole rainfall experience and they did that by looking how surfaces could be adapted to manage rainfall, and so this building, the Ecotrust Center, was one of the best examples to me of how the rain is first caught on the roof, so we have what's called a *green* or *blue-green roof,* and at ground level it was caught in a number of other features. On the right hand side is a gravel filter drain, so they're not talking about exotic techniques here. We're pressing ideas that have been well tried and we're pressing them into this new way of managing rainfall. And then the bit on the right of that filter drain, which is a gravel trench essentially, is a free-draining soil called either a *raingarden* today or other various names and, in this case, is basically runoff going directly into a planted area.

And then the blacktop (asphalt), that was permeable blacktop. Now

Fig 5 Blue-green roof and raingarden, Portland, Oregon

over here in Britain we had used permeable blacktop for things like tennis courts where water went through the blacktop into stone underneath but was only used in that sort of limited way while they were using it for road construction. So that was for me a really exciting thing to see and then we travelled down the west coast of the States and we came to something called a Sustainable Village in Davies County (Fig 6). Again

Fig 6 Sustainable village, Davies County, northern California

this was a first even in the United States and again some ideas which have taken root in Britain as well. So on the top we've got a bridge. Instead of water being collected in a hole in the ground, the water is conveyed laterally over some gravel into what we now call a *swale*. (Swale as an old English word for the bottom of the valley and the Americans still refer to the vegetated bottom of a valley as a swale – a flat-bottomed channel.) To the right is a low-flow channel carrying water from the house, so that is gravel or cobblestones used to carry water at the surface, and you can see water dropping down through a downpipe again onto a gravel surface and these were carried on into grassy basins. We know that in California (this is northern California) when it does rain it rains stairrods and on a number of occasions it has rained sufficiently to flood all the residential areas located around this site, but this site didn't flood, because the landscape had either absorbed that water or it was held for long enough for the water to move to somewhere else.

This is a guy called Tom Lipton (Fig 7) who is a mover and shaker up in Portland, Oregon, and he's measuring stuff on the green roof. Probably you've come across the idea of a green or, if you store the water on the top of that, a blue-green roof. The river going through Portland, Oregon, is the Willamette river and it's a salmon river so what they were concerned

Fig 7 Green roof, Portland, Oregon

about was not so much the volume of water but that water should be clean when it went into the river. Therefore all the roads tend to have these 'build-outs' which we call *bioretention* raingardens (Fig 8). Basically the water goes into them, soaks down through a very free-draining soil into an underdrain and that water then is clean. It's taken out all the pollutants from the road runoff which is increasingly seen as a real problem. It's oil, silt and now microplastics. So all of the things that went into that river are caught in those bioretention features (bottom picture) which is more raingarden than bioretention. It's hybrid, I think, probably, because an ordinary raingarden is just the depression in the ground where you collect water. They're quite common in the States on the east coast where there are free-draining soils but this is quite an elegant solution. This raingarden deals with all the roof water from the surrounding buildings. The water travels across the paving, across the gravel underneath

Fig 8 Build-outs and bioretention rain gardens

Fig 9 Designing with rocks

the hedge and the centre of that raingarden has dropped by about 100-150mm; water goes in there, drains down through the soil into a drainage layer underneath and there'll be an overflow somewhere in there. When a big storm occurs, water can go down that as an overflow. So that space is enhanced by these wonderful features and I'm going to try and convey to you that one of the things that landscape architects bring to to the party here is *design*. So we're not just talking about volumes and flow rates; we're talking about design.

This (Fig 9) must have cost a fortune but this is designing an expensive landscape around a high value building, a convention centre. You can see how they've used rocks very creatively to collect water. You can see that the spout on the building which directs water into what looks like a gulch, the Americans would probably call it, or to dry streambed as we might call it unimaginatively, and that is a designed landscape. That water carries on through and round the building into a series of a basins with a lot of rock work. There's a flow control, so that is the chamber through which water leaves the site in two ways: (i) as though it were *greenfield*, that is as though what was there would be just a grass field with a greenfield runoff rate and (ii) it leaves it clean.

Here (Fig 10) is really a contrast to the last one. This is very expensive because lawyers live here and when we went around it the engineer said, Well of course this is very expensive because this is not an area that naturally has rock in it so all of this rock work was imported. The top shows a very elegant inlet, that is water coming into the system. There are features above that which take out the silt but that's an inlet into this main system and the bottom is basically a pool and riffle system which is mimicking a river or stream situation. Boulders are controlling in a very rough and ready way the flow out of that system. The Americans are really good at explaining through these (information) boards exactly what's going on but in Europe the best example I think that inspired me again was when I heard about this place in Malmö .

I'd been to Malmö as a 14-year old (well that's another story) but I went over to have a look at what was being

Fig 10 Mimicking natural river flow

lauded as a really exciting scheme in Malmö (Fig 11). There they had used a much more modest approach collecting water and all the down pipes go into a wetland channel taking out any silt or bird faeces from the roof and that would be taken out in the little strip of wetland before going into this pond. It's not that much polluted on the roof, whereas with the road you've got a lot of pollution and you would have to clean up water more thoroughly before it got into say a pond or a landscape feature.

Fig 11 Series of basins, ponds and rills, Malmo

The water is carried around that site in a series of basins, ponds and rills. Fig 12 is not an overflow – water would normally go down the large grating but there is another grating which will pick up another volume of water. So you can play games with these systems. Fig 13 would you believe is a playground but the Swedes seem to be quite relaxed about water and if it rains very, very heavily then every available space is considered as fair game so that playground is a temporary water basin. They love their rocks and so at bottom there's a dry channel but it obviously runs

Fig 12 Playing games with outflows, Malmo

Fig 13 Playground and temporary water basin, Malmo

with water when it rains heavily (Fig 14). The permeable road surface is basically a plastic grid with grit infill and open-graded stone underneath so water can travel straight through it. A little channel has water being kept at the surface and taken through the surfaces in a series of channels (Fig 15). If ever you should get involved in all of this a trip to Malmö is a great place to look round. Again this was designed I believe for 1 in 25-year return period storm and during a 1 in 200-year return period storm this was the only part of Malmö that didn't flood. When I say *return period* all I mean is a 1 in 25-year return period storm is the storm which is likely to happen, may not happen or it may happen more times but once in 25 years. A 1 in 200-year storm is a storm which is only statistically likely to happen once every 200 years but appears now to be happening every other year but it's likely statistically based on all the records.

After this road to Damascus event in 1996 I very fortunately have done a number of motorway services, designing the landscapes around the country for Welcome Break. They wanted to build one at Oxford and I suppose to cut a long story short the person who I would normally talk to about landscape was complaining bitterly it will cost him two million pounds to carry water from this location to the nearest sewer, both storm and foul. I said, Well I can do that, crossing everything; I can deal with that stormwater because there's a ditch running down by the side of your motorway service area and, if we can hold that water and clean that water, the Environment Agency were very keen to have a demonstration site. I got a lot of support from the Environment Agency and I'll show you some of the things that we did. Unfortunately these people don't manage their site so that you can't see a lot of the infrastructure on this site because nobody's done any maintenance to it for 20-odd years. This is what it looked like (Fig 16). All the red is permeable pavement and all the black top is impermeable pavement. In the plan for it so the red would be the permeable pavement and water was taken in various ways. You can see a series of basins and wetlands and reed beds and water taken to where it went into a stream at 19 litres per second per hectare. Another story which we haven't got time for today is that (this isn't me designing this but a colleague and friend and a reedbed designer) all the wastewater from that motorway service area goes through a series to reedbeds and is cleaned by the time it gets to the end of that sequence of basins and ponds. Fig 17 is where water is collected from a lot of the areas of the motorway service area and you can see the basin, the pond if you like, is about number two in what we call the *management train* (ie one of the

Fig 14 Accommodating dry channel

Fig 15 Permeable road surface

Fig 16 Oxford services ('red' in text = dark concentric arcs at east of site)

techniques which we use all the time is the idea of the management train where you do things in a series: water goes into that pond and when it's been in that pond for a while it overflows back along a swale and then it goes all the way around the site into a final balancing pond; if there's a lot of water it goes into that balancing pond before it disappears at 19 litres per second per hectare into the local ditch).

