

Planning and designing green infrastructures

Milton Keynes, the “Forest City”

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Abstract: This article presents the case of the British New Town of Milton Keynes. Programmed in 1967, this true urban laboratory is the setting of numerous experiments. From the origins of green infrastructure in landscape planning to city planning, we will explore how its designers contributed to preserving and creating habitat areas for wildlife. The landscaping project implemented is sophisticated and detailed, designed according to a search for efficiency in a long-term perspective. Milton Keynes foreshadows some of the current challenges related to territorial development and green infrastructure.

Keywords: Milton Keynes, landscape planning, road verge, park network

Introduction

To participate in this special session, I have chosen to present a case study of Milton Keynes, a New City in England. This article is organised in three parts. The first identifies the contextual elements necessary to understand the city's project and its challenges, the second details Milton Keynes' specific landscape planning and the third puts into perspective the contributions brought through this project in relation to current issues.

1. Origins of an urban laboratory

The New Town movement began in England in 1946, following the publication of the New Towns Act. This document preceded the planning of around thirty new cities over a period of about thirty years, exceeding by far the initial objective to develop ten cities. The creation of these cities or city extensions took place during the reconstruction period following the Second World War and aimed to unclog the capital city of London, which had become saturated by polluting industries and insalubrious. Milton Keynes is one of the last planned New Towns and is the most important and ambitious New Town developed in Britain.

Programmed in 1967, Milton Keynes is implemented at a later date and in different circumstances as compared to the first New Towns. Reconstruction in the context of the creation of the first New Towns is marked by a strong development of industries accompanied by an improvement of living



conditions and an increase in household consumption. The quest for opportunity and freedom of choice defines the time of Milton Keynes' construction.

Milton Keynes' master plan was designed between 1967 and 1970, just before the two oil crises of 1973 and 1979, which deeply impacted consciences and economies worldwide. These crises, among other situations, became triggers for ecological awareness. The 1970s and 1980s were defined by the development of a great variety of experiments around alternative lifestyles and autonomous housing systems. (Maniaque, 2014, p. 52-76)

Influenced by this historical context and the experience of previous New Town developments, Milton Keynes is projected to offer a new way of life, redefining housing, work, travel and entertainment. Abundant experimentation on sustainable housing was carried out in the 1980s and today autonomous vehicles are developed and tested in the New Town. Also, its urban planning is one of its most highlighted assets today, both in terms of its heritage value and as reference for future planning.

The development area designated for the implementation of Milton Keynes was made up of agricultural land and composed of about ten villages that were integrated into the city project. Several master plans were produced, the first one by Bucks County planner Fred Pooley and later by the planners of the Milton Keynes Development Corporation[1] (MKDC) before a feasible project could be achieved, taking into account the budgetary constraints imposed on the designers. Very different planning solutions were considered thanks to Milton Keynes' status as a New City, where almost everything was to be conceived and created from the beginning.

The city of Milton Keynes presents a number of specific urban and architectural features. We will focus on the development of green and natural spaces, one of the major aspects of city planning conditioning the quality of living environments. We shall see how issues that arise today related to territorial planning are already taken into consideration in this context.

2. Green infrastructure: policy tool and precedents

Today, fifty years after Milton Keynes' planning, European natural areas are degraded and their role as habitat for a great number of animal and plant species is compromised. To respond to this situation, the European Environment Agency (EEA) aims to develop green infrastructures as planning policy tools. And so, the European Union in its *green infrastructure strategy* recommends that they be fully integrated into spatial planning policies.

Gorm Dige (2015) explains that green infrastructure is a tool to understand the advantages offered to human society by nature, and to mobilise investments to sustain and enhance these benefits in order to generate ecological, economic and social services through natural solutions.

Here we borrow the EEA definition of green infrastructure as explained by Gorm Dige (2015) and defined as a strategically planned network of natural, semi-natural areas and green space that provide ecosystem services. These services, defined as supporting our well-being and quality of life, include water and air purification, biodiversity conservation, biomass production or the mitigation of surface runoff. A combination of services can thus be obtained from one vegetated area. Most of these services are essential but require significant investment and maintenance efforts when they are implemented as “grey”[2] infrastructure solutions, while green infrastructure solutions prove more socially advantageous and less expensive.

Green infrastructure is a spatial and ecological concept aimed at promoting the vitality and resilience of ecosystems. It helps to preserve biodiversity and promote ecosystem services for the benefit of humans, such as reducing the effects of global warming, identifying and preserving critical habitat areas and connecting them.

