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Kourmouli, Angeliki; Lesniewska, Feja

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OPINION PAPER

Losing Ground: Targeting Agricultural Land Take by Enabling a Circular Economy in Construction

Angeliki Kourmouli[1,2] · Feja Lesniewska[3,4]

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Abstract
Among the numerous causes of soil degradation, one of the most severe and difficult to reverse is land take. Land take results in the loss of valuable ecosystem services that negatively impact soil health, especially in agricultural areas. The main drivers of land take are increased provision of housing, schools, hospitals, industrial and commercial sites, transport networks and infrastructures, mines, quarries and waste dumpsites. Globally, the rate and scale of land take is increasing. Given the impact on soil ecosystem services such as the carbon, hydrological and nitrogen cycles, preventing agricultural land take is essential if the triple planetary ecological crises of climate change, biodiversity loss and pollution are to be addressed. Most countries use sustainable management techniques to limit land take by development projects. In this opinion paper, we argue that the circular economy concept could help to establish an alternative perspective on how to understand and address the agricultural land take problem. Law and policy need to foster a systemic transition to a circular economy throughout the entire construction sector's multiple material life cycles if it is to significantly reduce land take. We use England as a case study to show how the UK government can revise and build on current policy to enable a transition to a more circular construction sector. The case study provides valuable lessons for other countries at a crossroad on land use policy on how fostering a circular construction economy can reduce land take and maintain agricultural soil's ecological services.

Keywords Land Take · Circular Economy · Soils · Construction · Policy · England

✉ Feja Lesniewska
f.lesniewska@surrey.ac.uk

Angeliki Kourmouli
a.kourmouli@lancaster.ac.uk

1 Lancaster Environment Centre and Interdisciplinary Circular Economy Centre for Mineral-Based Construction Materials, University of Lancaster, Lancaster, UK

2 Birmingham Institute of Forest Research (BIFoR), University of Birmingham, Birmingham, England, UK

3 School of Law, University of Surrey, Guildford, UK

4 Interdisciplinary Circular Economy Centre for Mineral-Based Construction Materials, University College London, London, England, UK

Introduction

There is no simple solution to restoring soil health, and a holistic approach is necessary given the inherent variability found in soils globally. Considering the lengthy timeframes of soil formation and restoration rates, conserving existing soils should be of equal, if not higher, importance, than restoration initiatives. One measure that could contribute to maintaining existing soil health, as well as to soil restoration, is to minimise land take practices, especially in agricultural areas. Land take is an increasing problem for countries globally, especially where it results in agricultural land loss. Land take is 'the area of land "taken" by infrastructure itself and other facilities that necessarily go along with the infrastructure such as filling stations on roads and railway stations' [1]. Land 'taken' for development has a significant impact on soil health and ecosystem functionality, altering interactions with the water cycle, the atmosphere due to carbon loss and soil biodiversity loss [2–7]. However, the impacts from development are not restricted solely to the construction site itself. The materials used in construction including those extracted, processed and manufactured into products as well as waste disposed at waste facilities also result in land take. The construction industry is one of the world's largest consumers of natural resources; for example, the global usage of sand and gravel reached 50 billion tons in 2020 [8]. Construction and demolition waste also accounts for more than a third in volume of all waste generated globally [9]. Current initiatives, such as revising voluntary codes of practice, requiring site management plans and reducing waste to landfill and storage hubs, used to address the impacts of construction on soils including those on 'taken land', are not radical or systemic in their approach. The initiatives give limited attention to reducing land take through supply and demand side measures to increase material efficiency within the construction sector itself.

In this opinion piece, we focus on the interconnections between construction and land take to show how an alternative approach in policy can be achieved by transitioning to a circular economy. We use England as a case study to show the potential there is in the near term through policy to enable a transition to a circular construction economy that will contribute to reductions in agricultural land take. England[1] is a good example of a country that is at a crossroad in land use policy making. Formerly an EU member state, the UK has not followed the union on soil and land take policy. The EU, in part driven by the UN Convention to Combat Desertification pledge for no net soil degradation [10], reiterated in its 2030 Soil Strategy a target of no net land take by 2050 [11]. As of spring 2023, the UK government has yet to publish a clear soil strategy and/or targets on reducing land take.