So that was my first go. Seven out of ten possibly there, but in the land of the blind the one-eyed man is king. I managed then do the second one which is Hopwood which is on the M42 which was hopefully better but again the water from the roof was separated from water from

Fig 17 Collection basin

elsewhere on that site so the amenity pond, or whatever we call that, takes all the roof water (Fig 18). Because the roof water is clean we only need to go through one *treatment stage*. A treatment stage basically means that the water has silts and pollution taken out of it and if there is any silt on that roof, there's very little, then it will stay in that pond for the water is essentially clean. As you might imagine on a motorway service area some areas are very mucky indeed and I'll show you that in a minute. To the right shows water going through what we call a low flow channel after being stored and cleaned further up the system and so this is water travelling to the final basin. There are three sources of water that we've identified because we've split the site up into a number of different *sub-catchments*. Sub-catchments is an important concept and *source control* is another one and *management train* is the other one so I will reuse those words hoping that you've caught on to that. But this is the most polluted part of site. This is the HGV (heavy goods vehicle) site so you can see where all of that water goes across – no gullies, no pipes because they accelerate the flow (Fig 19). The reasons these systems tend to be very cost effective is because we're not using conventional drainage to do work so the water is travelling across the surface. The first black line is is just a silt trap during construction. The black dots are boulders and they move – it's amazing how those boulders move and it's to do with the driving abilities of the people in the lorries. That first bit of grass takes out most of the pollution though and water travels across it, what we call a filter strip. It's very simple technology but it takes out most of the silt and the oils until it gets to the second black line which is a filter drain which is a stone-filled trench. The filter strip protects the filter drain but that's one, two stages: remember we talked about management train and the number of stages that you use to clean and slow the water down and then there's a wetland (on the right-hand side) which does further cleaning. And then the amenity pond for wildlife etc is the final stage where water is stored after heavy rain. If there's too much water for those first two stages most of that water will be clean. It's the first part of the rainfall event that is always dirtier than the rest and that's

Fig 18 Hopwood services

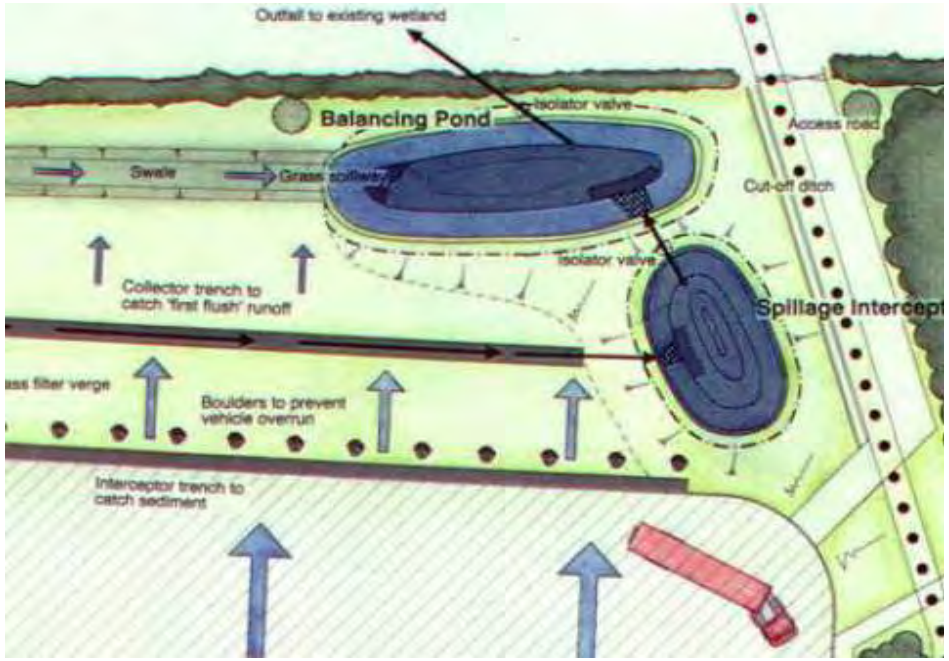

Fig 19 Most polluted HGV site

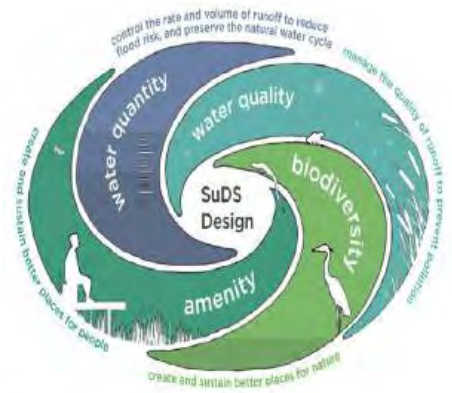

Fig 20 Four pillars of SuDS

dealt with by that black line which is sized to that particular volume and then if it's exceeded then water goes over an other filter strip and then a swale into the basin. So we've got a whole number of techniques that we can use to do this so it's not just one technique but the whole package of what we're talking about here is a whole load of different techniques to slow the flow down to clean the water and then to let it go slowly, to show that we get that nice tinkling stream that we saw in the first slide.

In 2000 we had the first SuDS manual and I won't go into that in too much detail but there was something presented called the SuDS triangle. By this stage we'd started calling it sustainable drainage systems and the triangle was *quantity, quality* with *amenity biodiversity* and with the third SuDS manual in 2015 it had become the *four pillars of SuDS*. Four different elements make up the SuDS philosophy (Fig 20), so 2000 was a very important year because that was first time everything was put together to say how you should

Fig 21 Spring Hill, Stroud

do these things. We were a little bit ahead of the game because we'd started doing it in 1996 and therefore we'd hopefully stolen a march on people and most of our schemes meet these criteria absolutely. We're landscape architects but we use engineers on an as-required basis as opposed to the other way round: very often, at the moment, these sorts of features are designed up to a point by engineers who then ask landscape architects to come and put green bits round. And we don't do that.

So here's some examples – I'm going to just talk about SuDS by just showing you examples and talking about them and how they how they work. So this is Spring Hill Housing in Stroud (Fig 21). This is the access road and that comes on to some permeable pavement and forms a sub-catchment. There's a tile-hung wall and the water comes down from the top bit down that wall to the bottom and through a series of basins and finally into a great grassy basin at the bottom-right. But there's some storage on the way and that means that we only get water in that grassy basin beyond the 1 in two years storm but up to the 1 in two years storm water doesn't reach that basin so it's always available for play. So water is actually making its way slowly through that whole system and is stored as we go through that system.

Cannock Mill (Fig 22) is a recent housing scheme in Colchester. The pond is an existing mill pond so we were able to use that, but as part of the project we cleaned that out obviously and it's now a swimming pond as you can see. It goes up and down by about 300 millimetres so it's got 300 millimetres of storage but the water's clean before it gets there. At

Fig 22 Cannock Mill, Colchester

top-left the centre of that row is a thing called grass creek where water goes down through the paving and it's cleaned in the stone underneath. To the right that's a conveyancing system bringing water from one part of the site to the other and the green roof. Again that is clean water but it's held on the roof so we call it a blue-green roof but literally it's a plughole. Essentially the plughole is a flow control so water can come off there slowly and all parts of the site are working hard such that when the water enters the swimming pond it's clean.

Schools. So this is a school (Fig 23). I've probably done 20 schools in Worcestershire and this is Red Hill primary school and top-left is a swale maze. Water comes off the various parts of that school and it flows into what was an existing copse. Well we played around with the copse, did some crown work and put a berm round back of those trees with help from the tree officer from Worcestershire. We just gently modified that ground so that water comes in gently in channels which have little bridges over them. When it rains the children have to find their way around the space by going across bridges: we call that a swale maze and when it's dry it's used for lessons. Eventually that water goes to a very small pond with a low fence, toddler-proof, with some frog tadpoles in it. We collected all the water wherever possible at the surface so every time it rains things happen on these sites because water is being collected and it's being conveyed; it's being taken into one space and then moved on to the next space to clean it and store it, so that we can release these volumes of water as close as possible to a greenfield runoff rate as we can – something between 3 and 8 litres per second per hectare.

Fig 23 Red Hill Primary School, Worcestershire

Fig 24 Fort Royal, Worcester

This is Fort Royal in Worcester (Fig 24). In the good old days there was enough money to design slightly wacky things in schools so the top-left is the last part of the system which is a wildlife pond. Water is coming off a carpark which comes down through a pipe, through a flow control, then down through that little stainless steel tube, down a rain chain into that pool at the bottom of it and then it runs along and out to the pond. Another part of the site goes into the raised pond and as we've got a quite a lot of disabled children in this particular school it would be nice to have a glass wall so when you scrub the glass and get the algae off it the children can see all the tadpoles whizzing about. And then there's a rain chain collecting in a pool in the centre there and water can travel at the surface in that channel – a rill – which is basically like the Alhambra that's full of rills. That's what I always say when they ask me what rills look like: It's going to be just like the Alhambra. Well, not quite but nearly.

Here's another school in Bewdley (Fig 25). This is again a straightforward rain garden and that's basically taking roof water so it's clean and the water's carried across the pavement and drops down into that rain garden. On the right-hand side of that bottom-left shot you can actually just about see some permeable pavement. That's for vehicles, not many vehicles, but using permeable pavement which is basically 200 x100 x 80 mm blocks on grit on an open graded stone bed that will act as a cleaning mechanism. It traps all the silts and the muck at the surface and it forms a biofilm on the stone as the water travel through. I hope you can see how much these features are all contributing to the landscape because the alternative would be to put the dirty water down in a hole and then immediately it begins its journey in a pipe. It can't get out of the pipe until it reaches the destination which in so many situations is either a stream or a river or, not normally, a landlocked pond or lake. Very often you get to a water treatment system but a lot of things get through – one of the worst is the tyre waste which I'll come to hopefully in a while.