In 2015 the EU biodiversity strategy aimed at preserving and improving ecosystems and their inputs through green infrastructure by 2020 and for 15% of degraded ecosystems to be restored.

Once again, according to Gorm Dige, green infrastructure remains a new and complex concept for which there is no widely recognised definition. He also points out a lack of indicators and quantitative analyses.

However, Mayté Banzo (2015) explains that green infrastructure originates in landscape planning, which is defined as the development of the urban environment through the landscaping of “open spaces”. This planning model was introduced by Frederick Law Olmsted [3] (1822-1903) in the 1870s in the United States and aimed at ensuring a connection between landscape spaces at different scales, organising the city around public spaces and landscaped traffic lanes (Banzo, 2015, p. 7). The green belt imagined in Ebenezer Howard's garden city project (1850-1928) falls into the green infrastructure project category. In fact, Ebenezer Howard and Raymond Unwin (1863-1940), with whom he collaborated, as well as Patrick Abercrombie (1879-1957), who put into application his recommendations for the Greater London Plan (1944), incorporated what is known today as green infrastructure in their development projects (Banzo, 2015). The Modern Movement dissociates urbanised areas from agricultural or natural areas but integrates tree-lined walkways as part of the urban tissue (V7 walkways, according to the categorisation of roads proposed by Le Corbusier (1933)), mainly in linear form, which ensure the continuity of habitat of animal and plant species (Corbusier, 1933). According to Le Corbusier, parks and tree-lined walkways allow wildlife species to travel across the city. Their linear shape is similar to the layout of traffic lanes allowing vehicles and their users to move within or around the city.



Figure 1 - Grid road, park and river network plan, Milton Keynes. Source: from the author and Campbell Park, Silver photography, November 2018. field research. Source: from the author.

The green infrastructure, considered as a policy tool by the EEA, stems from previous work related in particular to landscape planning. It is therefore possible to enrich future green infrastructure projects with elements from theories and applications developed since the end of the 19th century. Consequently, Milton Keynes allows us to study the application of principles defining the green infrastructure approach.

3. Milton Keynes: supporting for the creation of natural habitats

Before 1967, most of the geographical area defined for the implementation of the New Town of Milton Keynes was composed of agricultural land hosting a small variety of wild animal species and few habitat areas. Wildlife in rural areas is therefore under great pressure from the use of pesticides (Kelcey, 1975) and monocultures. Animal species would take refuge in hedges, on roadsides and in the few remaining forests. Most of these habitats were already the product of human intervention.

When Milton Keynes was conceived, two linear parks crossing the city from North to South were designed with the aim of safeguarding natural areas as biodiversity reserves. The Grand Union Canal and the River Great Ouse are two pre-existing natural or semi-natural elements. They host a variety of fauna and flora that the designers of Milton Keynes chose to preserve. The two linear parks are connected through the Milton Keynes city centre, as shown in figures 1 and 2. It is an area of activities and businesses with a lower density of vegetation and a lesser variety of species as compared to the parks, but which aims at ensuring ecological continuity.



Figure 2 - Diagram of the park network, Milton Keynes. Source: from the author.

As Michael Edwards (2001) reviews the history of the City's planning project, he explains that the dense land reservations along grid roads result from specific traffic related changes. Initially the main roads had a speed limit of 50km/h and intersections were managed by traffic lights. Activities, housing structures and bus stops were to be implemented along these main roads. But as traffic lights are replaced with roundabouts, automobiles start circulating at 100km/h and houses and activities are pushed away from the grid roads and into the grid squares, as shown in figure 3. The density and activity zones, initially located along the main roads, are moved and end up being implemented in the middle of sectors, which has consequences on the activity of local centres and on the use of public transport. The entire organisation of neighbourhood units is also affected. And so MKDC planners and landscape architects propose a landscape plan to be applied along the grid roads.