We make the case for England to adopt a no net land take target by 2050 within a wider policy strategy to enable a transition to a circular construction economy. A no net land take target would stimulate policy adoption to enable a more rapid transition to a circular construction sector. Greater circularity would significantly contribute to reducing virgin material demand, including land, and help meet a range of environmental targets including net zero carbon emissions, zero waste and biodiversity protection. The paper begins in the 'Land Take: Drivers and Impacts in England' section by outlining the drivers and impacts of land take in England; the 'Building an Alternative Perspective on the Land Take Problem' section then sets out why the concept of a circular construction economy

[1] The four nations of the UK, England, Scotland, Wales and NI, each have distinct soil types and land use. The UK parliament primarily governs England, while the devolved administrations set most of their own policies and legislation. In this paper, we focus on England.

helps to reconfigure the land take problem and how to resolve it. In the 'Policy Gaps and Opportunities' section, before the 'Conclusion' section, existing policies relating to soils, land take and construction are reviewed to highlight how new initiatives could foster a transition to a circular economy and help stop England losing ground.

Land Take: Drivers and Impacts in England

The Earth's land is a finite and shrinking resource. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, for example, states that land needs to be restored to support 'biodiversity and ecosystem services vital to all life on Earth and to ensure human well-being' [12]. Soil, one of the essential components of land, is a non-renewable, limited resource. It is defined as 'the layer(s) of generally loose mineral and/or organic material that are affected by physical, chemical and/or biological processes at or near the planetary surface and usually holds liquids, gases and biota and support plants' [13]. Soil supports multiple ecosystem services, such as producing fuel, fibre and food, interacting with the atmosphere, as a component of carbon and nitrogen cycles (storing carbon and regulating greenhouse gas emissions). Moreover, soils are interacting with the hydrological cycle, providing flood mitigation as well as nutrients' filtering, acting as a biological control of pests and diseases, and detoxification. Soils also provide raw materials and physical support, enabling high diversity of microbial and faunal taxa, as well as human activities (socio-economic, industrial and technical structures) and cultural needs (spirituality, sense of place and aesthetics) [14, 15]. A combination of industries from minerals and fossil fuel extraction to agriculture, as well as urban development, threaten soil functions and ecosystem services [16–18]. The challenges for countries to transition to more sustainable land use practices, including agriculture and development, are significant. Restoring soil health is increasingly understood to be necessary if the triple planetary ecological crises of climate change, biodiversity loss and pollution are to be addressed [19].

Demands on England's land territory are increasing year on year. A growing population with high consumption-based living standards drives demand for investment in development projects including housing and infrastructure such as road building. Meeting these demands sustainably within planetary boundaries presents significant challenges to all stakeholders. England has a land area of 13,046,001 ha, of which about 70% is used for agriculture, about 9% of land is classed as urban development and 10% is forested [20]. Between 2010 and 2022, over 14,400 ha of the UK's land surface was converted from prime quality agricultural land to urban development, with 55% of the development being private housing [21]. In 2022, approximately 170,000 new homes were built [22]. The use of prime quality agricultural land for new developments, not just residential housing but also industrial and infrastructure developments, has seen an unprecedented one-100-fold increase since 2010 [21]. The land take area since 2012 accounts for 0.6% of England's total prime agricultural land; this is equivalent to the land area required to produce the daily calorific value (in vegetables) to feed two million people for an entire year [21].