This is quite a recent school design (Moulsecoomb, Brighton, Fig 26). Again this was a courtyard school and the whole basis is using rainfall to create spaces and with features that children could play with. They're all designed to be safe but designed to tell a story of one sort or another. We've even got a watering can doing a job, so you can have a lot of fun with this, if you're with the right people and the right people are in the mood for it. I suppose that most exciting opportunities are to introduce water into the urban fabric but the urban fabric at the moment generally speaking doesn't have water in it. We're about two years away from something called a SAB which is a SuDS approving body. Wales has already got this approving body: it is the law in Wales that you must use SuDS techniques to clean water and

Fig 25 Bewdley

then the SAB approving body checks that everybody's doing this. Now the difficulty there is the huge numbers of schemes coming through the pipe – no I won't use that analogy – they're coming through the planning system which theoretically should have these ways of managing the rainfall so the water coming out is clean and in a controlled way, but unfortunately not enough people know how to do it and not enough people in the planning system know how to do it. So at the moment we are stumbling a little bit and Wales at least had the courage to create these SABs but all the evidence is that England has held back from going down that full route. Which means most developers decide against it not because it's more expensive but it is a different way of doing things and at the moment the old way of collecting water is preferred: pipes or storage underground. But by doing these at or near the surface we benefit from it all the things which these things can create.

This is in Hammersmith (Bridget Joyce Square) in Fulham (Fig 27). This was in part started off as an example the engineer wanted to demonstrate permeable pavement. We went to a residents' meeting and surreptitiously put a proposal together which said yes but you don't just have to have the permeable pavement, you could have this as well, if you wanted, because that space was almost sterile. It was classic road and pavement leading to a school and so we managed to persuade both the residents' association and the school and amazingly the local authority that the whole area could be changed by using this approach to managing rainfall. Now this is a retrofit situation; retrofits are always more expensive. It's very difficult to put a price on retrofit and if this had been a new development it would always be 10-30% cheaper to do it using SuDS rather than conventional drainage. So here up on the top-left we have a rain garden and we have what's called a wiggly wall running through it because the one thing that residents asked for was that when they were children they had this wall I suppose 18 inches high in old money but where they used to sit and run along or used to do whatever they did as kids and as parents. Could we just keep a semblance of the wall? So the wiggly wall has been integrated into the whole scheme. It's either raised so that children can walk along it (and through a sea of *miscanthus* grass) and then when it comes to paving, it follows through in a sinuous way you can follow. It has been kind of amusing – I've been in a meeting where we've all been clustered around chatting about this or that and a child comes along the wiggly wall, then on to the pavement bit and asks us to move over so that he can walk along the extension of the wiggly wall.

Fig 26 Moulescoomb, Brighton

In London, in particular, roads are constructed on top of concrete so we put the block and the grit on top of concrete so the water still goes through and the silts and the tyre waste stays at the top for sweeping off but water goes down through the grit and then travels laterally into this rain garden instead of going down. So this rain garden is in a sense picking up all the rainwater that's fallen on the road but there's a pre-treatment so all the silts and micro-plastics from tyre waste are taken away. Many of the pollutants that we have to deal with actually adsorb, that is they stick onto these very small particles and it's been a very successful scheme. You can see the most expensive gutter in the world with corten steel holding it up and there's some twisted steel rope carrying the water down from that gutter into the rain garden; because that's roof water it's a simple rain garden. The one in the back is a bioretention structure with layers underneath picking up water from the rope.

Fig 27 Bridget Joyce Square, Hammersmith

We managed to get a Landscape Institute award for this and I think it was probably the first time a SuDS scheme got an award but it's basically because of the design and I think it's worth making a point here that the word *drainage* has dreadful connotations in most people's minds and I'm always being teased about the fact that I do drainage. I think we have to perhaps find another word instead of sustainable drainage systems. Perhaps *managing rainfall*

Fig 28 Brighton: dealing with water in the landscape

creatively or something ridiculous like that but people have this fixation about drainage being about pipes and water being taken away from us as quickly as possible to somewhere, it doesn't matter where, but as long as it's not near where we are. There has to be some form of sort of seminal change in the way that we look at water so that we're not only comfortable with what's happening but we *celebrate* it. When it rains, as in the development in Stroud where the water begins a seven metre drop down a tile hung wall, children come out their doors to watch the rain falling. Perhaps if we could change that way of looking at rainfall then you know our environment would be very much better off for it.

This is Brighton (Fig 28) south of the South Downs where all of the rainfall that falls on the roads tends to have gone to soakaways in the chalk and you can imagine the sort of pollution loading that goes into those soakaways. Southern Water realised that their aquifer is slowly building up a pollution load that is going to be a real problem in the future so they were very keen to show how people could deal with this. There's a swale inlet and when the water comes down the road (we put in a traffic calming table – note the white arrows) instead of proceeding down the road it turns left and goes down the swale (just a flat bottomed channel) and we cleaned that water in a lined basin. The centre basin is the infiltration basin and a smaller lined basin is picking up all the silt and tyre waste and the muck. Top right shows what it looks like in the spring with a mixture of wildflower meadow, what used to be called weeds but now called cornflour wild flowers; they are there for the first year as a nurse crop for the wild flowers to come up for rest of the time. It is wonderful to see the transformation in people who lived there from being really apprehensive about all of this but now sending the council photographs of when it rains. As one lady said, I can now sleep at night knowing that the water isn't going to come through my house. Therefore there's a comfort seeing water going into a landscape space and being dealt with and so far in the last three years no water has gone over the overflow so we've been very pleased with that even though there's been a few headaches on the way dealing with highway engineers.

I'm going to finish with a scheme which is not ours. We were consulted on flow controls and how water should be controlled from one part of the system to the next, but the credit goes to Zac Tudor and Roger Knoll in Sheffield for this *Grey to Green project* where a four-lane carriageway which was largely bus lanes changed the urban fabric of Sheffield by freeing up two lanes (the buses went somewhere else). Now there could have been a whole number of things that they could could have done with those bus lanes but I'm not sure where the idea came from (it's a very radical city Sheffield) where there are people at the university working on some SuDS and planted SuDS. We worked on some basins in the early days but whatever the political driver, the decision was to take two of those lanes and create essentially a planted garden to deal with rainwater *and* runoff from the road. And Fig 29 gives you a sense of what it looks like. Water runs off the highway where the bus lane is. Water drops onto that resin-bound strip running along by the side of the kerb, flows onto the planted area and that planting area follows a new or modern technique of mixed ornamental and wildflower mixes. If those of you have gone down to London to the Olympics a lot of it was trialled there. The issue here of course is this has got to last now for as long as that whole thing stays in place. It may be the five-year rolling programme of taking out things which are not working, replanting whatever, so there's a real commitment to this in the future, a different sort of plant mix but essentially a gardenesque style. What you can't see below the gravel is a flow control which is like a bath with a plughole but it's a very small hole, protected by the gravel so that it can't get blocked. On a day-to-day basis that holds all the water back and then there's a slotweir where if necessary water can be released at a controlled rate. This has been designed for the 1 in 200 year storm I believe and if we get a 1 in 500 year storm maybe it'll have to go through that exceedance route, outside the calculations. And of course you can have fun with some of these things: note the stainless steel domed outlets. You can see a series of little concrete dams because we're going downhill meaning that each of those cells if you like is doing a job in holding the water back. There's a small pipe which carries the water to the river Don. It's a very exciting scheme and we're hoping that we get a chance to do something like this but I thought rather than be completely self-centred I'll tell you of the scheme I wish we'd done but we really like the people who did it and we only hope to get the chance to do something like that in the future. If you do go to Sheffield to see it

Fig 29 Grey to Green in Sheffield

it's called the Grey to Green Project. Excellent, so very lovely. Thank you very much for your time and I'm very happy to answer any questions.

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Bob Bray is a landscape architect and founder of the award-winning Robert Bray Associates specialising in climate-resilient, planet-friendly, healthy and socially valued places. This is an edited transcript of the John Simpson Memorial Lecture he gave at the University of Gloucestershire on 23rd April 2023. A film of the lecture is available from the course blogsite.

A WELSH UPBRINGING
Childhood memories of Bodfan Gruffydd and early influences on his subsequent career

My first memory dates from early in 1913 and, perhaps significantly, is of standing at the front door of my grandfather's home and looking down and across Llyn Padarn, the lower of the two Llanberis lakes, to Yr Wyddfa, Snowdon's summit, lost in mist, moisture laden, stones and bare branches glistening. That view has remained etched on my memory and must have been my first awareness of landscape, in this case a sublime one (Fig 1).

John Roberts, Tida, my maternal grandfather, was born at Castell, Llanddeiniolen, Gwynedd. His ancestors were cattle drovers and lived for many centuries at Dolwyddelan in the Lledr Valley. Like most families in the mid-eighteenth century in Wales, they changed their name to confuse the subjugating English. Every family in a district would assume the same surname as Hughes, Jones, Parry, Roberts and so on. Locally, individuals would be known by their nick-names as Sion Henfaes (John of the farm called Old Field), or Bob Refail (smithy) in the way surnames, as we know them, originally evolved; previously it had been Robert ap (son of) Cadwaladr, whose son would be Cadwaladr ap Robert, and so on. My great-great-grandfather's clan chose Roberts instead of Cadwaladr.