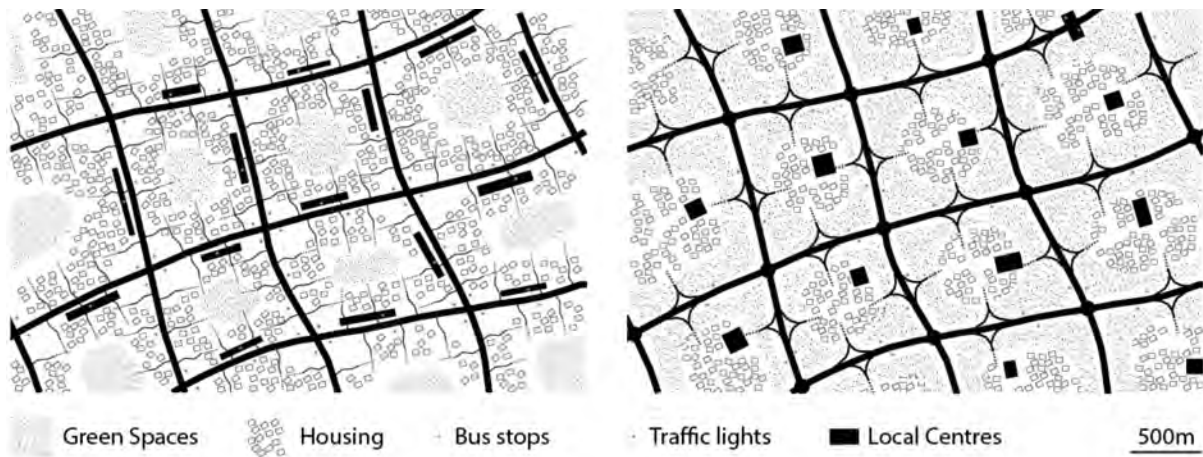


Figure 3 - Sector organisation around grid roads - project/development. Source: Edwards, 2001. Redrawn by the author.

4. Roadsides in the service of ecosystems

This landscape project is detailed in the *Ecological Studies of Grid Roads in Milton Keynes* (Kelcey, Milton Keynes Development Corporation, 1974). One year after the publication of the study, John Kelcey, a member of the MKDC, writes an article in the journal *Urban Ecology* (Kelcey, 1975) in which he analyses the development of road verges in the New Town from an ecological perspective, focusing on the diversity of wildlife habitat areas along roads.



Figure 4 - View of a grid road. Silver photography, November 2018, field research. Source: from the author.

The *Ecological Studies in Milton Keynes, Grid Roads* (1974) show that the design and implementation process developed into four phases and included recommendations for short- and long-term maintenance. Diagrams (plans, sections and drawings) shown in figures 5 and 6, were