As well as building residential housing to meet demand, new pressures for land take are coming from policies to decarbonise energy by expanding renewable energy infrastructure and storage capacity. In April 2022, the UK government published the British Energy Security Strategy that proposed a quintuple increase in solar capacity to 70 GW by 2035 [23]. Analysis estimates this will require an additional 464 km^2 of land for ground-mounted solar panels, equivalent to around 0.5% of the land currently used

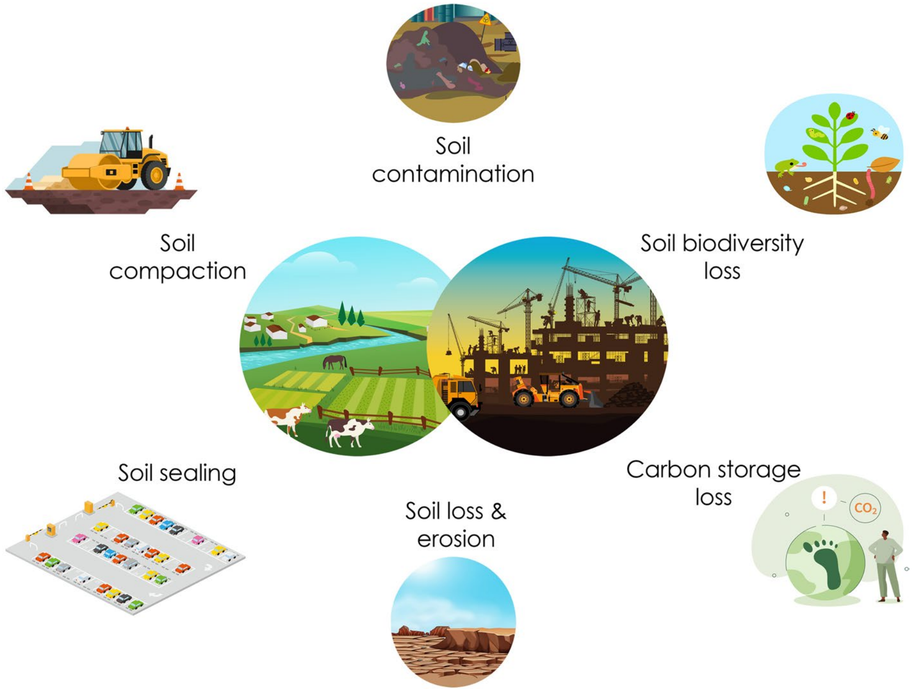

Fig. 1 On-site impacts of construction on soil

for farming [24]. The impact on soil health of solar farms depends on variables such as scale, design and associated infrastructure for storage and maintenance [25]. Despite the trend of increasing agricultural land take in the UK, it receives limited attention in policy [26]. Exactly how and why planning decisions to build on specific sites are approved in England is often the result of a complex and contentious process between stakeholders from the local to the national level [27]. The UK affords some protection to farmland through green belt zones and a brownfield first approach, although some of these policies have been progressively diluted and left to the discretion of local authorities [28].

Once agricultural land is taken for development, the process of construction leads to various impacts on soils (Fig. 1) and related ecosystem services. The impacts of construction on soil are compaction, contamination, sealing, soil loss and erosion, loss of carbon storage and loss of soil biodiversity. The effects of construction can severely compromise the ecosystem services that soils support. Firstly, construction materials such as concrete, paving and asphalt create impermeable surfaces resulting in soil sealing that impedes exchanges between above-ground and below-ground environments [29]. Soil sealing affects hydrological cycles, nutrient and carbon cycling, climate and microclimate regulation, loss of habitats for soil organisms and biodiversity [30–34]. Secondly, during a development, heavy vehicle traffic, construction material storage piles and improper soil stockpiling cause soil compaction, both of topsoil and subsoil. Soil structure during compaction is damaged with no pore space left for water and oxygen to go through, resulting in the loss of a soil's flora and fauna. Together, soil compaction, erosion and loss of soil organic matter were estimated to cost £1.2 billion a year in England and Wales in 2015 [35]. There is no simple solution to restoring soil health after compaction. Simply adding back the topsoil that was removed will not restore the soil and its functions in the short to medium term.