Moving about the country provided the opportunity for a cattle drover to look beyond his own parish for a wife thus introducing new blood to keep the family line healthy and alert. My great-grandfather, born in 1798, the second John Roberts to keep the name, eloped with a pretty girl who lived at Hafodty, now a scheduled monument in Llansadwrn parish on Ynys Môn, the island of Anglesey; she sat behind him on his horse to swim the Menai Straits. They had nine sons and a daughter and the old man used to brag to his pals in Caernarfon market that he had nine sons and a sister for every one of them so that everyone thought he had eighteen children. My great grandmother, having so many wifely duties, was usually late setting off to church on Sundays so she took a short-cut to cross the river on stepping stones. She was so frightened of slipping with a baby in her arms that she used to roll it up in her shawl, traditionally worn to secure a baby to its mother's bosom and gently throw it across the stream on to the soft

John St. Bodfan Gruffydd (5 April 1910 – 25 November 2004) was a Welsh landscape architect who was the driving force in the establishment of the full-time landscape architecture undergraduate course in the Cheltenham School of Fine Art in 1961, the first in the UK, now continuing in the University of Gloucestershire. He became president of the Institute of Landscape Architects 1969-71. Landscape Issues *has published various articles by him including transcripts of chapters (see endnote) from a planned autobiography from which this current piece has been extracted with additional illustrations obtained from a recent tour of north Wales taken by the Editor.*

Fig 1 Yr Wyddfa (Snowdon) seen across Llyn Padarn

grass beyond, before crossing over the stepping-stones herself. They were a tough lot ... My great-grandfather's brother was so taken with his sister-in-law that he also went to Hafodty to steal her sister to be his wife. My grandfather, the third John Roberts, born 1839, married Catherine James whose family had farmed for many generations at Dyffryn Mymbyr on the southern slopes of Glyder Fach and whose mother came from Pen-y-bryn, Edern on the Llŷn peninsula, Gwynedd (Fig 3). He qualified as a doctor of medicine at Edinburgh and I remember him telling me how fellow undergraduates from Highland homes brought a roll of bacon and a sack of oatmeal with them at the beginning of term returning for a renewal of supplies at half-term to provide their staple diet while at university. After qualifying he went to Paris to do research on haemoglobin. He settled as a general practitioner at Clwt-y-bont, Llanddeiniolen, Gwynedd. His practice was mostly with slate quarrymen working at Bethesda and smaller quarries on the northern slopes of Elidir Fawr.

I was born in 1910 at Plas Eryr, Place of Eagles, and spent the first few years of my life in my grandfather's home. My first memories of this place, on the lower slopes of Elidir Fawr, are of grey skies, mist shrouding the peaks of Eryri, Snowdonia, the Haunt of Eagles, up above Llyn Padarn; of purple slate steps leading down to the terrace in front of the house, gleaming, slippery; gleaming too the large quartz boulders, jumbled to make a stonery of the supporting bank, sheltering white rock cress and snow-in-summer. As a small boy, with my silver mug, already two years dented, always in my hand, I used to scramble up the front steps to the frosted glass doors of the porch, lit from behind,

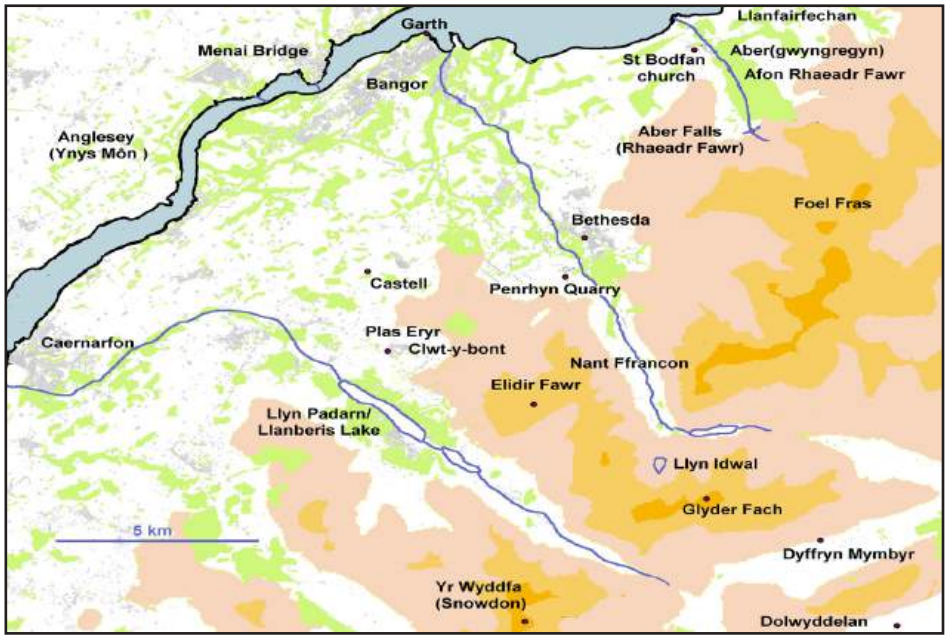


Fig 2 Eryri (Snowdonia) Main places mentioned in the text (traced from OS data)

from the other end of the hall, twinkling through stars etched in the frosted glass; then getting backwards down the stairs into the kitchen to be teased by Sion (John) the coachman and, in turn, comforted with liberally buttered *bara brith* (currant bread) by Sian (Jane) the cook. A quarter of mutton always seemed to be turning on the spit. Teida, my maternal grandfather as distinct from Taid my paternal grandfather, insisted on meat being cooked in the open air; there were always two sides of mutton 'hanging' in the safe outside, as was necessary for the meat to be tender. Only in summer and autumn did we eat lamb.

Upstairs, on the ground floor, the mahogany furniture was upholstered with prickly horsehair, black and very dismal. Teida would be discussing fishing and other outdoor matters with the gamekeeper who would sometimes draw a huge hare from his

Fig 3 Edern, Llŷn peninsula, Gwynedd

poacher's pocket as a gift. Many patients paid their bills in kind; school teachers, ministers, policemen and poor people were not charged at all while those able to do so paid a good fee for the doctor's services. I felt very small then, about as tall as the hare, but I much enjoyed the blaze and crackle of the fire which I could see through the mesh of the tall fireguard.

These are my first memories and about all I can recall of my grandfather's home, looking up the lake to the peaks of Snowdonia. He was a remarkable man; although keenly interested in natural history and familiar with the habits of animals as he was, he had never seen leverets. One night he dreamt of a hare's lay (aka form) beside a certain boulder on the common. Immediately he got up the next morning, went to search and there were the little leverets. He was an agnostic, and though he was married in church and his children were duly christened, presumably for conventional social reasons, we were not allowed to go to church until we were old enough to understand what it was all about. He was revered by the quarrymen whose doctor he was. Towards the end of the century, he became worried by the number and extent of injuries suffered by his patients and discovered that they were compelled to quarry away at a tall pillar of slate from which chunks were frequently and disastrously dislodged. It got so bad that he told the quarrymen that they must insist that the owners blow up the column before they approached that part of the quarry again. The owners refused and this became a factor leading to the first great strike at the turn of the century at the Penrhyn Quarry, described in *The North Wales Quarrymen* by R Merfyn Jones, the consequences of which are still felt today.

Fig 4 Snowdon seen from the lower slopes of Elidir Fawr

We were told that during the negotiations, runners traversed the lower slopes of Elidir Fawr carrying messages and advice between the quarrymen's negotiators and my grandfather's surgery. He was certainly a very rational socialist for he always affirmed, even before the First World War, that if ever nationalisation were to be thought of, it should begin with the land. Politics then did not seem to be so connected with money-making as with pursuing the principles of humanity and social justice. Many quarrymen lived on smallholdings scattered over the mountainside where their wives looked after a pig, some hens and possibly a cow. Others living on Ynys Môn (Anglesey) would rise very early on Monday to walk, perhaps half across the island, cross the Menai Straits by ferry and thence another long walk to the quarry, walking home the following Saturday afternoon. It was a very hard life without any protective clothing or proper gear. My grandfather observed that the families which kept a pig were the most successful in resisting diseases, especially pulmonary tuberculosis because, he said, the *saim* (liquid bacon fat) directly fed the lungs and helped them to resist the effects of the cold and almost continuously wet climate; annual rainfall on Snowdonia being one to two hundred inches.