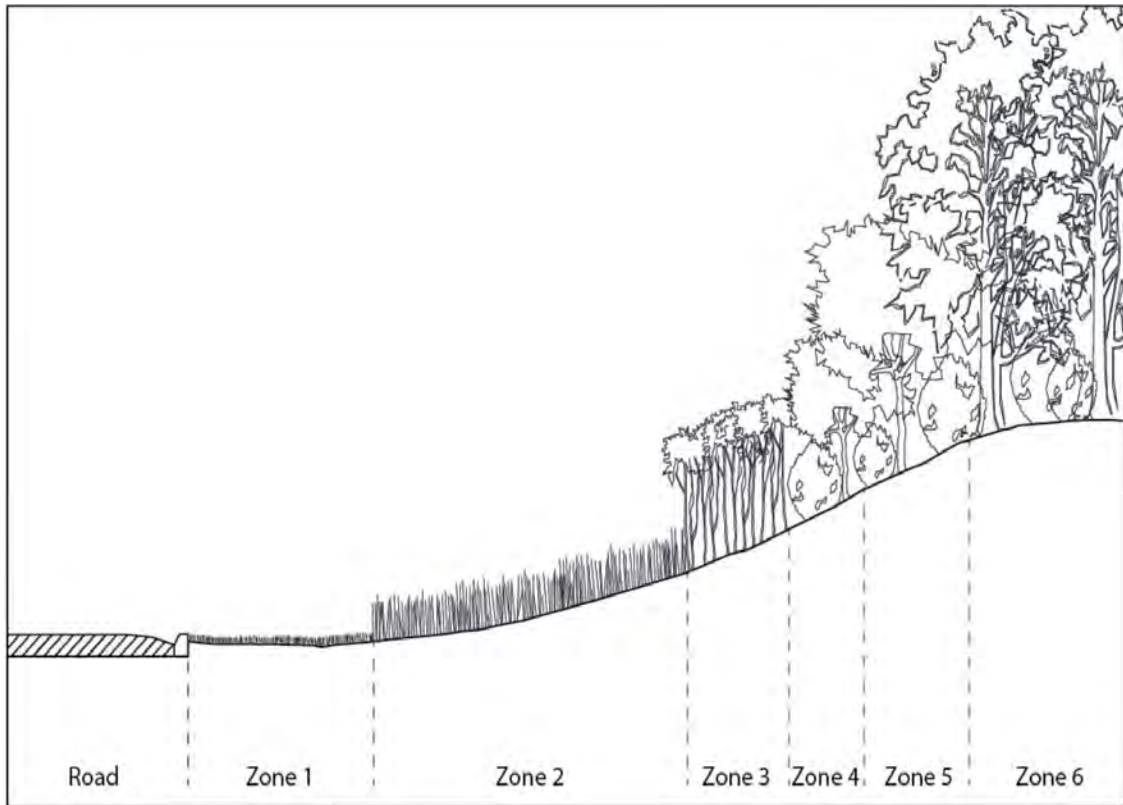


Figure 5 - Section across a grid road verge sowing the zonal structure. Source: Kelcey and MKDC, 1974. Redrawn by the author.

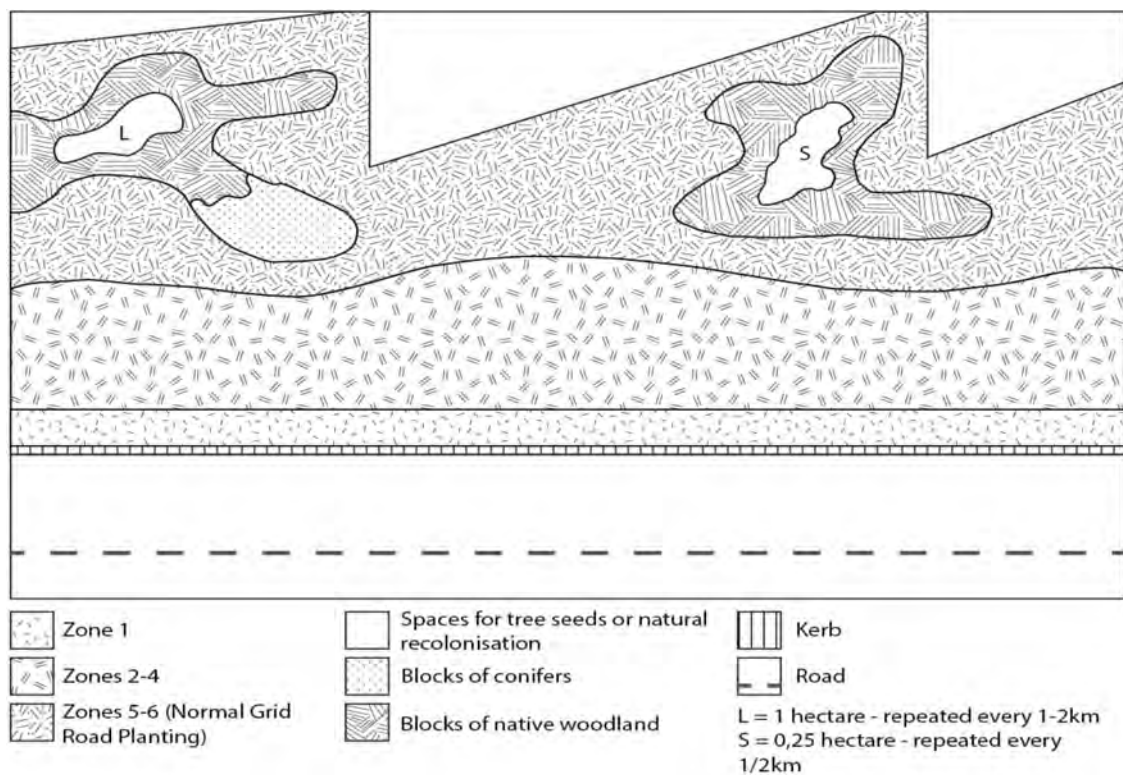


Figure 6 - Plan of grid road zonal structure. Source: Kelcey and MKDC, 1974. Redrawn by the author.

produced in order to provide landscape recommendations for roadsides. The proposed spatial organisation is intended to produce variations that are pleasing to the eye. The diversity of plant species provides a wealth of habitats for animal species and can therefore accommodate a variety of animal species present on the site. Grid roads are a unique means of creating landscaped areas that can compensate for or even increase the quality and variety of habitats for animal species. This potential improvement is due to the fact that agricultural monocultures preceded the city, limiting the diversity of natural habitats.

The recommendations made are detailed and define planting areas and the vegetal species to be included, taking into account the maintenance required in the short term and long term.

In terms of design, roadsides are divided into zones, structured together. Each zone plays one or more specific roles. The plant species that make up each area and the frequency of their maintenance are specified in the landscape plan.