Where soils are not sealed or compacted on construction sites, they will be recovered, removed or classified as waste, often then ending up in landfill. In 2018, in England, over 55% of the material deposited in landfills was soil (29.5 million tonnes), double the amount of what was reused and recovered (13.1 million tonnes), while the amount of soil needed to return a landfill site back to usable land is a fraction of this (12.7 million tonnes) [36]. The Waste Framework Directive (2018) limits the opportunity for soils to be reused off-site; if there is no immediate defined use identified or it is a surplus, then it is considered waste and is disposed of to landfill [37]. The situation is exacerbated by poor practices within the construction sector ranging from sham recovery activities, non-compliance and enforcement of quality protocols and waste characterisation, misuse and/or abuse of permit exemptions and sale of products that do not meet the end-of-waste criteria [38–40].

The impacts from construction projects both on- and off-site are unsustainable at scale and over time. Soil formation is a slow process. Different soil formation processes operate at vastly different timescales, ranging from milliseconds (e.g., transport processes) to thousands of years (e.g., weathering), so the regeneration of soils naturally is an extremely complex process [41]. On average, soil formation occurs at a rate of approximately 0.03 mm per year [42]. This should be contrasted with land use impacts, including the rapid erosion rates in modern arable agriculture, approximately 3.9 mm per year [43]. Considering the lengthy timeframes of soil formation and restoration rates, conserving existing soils should be of equal, if not higher, importance, than restoration initiatives. One measure that could contribute to maintaining existing soils, as well as to soil restoration, is to adopt policies to minimise land take practices, especially in agricultural areas.

Building an Alternative Perspective on the Land Take Problem

The concept of a circular economy can help to develop an alternative perspective on the interconnections between decisions, by both policy makers and business, on land use and the problems associated with agricultural land take. The economic model underpinning existing land use decision making is based on the linear take, make, dispose perspective in which sustainable management is viewed as being able to address negative impacts such as pollution and ecosystem service degradation. The sustainable management concept continues to dominate policy approaches to addressing agricultural soils and land use. Yet, a more radical strategic holistic strategy is needed to prevent agricultural land take arising due to development.

A circular economy is a regenerative economic system focused on maximising the reuse of resources and products to minimise the use of virgin raw materials and waste throughout the entire life cycle [44]. It is a contrast to the current linear take, make, dispose dominant economic model. Schroeder et al. [45] and Rodriguez-Anton et al. [46] argue that a circular economy would help contribute to achieving several of the UN Sustainable Development Goals (2015) including soil health, sustainable production and the built environment. Research demonstrates the potential benefits of transitioning to a circular economy within the agriculture sector (both arable and livestock) for soils

[47–49]. However, we argue that transitioning to a circular construction sector would potentially offer further opportunities to protect and improve soil, including agricultural. The interconnections between the beneficial impacts for soils of transitioning to circular agricultural and circular construction sectors have to date not received detailed research. A circular construction sector could deliver significant reductions in land take and result in ecological benefits, including those functions related to soils, through reducing demand for raw materials and generation of waste [50, 51]. Increased circularity within the construction sector would reduce the flow and extend the life cycle of materials from the points of extraction to development and disposal [52]. Minimising the demand for new raw materials such as rock, sand, lime and gravel could reduce land take occurring from expanding existing quarries or opening new ones. By fostering a range of initiatives such as circular design for disassembly and reuse, minimising demolition and incentivising retrofit of existing building stock, the nexus between development and material use could be decoupled [9, 53].

Determining the actual amount of land take savings that can be achieved by increasing circularity in the construction sector will require data gathering, modelling and analysis. Established methods can be drawn on and developed further to gain a more accurate picture of how transitioning to greater circularity in construction can contribute to reductions in land take and impacts on soils. Combining methods such as material flow analysis and life cycle assessments can help to expose the origins, use and final destination of materials throughout the construction supply chain by bringing together different data streams. Mapping and land use data can be used to identify impacts not only on carbon from land use changes but also on ecosystem services. Realising these opportunities however would require there to be a systemic policy and regulatory landscape to enable a transition to greater circularity. One way to achieve greater policy coherence is to adopt strategic targets. Perspectives about the interconnections between land take, development and construction would only be radically reconfigured if interconnected targets were adopted drawing on circular economy principles, including prevent, reuse, recycle, recover and regenerate.