Taid, my paternal grandfather, farmed at Henfaes (Old Field), Aber, Gwynedd. His family had moved down to the coastal strip from the northern slopes of Carneddau, cleared the good alluvial land of boulders which were used for the farm buildings and the walls of immense thickness dividing the fields. It must have been a vast labour for the boulders were water-worn, rounded, some of cyclopean size and yet all skilfully built into dry walls. The river, Afon Anafon, joined by Afon Rhaeadr Fawr, watered the western boundary of the farm and provided power for the farm machinery; its gentle murmur was just sufficient to drown all other noises so that the farmhouse seemed the most peaceful place on earth, looking south up the valley to Foel Fras and the glories of Carneddau beyond. Northwards the view was across the Menai Straits to Beaumaris which appeared to be continuously bathed in sunshine, due, no doubt, to a rift in the clouds above Foel Fras resulting from katabatic valley winds, thermal winds generated by sunwarmed air rising during daylight hours and, conversely, cooling as evening approached, causing downward moving air during the night.

Due to typhoid germs being carried back in the milk churns from an epidemic in the nineteenth century in Llanfairfechan, my grandfather's generation was decimated. He only escaped because he had gone to New Zealand to make his fortune but he returned to carry on the farm and I have fond memories of this charming Taid. He always put a buttonhole (Christmas roses in winter, jasmine or William Alan Richardson roses in summer) by every breakfast place. He ate a huge duck egg for his breakfast every day and never had salmonella poisoning. After breakfast, he took me out to the *ty bach* (small house) in the garden and put me to sit on the child's seat while he sat on the bigger one for grownups. Then, feeding me treacle toffees which he always had in his waistcoat pocket, he would regale me with fascinating stories of sailing ships and life in New Zealand, the first frozen lamb and hot geysers. It must have been the most hygenic water closet at the time because a stream of water from the trough which fed the water-wheel flowed constantly beneath. The little house was embowered in sweet jasmine and I can never encounter its fragrance without delightful memories of that charming old man in his lovely loo and bless the resulting good habits.

He was very keen on his garden and fruit which included a fine sweet cherry. To keep the hungry birds at bay he used to hang a bell in the tree with a cord attached to it through his bedroom window. When he went to bed, he tied the cord to his big toe so that whenever he moved in his sleep, the bell rang and scared away the blackbirds.

My father was noticed by the headmaster of the village school and persuaded to sit for a scholarship to Christ's Hospital which he won. He arrived in London reading only Latin and Welsh and with but little knowledge of spoken English; his first term must have been intimidating indeed. He sat for his first degree at University College, Bangor, where he misbehaved, being caught climbing through a window of one of the women's hostels; a youthful escapade after which he went on to Aberystwyth. But he was clever, a wrangler at Cambridge, and went on to become a successful and much loved headmaster of Friar's School, Bangor, where his pupils' appreciation of him was as much for the manners as for the sums he taught them.

My father's sister, aunty Dadge, carried on the farm. She had a fascinating and beautiful garden. To shelter it from the sea winds, it had a small wood of beech trees, laurustinus and bay carpeted with snowdrops. In front, separated by a low hedge from the permanent pasture where the dairy herd grazed, accompanied by a billy-goat to ward off contagious abortion, there were myrtle bushes and masses of wallflowers, daffodils, narcissi, honesty and old-fashioned clove scented carnations with Jew's mallow round the corner. The kitchen garden was surrounded by a high stone wall on two sides on which apples, pears and plums were trained; there was an enormous apple called Lane's Prince Albert and a huge pear Pitmaston Duchess. I also remember delicious greengages and an apricot. The third wall carried a trough lined with mosses and ferns along which river water flowed to the water wheel and from which syphons could be arranged to irrigate the soil, producing magnificant raspberries. These, with snowdrops in their turn, were picked and sold by my aunt for charity.

I remember when a storm blew a large limb off one of the trees, taking with it a cavity occupied by a barn owl. An owl box was put up as a replacement, but the owl did not think much of it. My aunt asked "Have you told the owl what you have done and invited him to his new house?" We had not thought of that, so she went with us to talk to the owl and he soon settled down quite happily (just like the rooks in *Precious Bane*).

The garden was divided by paths lined with dwarf box. Monthly roses and all sorts of herbaceous flowers, including *Galtonia candicans*, grew inside with vegetables in the middle of each plot. There was a magnificant patch of Christmas roses, *Helleborus niger,* under the one of the Bramley Seedling apple trees. In the autumn these received a thick dressing of straw and were always in bloom for Christmas.

A favourite walk up the valley led to Aber Falls (Rhaeadr fawr) (Fig 5) where we used to pick crab apples to make into jelly and always, at a small farm on the way, enjoyed a traditional tea of boiled eggs, homemade bread and butter with whole strawberry jam and fruit cake. A little higher up the valley, the owner tried to close the footpath with a locked gate so that he could charge people to look at the falls. Everyone was up

Fig 5 Aber falls (Rhaeadr fawr)

Fig 6 St Bodfan church, Abergwyngregyn

in arms and my aunt, as chairman of the Parish Council, fought and won a long court battle to keep it open. She was the first to be christened in the new church of St Bodfan, opened in 1876 (Fig 6), while my father was the last to be christened in the old.

There was a large cool dairy, built entirely of slate as were the deep shelves around the walls where the pans of milk 'matured' before being skimmed to churn into butter. The churn was enormous, turned by a water-wheel which rumbled on the other side of the wall in its own watery wheel-house. In this house levers could be adjusted to send the power via revolving steel rods in an underground conduit, right across the farmyard to the big barn where it turned the corn mill and chaff cutter. There were little inspection boxes, all made of slate with thick slate covers and it used to fascinate me to watch the bearings being oiled.

A great event was the visit of the itinerant threshing machine. Before the advent of binders, the corn was cut with the newly-imported reaping machine. The corn had then to be bound into sheaves with ropes of hand twisted straw incorporating the inevitable thistles. The sheaves were then set upright into stooks, off which the rain ran. Then the sheaves were transported to the rickyard which adjoined the barn. The wagons had to be skilfully loaded to avoid collapse of the load on its journey to the barn. Years later, in Sweden, I learned that the penalty for this was a bottle of schnapps all round to the loaders. I remember my first load very nearly did collapse while I was lying heavily on the opposite side to prevent it from falling over. The wagon had to be driven to the barn, unloaded and then driven out the other end. But I had forgotten how to stop the horses in Swedish – one shouted 'pwff'– and I had to drive right round again, still clinging precariously to the load.

The sheaves were then built into beautiful stacks, thatched with straw, or later, protected with a tarpaulin to keep the corn dry until the arrival of the threshing machine, which was driven by its steam traction engine with constant danger of fire from flying sparks. The grain was stored in the barn and the straw was then carefully built into stacks again which were perfectly thatched with straw to keep it fresh for chaffing with turnips or mangolds for the cows to eat (this was before the introduction of silage), and for bedding when indoors during the winter. Concentrates and automatic drinking troughs were yet to come and so hand watering was the only way. The corn crop was thus handled eight times before its ultimate use. No wonder there were so many farm workers. After all the noise, heat and dust, I would be washed in a bathtub in front of the kitchen fire to the teasing of Tom Parry, the bailiff. I was then given *possel llaeth* (buttermilk curdled with hot milk) and a *brechdan* (bread and butter liberally sprinkled with sugar). It was all new and very exciting to me, a small boy living at that time in a professional household, in Uppingham, in England.

Another major event concerned the flock of sheep which spent their summers on the open mountain. In spring they were driven up, then later on there was the mustering with clever dogs, the shearing, the branding, the dipping and ultimately the return to home pastures again for the winter. All these operations were very neighbourly affairs among adjoining farmers since flocks from different farms shared the common mountain grazing and communal effort dispatched operations more expeditiously. But every farmer had to be very careful to see that a neighbour did not craftily introduce more than his allotted number of grazing animals while being careful to see that he himself did not understock his own allocation, as in this case someone else's sheep would take over a bit of territory commonly used by his flock. There was no end of friendly rivalry.

When I was three years old in 1913, we moved to Uppingham where my father was teaching and in charge of the Officers Training Corps. He was a good all-round athlete and an excellent teacher (he always said good all-rounders were also good learners). I remember very well when the family had a through-carriage from Caernarfon to Uppingham. The coach, which also carried the furniture, was shunted round at different stations; it was a long journey. I remember my father leaving the train at one shunting to buy a newspaper and we did not see him again for hours. From the station at Uppingham the household goods were transported on a wagon by Mr Baines who had a joiner's shop like the one on my grandfather's farm. Mr Baines was a friendly old man with a white beard and he wore a white canvas apron. In due course he showed me how to use various woodworking tools, which made me feel very grown-up.

We lived in a rambling Edwardian house with a large garden and plenty of space to play; a lawn to play tennis and a large orchard with masses of fruit and big trees in which to build houses. Every tree in the orchard had a ruffle of peonies round its trunk with daffodils and pheasant's eye narcissus in the surrounding grass. It was very pretty. We were allowed to do whatever we liked except tell lies, be cruel or be rude. I don't remember ever being told not to do

something specific; instead we were advised, "I don't think you will like doing this, that or the other, but by all means try it".