As shown in figures 5 and 6, Zone 1, a strip one to two metres wide, hosts grasses that require mowing three to four times per year while Zone 2 is occupied by medium-length grasses, to be cut once every year. Zone 3 is home to tall grasses that require cutting once every two to three years. Lastly, Zones 4, 5 and 6 require some intervention during planting and in the years following planting, and very little maintenance once the plants are developed. Zone 4 is mainly composed of shrubs that form a visual screen between the road and the residential areas. Zone 5 is planted with small trees and shrubs. And Zone 6 is composed of forest trees combined with plant species found in Zones 4 and 5. An urban planning rule determines that the tallest buildings may not exceed the height of the tallest trees. This landscaping treatment makes it possible to circulate on the grid roads almost without seeing the city. What makes MK its name as a forest city.

In addition to spatial instructions, the *Ecological Studies, Grid Roads* (1974) state that certain roadside areas are to be used to sow seeds and plants from threatened areas elsewhere in the city, particularly during the construction phase of the project. Other areas are saved to carry out experiments making it possible to assess the impact of the use of certain soil types. Specific recommendations are also given for the maintenance of green spaces. For example, it is specified that no herbicides may be used except under exceptional circumstances. These clarifications provide indications as to the designers' vision, leaning toward respecting wildlife and preserving soils.

5. A quest for efficiency and sustainability

The process of designing and setting up vegetated areas along grid roads unfolds over four stages, each playing a particular role to ensure the quality of the final result. As stated by John G. Kelcey (1975), the first stage concerns engineering and landscaping, that is, the study and development of

conditions for the implementation of the future green infrastructure. This involves levelling the ground, making embankments or excavations and managing the slopes and type of soil, which are mainly dictated by the layout of grid roads and can be modified by engineering design. For example, on portions of grid roads located near residential areas, the excavated soil generated through road construction activities is used to create mounds that reduce vehicle noise. The second stage consists of depositing a layer of soil on the surface of the developments carried out during the first phase, then sowing a mixture of grass and herbaceous plant seeds. The third stage concerns the planting and short-term management of vegetation, This stage extends until the canopy is almost closed and therefore includes the required maintenance to control the development of vegetation during the first five to six years. Once the canopy is closed, the weeds give way to woody plants requiring less frequent interventions. It is specified that landscape project design and maintenance activities are complementary and may not be considered separately.

This organisation demonstrates that MKDC aimed to take into consideration the investment and maintenance required to operate the infrastructure, from the design phase and with a long-term perspective. This reflects a systemic vision and a search for efficiency defining the overall project as well as guiding the design of all of the city's infrastructure and facilities. While efficiency issues and even profitability issues in some areas remain central, MKDC never underestimated the aesthetic value of all solutions considered.

6. The aesthetics of diversity

John Kelcey (1975) explains the decision to incorporate non-local plant species. England is not a region that naturally hosts a wide variety of plant species, so the designers chose to import plants from other regions that are compatible with the local climate in order to provide variety in landscaping. The designer made sure that these new species did not compromise the natural habitats of animal species or even increase biodiversity - variety was mainly sought-after due to its aesthetic appeal. The Ecological Studies on Grid Roads, (Kelcey, MKDC, 1974) specifies in Appendix 1 that trees and shrubs must be planted randomly in order to achieve a natural appearance.

The aesthetic research linked to landscape design carried out throughout Milton Keynes is often associated with the notions of variety and diversity.

7. Milton Keynes, an example in the face of current challenges

- The quality of the living environment

Philippe Clergeau (2012) invites us to consider environmental issues in the city as requiring an “act of construction and reinforcement” of natural spaces, instead of a few measures aimed at avoiding their degradation. Today, landscape design is an intrinsic part of sustainable development and is no

longer practiced for merely sanitary or aesthetic purposes. Indeed, many ecosystem services can be made available through green spaces and are classified into three categories according to the Millennium Ecosystem Assessment, as follows: provisioning (production of food and water, biomass), regulating (of ecosystems, climate, disease) and cultural (aesthetics, recreation). These three categories of ecosystem services contribute to the well-being of dwellers across the cities and territories concerned, through four essential components: security (food, access to resources), access to basic needs (a balanced nutrition, employment, housing), health and social relations. These four components grant opportunity and freedom of choice (Millennium Ecosystem Assessment, 2005), precisely one of the conditions that Milton Keynes originally aimed to provide (Milton Keynes Development Corporation, 1970a and b).