Targets are commonly adopted to achieve objectives in monetary, social and environmental policy such as inflation, housing and greenhouse gas emissions. Using targets is popular within policy because they are practical, measurable and focused on delivery [54]. Targets place a limit on the availability of a resource or right to perform an activity to help to alter perspectives about what is normatively (and often legally) acceptable behaviour. Adopting targets can also spur innovations in policy making [55]. However, to be effective, targets need to be evidence based using a realistic baseline and supported by enabling policy. Oversight combining monitoring systems and governance frameworks is required to ensure accountability and non-compliance of targets is addressed [56, 57].

There is increasing interest in how targets in policy can be used to enable a transition to a circular economy. Circular economy-related targets already exist for distinct domains such as resource efficiency, recycling and recovery rates [58]. Linking data across indicators on efficiency, use, reuse, recovery, recycling and recovery throughout the life cycle of materials and products could provide comprehensive temporal and spatial knowledge sets for decision makers on how to increase circularity. A changing knowledge landscape could provide the paradigm shift needed in perception of the interconnections between land take, land use decision making and construction that is needed to enable policy making for a circular economy.

Policy Gaps and Opportunities

Enabling a systemic transition to greater circularity in the construction sector to achieve reduction in agricultural land take will require coordination across several policy domains, including environment, development and planning. Since withdrawing from the EU, the UK has had an opportunity to revise existing laws to develop a national approach to enabling a circular economy including in both the construction and the agricultural sector. The UK initially demonstrated its intention to transition to a circular economy after leaving the EU in the legally binding 25-Year Environment Plan (2018) [59] and the 2020 Waste (Circular Economy) (Amendment) Regulations) [60]. Subsequently, the circular economy has continued to be referred to, albeit often vaguely, by the UK government in strategy and policy documents on decarbonisation, industry, agriculture, infrastructure and waste [61–64]. The approach taken in England to the circular economy remains fragmented, lacking an integrated systemic approach across the policy and law landscape. The focus in policy making continues to be on waste reduction and efficiency by adopting targets for recycling and reducing landfill rather than preventing waste generation. As this section shows though, there is scope to begin to build on current policy initiatives to foster a more circular approach in the short to medium term that would set in motion a longer-term transition that reduces waste, virgin raw material demand and land take.

Soil and a No Net Land Take Target

The UK government currently does not have a unified and comprehensive approach to preventing land take and maintaining existing soils [65]. Commitments relating to soil were only included for England in the first Environment Improvement Plan (2023) [66] after being excluded from the Environment Act (2021) [67]. The legally binding commitments included producing a baseline map of soil health by 2028, to bring at least 40% of England's agricultural soil into sustainable management by 2028 and increase this to 60% by 2030 [66]. There was also a commitment to publish a Land Use Framework in 2023, setting out how multiple demands on land can be balanced, including climate change mitigation measures, infrastructure and biodiversity conservation. Details of the Land Use Framework have yet to be published.

There is an opportunity to incorporate a no net land take target by 2050 in the Land Use Framework that is being developed. A target would help to drive law and policy decisions in other domains such as construction, agriculture and planning to achieve no net land take. A target would operate in a similar way to the 2050 net zero greenhouse gas emissions target which included in the Climate Change Act (2008) [68]. A long-term target needs to be accompanied by shorter intermediate and realistic targets, supported by incentives to encourage the reuse and restoration of brownfield sites. The definition of land take adopted for the target should be clear-cut enough to avoid too flexible local interpretations that lead to inconsistencies. A land take hierarchy could be adopted through planning law to encourage densification and reuse of existing urban or industrial areas such as abandoned areas and brownfields and restoring degraded neighbourhoods after appropriate reclamation measures have been implemented. The opportunity needs to be taken in revisions to planning law under the UK government's Levelling Up and Regeneration Bill (2022) [69] to include requirements that developments should be aligned with achieving a no net land take target adopted in a Land Use Framework. This will also help to achieve other commitments on sustainable development, climate change, biodiversity, water and other environmental laws.