We very soon learnt that those things were not worth doing. Often enough it was of course the case that no-one knew what we were up to and one occasion we got into real trouble. We had a black cat with white whiskers and a white tip on the end of its tail. For some reason we did not approve of the white features. We tried ink and black lead but of course these soon licked off. In desperation, my elder sister donned the Red-Cross uniform which she had been given for Christmas. We went to the woodshed, cleaned the axe thoroughly and chopped the end off poor pussy's tail, just as we had heard some dogs were docked. I shudder, but at the time, it seemed logical. We were sent to bed and kept there for three days on only bread and water. My mother was the 'bringer-up' and very fair and tolerant she was too. Only when we were older were matters referred to our father when he just caned us, usually for being rude to people who had injured our dog, or for aiming pea-shooters at them because they were 'hoity-toity' or some other heinous offence.

My mother, whose real name was Dora, always answered to Doli; she had had a very carefully thought-out upbringing; her mother died when she was three years old; the shock turned her father's hair white overnight and he was determined to keep her constantly under his eye. She would go, wrapped up against the cold, in his trap on his rounds morning and afternoon every day of the year until a relative began to teach her lessons, before going away to school. She led a tom-boy life with her brothers during the holidays and one year when Llanberis Lake froze over she was allowed to stay at home from school to skate for two whole weeks as her father said it would never happen again in her lifetime. She used to skate to the head of the lake, hold out her skirts and sail down the three miles to the foot. In turn her children were encouraged to take advantage of every opportunity to learn to enjoy themselves as the chances were unlikely to recur. She had a remarkable brain and great perception as well as perspicacity – an ability to come to valid conclusions on seemingly scant evidence which had the effect of giving her almost oracular powers. To some extent, I know, I have inherited these traits – I am frequently accused of jumping to conclusions and as frequently have some difficulty in justifying them, though I find myself stripping problems to their bare essentials and so coming, almost instinctively to decision. My mother in consequence was a great repository for confidences. She always said, "If you want to keep a secret you must tell no one."

During the First World War, Mr Dawson the postman, came every afternoon to help old Spencer with the vegetables. Mr Dawson was sandy-haired with a moustache, very efficient and a bit intimidating. We kept a splendid black pig and every day the household swill was cooked up with potatoes and any other available vegetables for him and the hens. The hens were not laying well in spite of Karswood Spice and we were very cross when our beautiful playroom cupboard was commandeered to make a scratching shed (the first deep-litter?) in which Brussels sprout stalks were hung up for the hens to jump up and peck. Still they did not lay, in spite of the introduction of a beautiful cockerel. I was told, "It is not time for the hens to lay eggs". A few days later, the whole household was late getting up and the alarm clock was found ticking away in the hen-house to help their ignorance!

My father, in tails and top hat, used to go with us on Sunday mornings to see the pig being fed because he used to like the ecstatic grunts it made when he scratched its back. Old Spencer had a huge shallow trough in the cellar where he used to turn over the sides of bacon in their briney bath. I remember how he caressed the hams while rubbing salt into them with his huge hands. For lunch, he used to cut large chunks of crusty bread and bright orange Leicestershire cheese with his long curved pocket knife which always made us feel very hungry. When rationing came in, I always rode my tricycle with large solid rubbershod wheels down to the International Stores to collect the meagre allocations because the assistant always put in something extra for the 'sweet little boy'; but it was a terrible time for my father because so many of his young 'old boys' were killed so soon after leaving school.

One night, during the First World War, there was tremendous excitement when a Zeppelin came over to bomb the Corby iron works; it was shot down in flames by anti-aircraft guns. For the Christmas holidays my two sisters and I used to be taken to London to stay in Mrs Wiles' flat in Ashley Gardens. It was while staying there that we experienced several air raids. We followed a drill to wrap ourselves in eiderdowns and scurry down to the basement until the 'all-clear' sounded; very dull. Mrs Wiles was a great social worker – her husband was MP for Islington. She started crèches so that mothers could go out to work free of care for their children. She was driving with the vicar one day. He was worried because his wife could not get a maid. This surprised Mrs Wiles because maids were not hard to seek after the war. "But you see, Mrs Wiles, she must be a Baptist". She was astonished, "but do you realise what you are saying? You are a vicar of the Church of England!"

I did not go to school until I was seven years old because my grandfather believed it was bad to force young children. Then I went to Miss Masters' dame school which had Quaker leanings but I could not read when I was nine. Everyone thought I could because I knew the Beatrix Potter books by heart. I just used to look at the pictures which reminded me of the words on the opposite page. Just as years and years later I did a lot of lecturing which was not really lecturing at all but just looking at the slides which reminded me what to say to each. It was only later when quite grown up that I discovered my dyslexia.

We had dancing lessons once a week when we waltzed and galloped and danced the polka. Some Belgian refugees, quite grown up, used to sit and watch. One day we noticed one of the ladies crossed her legs and we saw *he* wore trousers and boots, which we reported in great excitement and indeed *she* turned out to be a *he* spy.

For the long summer holidays, the family went to Porthdinllaen, a ravishingly beautiful bay on the Llŷn peninsula of south Caernarfonshire with Yr Eifl (the Rivals – like a forked radish – but a punning form anglicised) mountain terminating the northern sweep of the bay and Trwyn Porthdinllaen at the western end. The triple peaks of Yr Eifl are the most distinctive features of the northern coast of Caernarfonshire, now part of the coastal Area of Outstanding Natural Beauty. It was where my mother, whose own mother had died young, spent much of her childhood with her grandmother at Peny-y-bryn, Edern. To get there involved a long train journey to Pwllheli,

Fig 7 Portdillaen on the Llŷn peninsula, looking north-east to Yr Eifl

or if one wished to cut off two sides or a triangle and change at Afonwen to Chwilog, whence in a landau to Morfa Nefyn. From Pwllheli, however, there was a splendid green bus with brass fittings and a rack round the roof to stop the luggage sliding off. It was approached up a ladder at the back and children were allowed to sit among the baggage on top. It was great fun because one could be whisked off by low hanging branches of the trees growing along the roadside. One of us kept a look-out and shouted "heads" and we all ducked. Going up the steep hill at Bodfean the conductor walked beside the bus with wood chocks in his hand to put under the wheels if the bus started to slip backwards. Sometimes, the chocks were forgotten and petrol cans had to be used. They held two gallons each and had a cap sealed with wire and were very strong. The final half mile was a walk along the beach to the little seashore settlement.

Porthdinllaen was in the running to be the port of embarkation for Dublin but Telford, followed by Stephenson, built their bridges across the Menai Straits to win the race from Holyhead; a partly-built breakwater, a public house, a smithy to service the shipbuilding and a cluster of houses mark the abortive effort. The main building was to be a hotel on the seashore and it was in part of this building we spent undisturbed summers with the sea coming right round the house glowing phosphorus, at spring tides. We had a dinghy which later sported a sail but were not allowed to use it alone until we could swim. We learnt to swim in three days. We used to set lobster and crab pots, scouring the district for smelly bait. Long lines and a trammel were put out for the night and, at spring tide, we pushed huge prawning nets through the 'sea lettuce grass' or went to collect winkles and look for crab holes on the rocks, only then uncovered. We also went trolling for mackerel with my great uncle who had a beautiful outboard motor made of shining brass and copper. He always carried a primus stove and frying pan in the boat so that we could eat mackerel straight from the sea, "the only way fully to appreciate mackerel", he used to say. One one occasion, when we had gone out into the open sea beyond the point Trwyn Porthdinllaen, the outboard motor failed; there were no rowlocks (they had been left behind), and a big sea was getting up. Strong currents flowed round the point and the tide was beginning to ebb. We had visions of being swept out into the Irish Sea. Oars being useless without rowlocks, my uncle and the youth who helped him used the floorboards as paddles while I tried to scull and steer from the stern with an oar. Somehow we won against the tide. After that the rowlocks were attached to the gunwale as an extra precaution. The trouble was that people sometimes removed the oars and rowlocks and that was why we always took them in when we came ashore. We used to go for long walks along the cliffs looking for flotsam and jetsam and to watch the cormorants drying their wings on their own special rock at Borthwen where ringed plover nested and oystercatchers scurried over the rocks below the cliffs. Further on the rabbit-grazed turf would be dappled with the spring squill (*Scilla verna*), as if sprayed with the blue sea. The flowers were marvellous; primroses (*Primula vulgaris*), bluebells (*Endymion non-scriptus*) and red campion (*Silene dioica*), purple orchis (*Orchis mascula*) and kingcups (*Caltha palustris*) where small streams ran down to the shore and always, hauntingly, the cry of the curlew come down to the shore to feed.