The three categories defined by the Millennium Ecosystem Assessment concern ecosystem services potentially provided by green infrastructure. In practice, oftentimes they remain under-developed or untapped. The first category of services, provisioning, is rarely effective. Indeed, the food sovereignty of cities is an issue in the transition debate, and today many cities are unable feed local populations. On the other hand, objectives in terms of aesthetics and recreation are most often met, and the importance of green spaces in connection to climate regulation issues is also generally acknowledged. Open spaces such as parks or tree-lined ways are used for walking, contemplation or to find a cooler spot when the weather gets hot. However, further information is still needed to determine the impact of vegetation on urban heat islands and to specify the species and forms that are better performing.

- Questioning density through mobility

Richard Llewelyn-Davies (1966), who joined MKDC at the time of its creation in 1967, invites us to start a reflection on density and urban quality. He questions density in relation to traffic, considering the fact that many households own one or even two vehicles and pointing out a strategic threshold beyond which the travel time savings made possible by density no longer compensate for the increased maintenance costs of the latter. Between hyperdensity and urban sprawl, the English choose an intermediary situation, whom R. Llewelyn-Davies himself qualifies as being either the golden mean or a combination of the worst characteristics of each of the two extremes.

As for Milton Keynes, we can mention oversized road infrastructures in relation to the density currently supported by the city. Indeed, one hundred and sixty kilometres of expressways criss-cross the New Town on a grid of about one-kilometre intervals, for a population of 250,000 inhabitants. Grid road traffic is congested at peak times due to the intensive use of private vehicles by a majority of unaccompanied drivers[4]. A shift toward new mobilities, collective or even autonomous, which

seems to be a trend in Milton Keynes, could allow for an optimised use of the road infrastructures already in place.

8. Conclusion

Milton Keynes, being a New Town, functions as an “urban laboratory” and as an experimental site for housing, mobility and landscape related developments. The aim of this article is not to offer recommendations for the implementation of efficient green infrastructure solutions, but to understand the objectives and choices made in this context by taking into account local characteristics and available resources. The case of Milton Keynes allows us to question aspects of urbanity that are being re-evaluated today, and which are common to many cities, such as density, mobility or our relationship to the landscape and to the ecosystem services on which we depend.

Browsing through studies and reports dating back to the city's construction period, we can see an evolution of the terminology and notions used in the field of landscape ecology. What was referred to as an interest in wildlife turned into a quest for the preservation of biodiversity and the search for a diversified flora involving ecosystems. Numerous and increasingly published studies on environmental issues have contributed to a redefinition of terms, but the designers of Milton Keynes put forward, as early as in 1967, a global vision that included life protection and soil preservation in an environment inhabited by humans. The proposed project is phased in the short term and in the long term and takes into account the management and maintenance of spaces from their conception. Many spaces are self-regulating, which testifies to the project's quest for efficiency and cost control. MKDC, the entity responsible for the design, financing and maintenance of green spaces and the entire city, aimed at creating and maintaining a quality environment for human life. The choice was also made to preserve soil quality and biodiversity. Operational, political and spatial dimensions linked to the development of parks and roadside areas prefigured the current notion of green infrastructure.

Milton Keynes, a project that stemmed from the New Town movement, is in continuity with the English garden landscape tradition while at the same time integrating elements from the radical break represented by the Modern movement. As such, this example helps to deconstruct the myth of a polluted, polluting city versus a rural, natural countryside. Urban areas can be a refuge for animal species driven away from cultivated areas by pesticides and other soil sterilisation processes. The landscape project is designed to represent the aspirations of the designers over the long term, i.e. seventy-five and one hundred or fifty years after its creation and so Milton Keynes may be perceived as a young and evolving venture, a future example and a viable context for experiments aiming for a more optimal use of ecosystem services provided by an existing green infrastructure.

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[1] The Milton Keynes Development Corporation was created to oversee the planning and design of the New City and coordinate its construction. It is a planning and governance body. The creation of each New Town is accompanied by the formation of a Development Corporation. Milton Keynes' was dissolved in 1992.

[2] "Grey" infrastructure involves the construction of elements such as roads or evacuation networks, often limited to a single function.

[3] F.L. Olmsted is known as the "heir" to Andrew Jackson Downing (1815-1852) - himself considered the founding father of garden art in the United States - because of the convergence of their work and the fact that Olmsted, with Calvert Vaux (1824-1895), designed New York's Central Park, while Downing was suspected of doing so but died early in a boat accident. Downing was greatly influenced by Humphry Repton (1752-1818) who was responsible for the first road segregation.

[4] Observations made during fieldwork, May 2019.

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