Planning and Agricultural Land

Planning is central to whether land is protected from or used for development projects. In England, a longstanding basic measure was adopted to protect agricultural soils in 1953. The Agricultural Land (Removal of Surface Soil) Act 1953 (amended 1997) made it illegal to remove surface soil from agricultural land without planning permission [70]. In relation to green field sites, the National Planning Policy Framework (NPPF) advocates that the best agricultural land is preserved from development and poorer quality agricultural land be used preferentially [71]. Both the NPPF and the Guide to Assessing Development Proposals on Agricultural Land [72] utilise the Agricultural Land Classification (ALC) system, which was established in 1966, to determine if development planning decisions can use agricultural land. However, there is scope for 'exceptions' under planning law to permit developments on protected sites and agricultural land. As Lee and Abbott note, planning law is 'slippery' when it comes to preventing development on protected lands [27]. Such levels of land take are often greater than permissible despite the apparent legal protections available.

The ALC system itself is problematic though as well. The ALC's five grade classification system means low-grade agricultural land can be used for developments. The ALC system categorises land using five grades (grade 1 being 'excellent quality' and grade 5 being 'very poor') to identify the 'best and most versatile (BMV) land' and protect it from development. However, the ALC system is limited as it determines only the quality of the agricultural land, without considering further the soils' ability for self-regulation, resilience or stress symptoms. As such when ALC surveys are performed for development purposes if the soil does not meet the higher quality agricultural land criteria, there is no consideration given on the impacted soil's functions. The ALC system either needs to be revised or a new system should be introduced taking into consideration the soils' ability for self-regulation and resilience as part of the ecosystem in a more holistic approach rather than focusing only on physical attributes. A new system will be necessary to support initiatives to advance more circular construction policy under a no net land take target.

Construction Soils Reuse, Recovery and Disposal

The focus on soils within construction under the current linear economic model is on managing impacts and excavated material once planning for development is approved. There are policies in place advising multiple recovery pathways for construction soil, such as agricultural and ecological improvement schemes [73]; however, the most widely pursued recovery pathway is for soil use for civil engineering purposes [74]. Much of the guidance available is voluntary. The industry-led Definition of Waste: Development Industry Code of Practice (DoWCoP) is a voluntary code launched in September 2008 (revised 2011) (applicable to England and Wales) by the Contaminated Land: Applications in Real Environments (CL:AIRE) [75] that was initiated to provide a clear and concise process to determine whether excavated materials on a development site constitute waste in the first instance and to identify the point when treated waste can no longer considered waste. While the Code of Practice for Sustainable Use of Soils on Construction Sites [76] is non-legally binding it does highlight the importance of soil functions and provides guidance on best practices to prevent poor managment of soils on construction sites.

Figure 2 depicts the available pathways of soil management under current regulation in England. Soils can be managed both on- and off-site. Soils can be reused on-site under the DoWCoP, outside of the regulated waste management, under the Waste Framework