One Sunday, seals chased a shoal of mackerel into a neighbouring bay. The mackerel chased the whitebait which were rolled up onto the beach by the receding tide. As it was Sunday, villagers were out in force dressed in their Sunday best and could not resist the fun. Anything that could be used to catch a fish was used; safety pins dangling on boot laces, even corset laces were seen, prawning nets, umbrellas and bits of underclothing … We were eating pickled mackerel for days afterwards. Now and then a coaster would anchor, high on the spring tide in the shallow bay. Farmers would come down with their horses and carts when the tide receded to collect the cargo of coal. Once a month, the steamship Dora came from Liverpool to the landing stage to unload groceries and general provisions and all the shopkeepers then came down in their carts to collect. We liked the colliers with sails best because they always had a parrot, a monkey and nuts. The SS Dora was sunk by a German submarine; we were all very sorry. She was never replaced as groceries started to come in by motor lorry. One day, shortly afterwards, looking down from high up on Yr Eifl, a shepherd saw the submarine lying in clear water below. He told the coastguard and three warships appeared from different points of the compass. There was shooting of guns and up came the submarine, just as the sun was setting. We were able to see the sailors surrendering silhouetted against the sunset; a memorable sight. We really felt we were in the war.

Porhdinllaen Farm occupied most of the land between the bay and Edern village. It was a large farm, if anything the largest in the district. There was a large pond, near the pigsties with the footpath running between and a large flock of geese, whose gander kept everyone strictly to the pathway. There were also many ducks of different categories and guinea fowl roosted in the apple trees. Old Mrs Williams ruled as a matriarch; she was magnificent, corseted, with tremendous dignity. Every morning the milkman always brought to the seashore the milk, cream and *llymru*, a delicious blanc-

Fig 8 Pen-y-bryn, Edern

mange made of oatmeal eaten for breakfast in summer. The butter and eggs, though, we used to collect as a family. The walk took us over the cliffs, across the golf course where lady's tresses orchids blossomed round the bunkers and along the lane whose high banks were covered with harebells (*Campanula rotundifolia*) and toadflax or wild snapdragons (*Linaria vulgaris*), rest-harrow (*Ononis repens*), devilsbit scabious (*Succisa pratensis*) and other charming wild flowers, all alive with countless butterflies which is why we called it Butterfly Lane. We always went to the front door of the farmhouse, flanked by big hydrangea bushes and herbaceous phlox; we were told they all looked very healthy, like those in most gardens of the village, because they were watered with washing-up water (they evidently liked the phosphate). The front door opened into a square hall with a large millstone as a centre piece in the stone floor. We would be shown into the cool parlour and Mrs Williams would appear with mugs of cool milk or buttermilk for us to drink. The round pounds of butter with a cow stamped on top would be packed with eggs into the basket which had two hinged lids to keep everything safe. It was a real ritual and always fascinated me as a child. One day we were taken to the huge kitchen. There was a big *simnai fawr* (open hearth) at one end and the other end of the kitchen was filled with straw. Large oatcakes, some eighteen inches in diameter, were being rolled out on the table in the middle and then baked on a tripod over a fire in the wide hearth. I suppose sufficient oatcakes were made to last a year. I also remember seeing the ladder left lying against the wall outside which I now realise was for young swain to do their courting in bed as was the custom.

Following the normal farm harvest, there was another harvest of hay to be gathered from the large village common, some distance from the farm, on the other side of the village. The whole village participated and huge pails of tea and baskets of food were carried there to succour the harvesters. It was lovely hay, full of wild flowers and we all had little rakes to help; almost a scene from Brueghel.

During the summer months and from time to time, my great-uncle lived at Pen-y-bryn (Fig 8) adjoining the common in a small manor house dating from the late seventeenth, early eighteenth century. The parlour could not be used because of dry rot and there were huge mushrooms growing out of the staircase wall until he renovated the house, which killed the mushrooms. My great-aunt was huge, presumably because she was an exceptionally good cook. She taught us as children to make *cyflaith* (treacle toffee) which we rolled out into long thin sausages and cut up with scissors. It was a favourite Christmas treat for all the children in the village and kept them quiet in church as little black dribbles ran from the corner of their mouths. On New Year's eve, the village lads had great fun changing round people's gates; some gates were carried considerable distances to exchange with those of a farm at the edge of the parish. Sometimes it took weeks for people to find their own gates again and many were the jokes of passers-by. Then first thing on New Year's day the children came round knocking at doors and piping *calennig* when they were each given a penny.

There was a small stable and coach-house and an outdoor kitchen across the farm lane with a walled kitchen garden beyond, mostly given over to fruit trees. There were apple, pear and plum trees with Irish Peach and Worcester Pearmain apples and plum to eat off the trees with William pears and Victoria plums to be released from their little cages put round them to keep out the wasps. One day the rest of the family went to walk up Garn Fladryn (Madryn mountain) in the middle of the peninsula. I was considered too small and was consoled with lemon curd sponge cakes and Stones ginger beer. We exchanged signals with the climbers using mirrors to reflect the sun.

My great-aunt was really too fat to walk anywhere much. She used to drive down to Porthdinllaen in a pony and trap and go home laden with lobsters and crabs and prawns and fish from the trammel. There was an elm wood by the house with undercover of ivy and hart's tongue ferns and many hedgerow trees along the lane. I still have the dresser which used to stand in the *neuadd*, the large room in the house; it is contemporary with it, being seveenth century and was made by an itinerant joiner. He would call to select a suitable oak or elm tree which could be felled. After an interval, he would return to cut it into planks to season and ultimately he would return again to make whatever pieces of furniture were required. I can remember my great-aunt Louisa washing the plates in a bowl on the table after a meal and putting them back on the dresser, ready for the next meal. The spoons and forks hung from slots in the front of the shelves.

A public footpath to the church (Fig 9) ran in front of the house so we used to see many people coming and going about their business. But adders lived in the lane so one had to walk carefully. We were told where the bottle of potassium permanganate crystals was kept in case we were bitten; but thank goodness, I never had to put one on a bite.

I am undyingly grateful for the happy youth I shared with my two sisters. Our mother used to say, "It's a lovely day, off you go and enjoy yourselves for, remember, the oppor-

Fig 9 Eglwys St Edern

tunity will never come again". Later she used to tell us that the object in life was to be happy and the only condition was not to make anyone else unhappy in the process. She used to think of the repressive puritans of her youth who frowned on frills and furbelows and thereby suppressed the Welsh people's love of colour. They were allowed to sing in chapel and in consequence most of their emotional expression went into that though people were shocked when we sang *Men of Harlech* to harmonium accompaniment. "We only play that for hymns on Sunday" our landlady said. I recall being told how they remembered in the time of their youth the men-folk sitting on one side of the aisle while the women sat on the other, as I found some congregations still do in some other countries. The preacher would wax so eloquent, he would go into *hwyl*, a peculiar Welsh intonation of fervour; and women would roll in the aisle, exclaiming "Hallelujah". Religion meant a great deal then and people, though shockingly repressed, were more disciplined in consequence. My mother had considerable visual appreciation herself. She was the first pupil at the Bangor County School for Girls under Miss Mason of whom she thought a great deal. Miss Mason was keen on antique furniture and Persian rugs. My mother went on to the University College where she played hockey and tennis, under a huge handicap, for Wales, before graduating in botany from Bedford College, London; she and my father were keen botanists and these factors no doubt influenced the development of my later career.

Following the First World War, when I was nine, we moved from Uppingham to Bangor where my father became headmaster of Friars' School. It was an appropriate appointment in that he was a good teacher, a good disciplinarian and a local boy from Aber; he also had tremendous charm and tact. He started his college days at Bangor University College and walked across Penrhyn Park, by special permission, most days. He always carried two button-holes, one for himself and one for his friend, Robert Roberts who shared rooms on Glanrafon Hill with his sister, later my mother, and his two brothers, before they went off to do their medicine.

My sisters and I found life more constrained under the influence of lingering puritanism in Wales, but we had friendly aunts nearby to visit. One great-aunt in particular was very popular. She always gave us seed cake and a small glass of Malmsey (Madeira) at eleven o'clock in the morning (our mother would have been horrified), when we went every week to pore over *Country Life* and the *Illustrated London News* in her home full of old Welsh furniture. These two journals were formative in our developing appreciation of art and news and views before the days of radio and television. The arrival of the first radio crystal set was immensely exciting. We all sat round in a circle with earphones and heard messages from Colwyn Bay twenty miles away. Later the cat's whisker was superceded by a two-valve Marconiphone with spade tuning. It took two people to tune it in and it had an amplifier by its side with a horn loudspeaker which dispensed with the earphones, but required frequent recharging of high and low tension batteries. Then we used to get '2LO' London calling!

Another great aunt gave us *crempog*, Welsh pancakes with *llys* (bilberry) jam for tea. She had a delightful red, green and gold tea service and silver lustre cream jugs and basin; she would first pour a little milk into the cups (to protect the glaze), then half fill with tea, then cream, before finally filling up with tea. There was a theory that hot tea poured into cold milk coagulated the casein in the milk, making it indigestible, but my aunt wanted to protect her porcelain; was this the origin of MIF one wonders? Welsh teas were a great and filling event. To do them justice as children we forewent lunch and ate nothing but protein for supper. In addition to *crempog* there might be tea cake also served hot, *bara brith*, sponge cake, sandwich cake, seed cake and fruit cake; we had to be persuaded to sample the lot. As a variant to tea cake, there might be *teisen gri*, Welsh girdle cakes. Her brother was a very grand gentleman farmer, a JP and High Sheriff. At the time of the introduction of nitrogenous fertilisers, I remember he overfed his precious Lenten roses, (*Helleborus orientalis*) and killed the lot. That was how I learnt about osmosis.