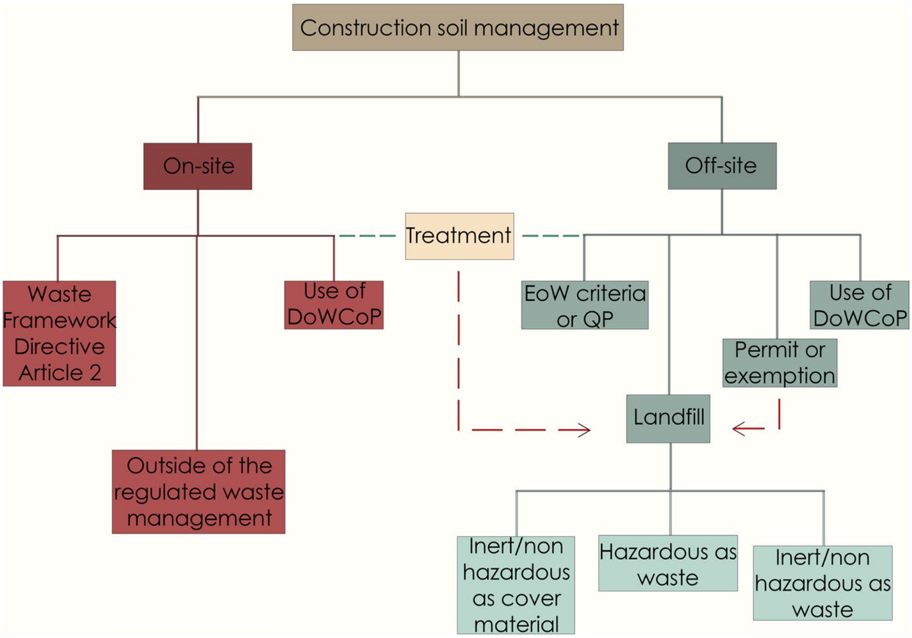

Fig. 2 Soil management pathway under current regulation in England for soil arising from construction

Directive Article 2. Soils can be reused off-site under the DoWCoP, with permits or exemptions, after meeting the End-of-Waste (EoW) criteria or following Quality Protocols (QP) or sent to landfill. In landfill, they can be either disposed of as waste (inert/non-hazardous or hazardous) or used as cover material in inert/non-hazardous landfills. Soil treatment is available for both on- and off-site management.

The First Environment Improvement Plan (2023) [66] included a proposal for a revised code of practice for the sustainable use of soil on construction sites. The revised code specifically aims to reduce soil disposal by landfilling. In England in 2016, 51 million tonnes of soil were excavated in construction projects, approximately half of which went to landfill [77]. In England, there are two landfill tax bands (£102.10 per tonne of active waste and £3.25 per tonne of inert or inactive waste) presenting a cheap opportunity for developers to dispose of their surplus soil. Over 90% of the soil coming from construction and demolition sites is considered inert, thus posing no threat to humans and the environment [36]. A pilot soil reuse and storage depot will start by 2026, whereby landfill-bound soils can, instead, be remediated for reuse and then stored at banks until needed [78]. The reuse of soil is an important factor in the Waste Strategy (England) and transitioning to a more circular construction economy.

Although reducing soil to landfill may be an indicator of transitioning to greater circularity within construction, there need to be policies in place and supporting regulation to stimulate changes in industry practice if land take is to be reduced. A low hanging fruit for the UK government would be to end value added tax (VAT) on retrofitting of existing building stock, to deter unnecessary demolition of stock. Currently, the VAT for new build developments is zero, whereas any refurbishment, repair or maintenance activity incurs 20% VAT. This disincentivises the potential of a circularity concept in the industry and increases the demand of land take for new development activities. Supporting regulations and standards on reuse of products such as modular raised flooring or recycled content in materials such as concrete can also contribute to reducing land take demands. The government can stimulate circular innovations through the market by using procurement and subsidies to invest in businesses. Investment will bring security for investors in innovations that can enable a transition to a circular approach in construction and development, helping to meet the no net land take target.

Data Gathering, Land Take and Modelling Construction Impacts

Digital technologies can help to foster a transition to a more circular construction economy, one that minimises land take. Reliance on ALC data is not sufficient for assessment of a proposed site for development. Depending on the type of development and statutory importance of the site, impacts of projects on soils need to be considered. Currently, EU-derived Environmental Impact Assessment (EIA) under the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 are used to assess the effects of developments on soil functions [79]. In England, EIAs however may soon be replaced by Environmental Outcome Reports (EORs) if a proposal in the 2021 Levelling Up and Regeneration Bill is adopted [69]. It will be the Secretary of State who has the power to set the environmental outcomes, but they should do so with 'regard to the government's Environmental Improvement Plan' [66]. Access to a broad range of data will be integral to developing effective EORs.

The UK Soil Observatory, as well as the baseline map of soil health (promised in the first Environment Improvement Plan, 2023), will be valuable sources of information for potentially modelling how proposed construction projects increase land use demand and their impact on the environment. Digital technologies can be used to provide insights ex ante for planners, developers and other stakeholders into the potential for land take of adopting a particular project. Digital twins could also be a method used to simulate the potential land take savings from adopting different circular construction pathways. Although such tools exist and are currently used especially for modelling climate change impacts of policy interventions, there is scope for using them to build knowledge about the interconnections between construction and land take. Research and development on integrated indicators to map the Sustainable Development Goals (2015) could be a useful source of information on combining diverse data sets to guide policy interventions [80, 81]. Lessons can be learnt from processes to develop embodied carbon assessment indicators for life cycle assessment of construction projects. Gathering information and making it publicly accessible to support innovation that minimises ecological impacts and, where possible, contributes to ecosystem regeneration will hasten the transition to circularity.

Conclusion

In this opinion piece, we have argued that the circular economy concept offers a new perspective on understanding drivers behind land take and agricultural soil loss. Both land take and soil loss are significant problems globally especially with urban expansion to meet housing and infrastructure demands, including those generated by climate change net zero policies, from a rising human population. The construction sector's entire material supply chain from extraction to disposal results in significant land take and detrimental impacts on soil ecosystem services. Existing linear economy sustainable management strategies to manage competing land use demands and impacts from development do not offer long-term solutions. We argue that by identifying the interconnections between land take, development and construction and transitioning to a circular economy, there is scope to develop policy interventions across a broader landscape to stimulate targeted outcomes that reduce pressure on soil ecosystems. By transitioning to a circular economy, the construction sector can address its own challenges such as resource use, carbon emissions and waste generation, but also compliment a circular agricultural sector by reducing land take and soil ecosystem degradation.

England, the case study, offers an example of a country with limited surplus land available that is already losing agricultural soils to increasing development demands. This is a situation that many countries are facing. The UK government has as yet not recognised the opportunity that transitioning to a more circular economy, especially within the construction sector, could hold including for more sustainable land use in which land take is minimised. The government has not followed the EU in adopting a soil strategy and a no net land take target. In this opinion piece, we argue that there is scope though to build on current policy initiatives and act boldly to proactively tackle the problems of land take, development and related soil degradation. The UK government should firstly adopt a no net land take target by 2050 like the EU after which other supporting policies, such as planning constraints and revisions to the ALC system, will be needed so the target can be met. Introducing a zero VAT retrofit, supporting market innovation through procurement contracts and subsides for circular construction business will, among other measures, enable a transition to a circular construction sector. Finally, the UK government should work with the UK Soil Observatory to build up a soil data repository to guide future land use planning to advance other policy domains such as climate change, biodiversity and waste. Using data to understand the connections between policy domains will be integral to achieving a circular economy, and this will be the case for land take, construction and agricultural land use planning.

Reducing land take is imperative to protecting soil functions and ecosystem services. A circular economy can play a crucial role in minimising land take and reducing soil degradation from development projects. To do so, however, a more coherent systemic approach to policy is needed across all sectors including construction and agriculture. More research is needed to explore the interconnections between sectors and how existing policies and regulations shape those relations. Modelling of future policies is also needed to understand if implemented collectively whether they will enable a country to prevent land take and soil degradation.

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Author Contribution Feja Lesniewska—original concept.

Both authors contributed equally to the research, drafting, editing and revising the paper.

Angeliki Kourmouli—infographics.

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