Our home was on high ground above the tunnel for the railway from Bangor to Holyhead. The whole of Snowdonia (Eryri) from the Yr Eifl (the Rivals) in the west to the Great Orme in the east stretched out in front of us and behind, on the north

Fig 10 Nant Ffrancon pass

side of the house, the Menai Strait with Anglesey (Ynys Môn) beyond. A favourite Sunday walk was down to the Menai bridge built by Telford a century earlier across to the Strait, up to the higher road beyond the town and on to the Garth Ferry. The road ran above the wooded scarp, sloping down to the water, with clear panoramic views of the mountains, even better than from our home. For one penny, one could ferry cross to Bangor to complete the circuit home through the Siliwen Woods beside the Strait.

Harking back to her childhood no doubt, when her father took her out in the pony-trap every single day, my mother was addicted to driving out into the countryside, visiting or maid hunting; she claimed it was good for her liver; in fact we suspected the reason for so often running out of petrol was to prolong her journeys. We had a T-Model Ford, fitted with a soybean body, with a hood which folded back like a pram, and a dicky seat behind. It took three people to drive, because my mother got tired of holding down the clutch gear lever in low gear to go up hills; my sister did that while I blew the coaching horn which the driver of the last stage coach to Holyhead gave to my mother as a child. It was necessary to go backwards up steep hills because the reverse gear was lower than the two forward ones. One day going over the Menai suspension bridge, my mother's hat blew off and flew behind at the end of a long coil of hair; she let go of the steering wheel to catch it! She had forgotten to tie the long motoring scarf to hold her hat down and fortunately escaped the fate of Isadora Duncan. In addition to the strangely arranged gears, there was a weakness, no doubt due to the heavier fitted disc wheels, for we frequently saw rolling away in front what proved to be one of our front wheels.

At about this time, my father used to take me botanising up Nant Ffrancon Pass (Fig 10) to the Devil's Kitchen above Llyn Idwal where we were lucky enough to see the Snowdon lily (*lloydia*) unique to Snowdonia, in flower (Fig 11). We collected many flowers and, I now regret to say, plants which I carried home in a little vasculum I had been given. I planted them among the rocks which outcropped here and there around the house. Alas, not all of them grew and I suppose that was when I began to be aware of ecological relationships, especially concerning Parsley Fern of which I am particularly fond. Water also fascinates me, the way it flows through the countryside and through pipes and along leats; in fact one of several recurring dreams which run like serials in book or film form, concerns the origin and destination of a water or river course, sometimes disappearing underground like the river Mole and emerging out of a tunnel and then coming out of a tap to join

Fig 11 Snowdon lily, GNU licence

the mainstream.Unfortunately there was no natural water in the garden but I made a fountain and diminutive rill out of a large flower pot, rubber tubing from the lab and a fountain-pen filler for the jet. I also pressed wild flowers and slowly learnt their names and so my interest in flowers developed.

During this period, I suffered most childish illnesses, the worst of which was discovered, after much investigation, to be paratyphoid, apparently caught from the septic eye of a pet rabbit; this put an end to pets. I missed Jemima, an old Aylesbury duck most, but these illnesses were always amply compensated by special dishes which were served up to encourage the appetite, the most delicious of which I remember, was Asparagus Chicken from Harrods. Since that time, I have been cut various ways but I have persistently enjoyed good health which I feel must be due to a healthy diet and plenty of exercise. My grandfather was often heard to say "Eat a little of everything and then you miss nothing". He amalgamated the various dishes of each course of a meal into delicious mixtures so, as children, we became familiar with all the different flavours and so acquired taste. My favourite was bacon, egg and *lafwr* (laver bread), mixed with cubes of fried bread for breakfast. *Lafwr* is a paper thin seaweed gathered from the rocks at low tide in and around Swansea Bay. After cooking it is formed into small cakes, coated with oatmeal and traditionally fried with bacon.

Recipes for this and twelve other Welsh dishes then conclude Bodfan's original typescript. Sadly space does not permit the inclusion of these, but perhaps, in my opinion, this is a logical point to draw this article to a close. The essential intention here being to focus on the places and experiences of his early upbringing which he frequently admits to having been formative, notably his love of sublime landscape and interest in plants so important in his subsequent professional life as a practising landscape architect. [Editor]

Previous publications from Bodfan Gruffydd's 'autobiography' can be found in other *Landscape Issues* at:

Discovering a calling for landscape architecture, volume 17, May 2018, pp 56-67

My philosophy and practice of landscape architecture, volume 18, May 2019, pp 33-50

The importance of travel to a landscape architect: a European perspective, volume 20, May 2021, pp 76-90

The landscape architect abroad: an American interlude, volume 21, September 2022, pp 39-66

The photographs illustrating this article except Fig. 11 were taken in October 2024 by the Editor and the two maps drafted using Ordnance Survey source material from 1:25000 maps and DTM terrain data.

CHELTENHAM COURSE NEWS

Obituary: Alan Steeves-Booker

Alan Steeves-Booker, former tutor on the landscape course and affectionately known as Booker, died in August 2024. He was responsible for graphics teaching from the late 1970s through to 1991 when he retired, and he will probably be remembered most by those many students who were inspired by his style and enthusiasm, the imaginative short exercises and longer projects he devised and by his insisting only on the best design outputs. In later years he developed the application of video to physical models, producing amazing footage of landscape experiences in walk-through simulations, shown to best effect in the 'urban projects' based on London cityscapes (see image below).

In his own words, he "showed the students how to forget the fine art context in which their course was set and to develop a method of seeking for ideas by what I called the ten second sketch. I was required to lecture on the role of religion in every day and sacred landscapes, a subject for which I was in no way qualified, but I used film, dance, music and memories of my midnight discourses with [local vicar] Henry Morgan in order to open the imagination of the students."

Apart from the teaching commitment, Booker also had a major hand in curating the 'end of year' student exhibitions which showcased their work to staff, external examiners and prospective applicants to the course. This visibility was responsible I am sure for the very favourable reputation bestowed on the course by various landscape practices seeking new recruits.

Landscape architecture at Cheltenham owes him much as a charismatic indefatigable member of the course team who developed a robust and relevant curriculum to achieve CNAA honours degree status, later to underpin course restructuring into the modular scheme now common in universities. Graphics teaching was then, as now, an essential component in forging the synergy between the academic foundations and primary design activity of the profession. This is what Booker did par excellence.

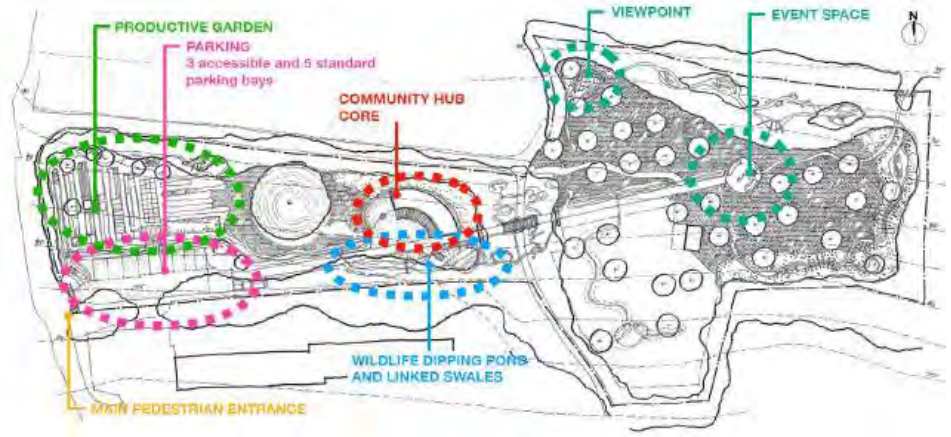
Robert Moore

Community Design Charrette

The week beginning 28th October 2024 was scheduled as a Community Design Charrette — The Community Gardens Community Interest Company (Charlea) owns a circa 3 acre (1.2ha) site in Brimscombe, Stroud, consisting of two fields: the Play Area field, recently acquired from a developer following three refused planning applications and now much neglected and in poor ecological condition. The other field also acquired

has been recovered from an overgrown state. The project aim was to create a Community Farm and Gardens which will become a significant facility both for the immediate community and also for the whole parish of Brimscombe and Thrupp.

Students formed two groups who independently undertook research and analysis of the site conditions and possibilities, focusing on the requirements in the brief, which were: natural children's play encouraging creative activities; keeping livestock to manage the land but also promoting husbandry; a productive garden for growing food, carefully sustaining the soil; hydrological design involving rain management; planting of orchard trees, hedgerows, vines and establishing nesting boxes; creating new habitats and picnic areas; ultimately to create a natural space for health and wellbeing, exercise and social events. The drawing below shows the student ideas synthesised.



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