Chapter 11
Land Sparing and Land Sharing: Rural and Urban Drivers of Ecosystems Services Delivery in the Netherlands and UK

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Abstract This chapter builds on notions of land sharing and land sparing, to cover contemporary ecosystem services (ESS) governance challenges. Attention is paid to how such challenges affect rural-urban dynamics. Empirically grounded in the UK and the Netherlands, land sparing/sharing possibilities are explored from distinct rural and urban perspectives. Dutch policies to introduce circular farming could radically reduce the environmental impacts of agriculture, while also reshaping landscapes around the city of Ede. In Gloucestershire, peri-urban growth offers possibilities for integrated urban green infrastructure and/or enhancement of dispersed and protected rural landscapes and habitats. These binary notions of land sparing/sharing can distinguish and characterise different ESS delivery orientations, in terms of regional rural-urban interdependencies. Studying both urban and rural dimensions of ESS indicates the need for innovative governance of ESS. The chapter calls for more comprehensive insights into rural-urban land use features, interactions and outcomes, to unravel and plan sustainable ESS governance.

Keywords Land sharing · Land sparing · Rural-urban synergies · Ecosystems services governance · Circular farming · Urban expansion

11.1 Introduction

Drawing on case studies in the Netherlands and the UK, this chapter considers how distinct rural and urban perspectives inform attempts to integrate eco-systems services (ESS) within land uses. In particular, the binary concepts of land sparing

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(LSp) and land sharing (LSh) are revisited as a way to delineate urban and rural ESS perspectives. Originally conceived of as a way to optimise the balance between agriculture and biodiversity, LSp foresees the location of intensive agriculture in areas of the most productive land, while separating and protecting (sparing) areas of rich biodiversity from cultivation. By contrast, LSh foresees the integration of food production and ecological enhancement in the same areas (Phalan et al., 2011; Rabbinge et al., 1994). In this chapter it is suggested that LSp-LSh debates, while closely focused on biodiversity, inadequately illuminate rural-urban links.

In the Netherlands, emerging circular farming policy agendas foresee fundamental changes in the way that rural food production is organised, while in the UK, green infrastructure enhancement has the potential to incorporate ESS within urban expansion plans. Studying urban and rural dimensions of ESS, particularly for their connectedness and interdependence, indicates the need for innovative governance of ESS, including the need to align different views on contemporary rural-urban synergy potential. Typically, urban citizens are characterised as users or receivers of rural ESS (Castan Broto et al., 2012; Holden, 2004), with notable exceptions from urban agriculture (e.g. de Zeeuw & Drechsel, 2015) and urban ecology (Goode, 2014). ESS governance in urban spaces falls to city councils (e.g. through planning policies or flood risk engineering), but in rural areas more often to the provincial offices of national agencies (such as environmental or agricultural ministries): these are two distinct governance levels, policy arenas and activity sectors with limited connection (Curry et al., 2014).

This chapter specifically seeks to illuminate how the binary concepts of land sharing and land sparing are associated with contrasting attempts within ROBUST to optimise/sustain ESS delivery in two different rural-urban constellations.

The two cases represent a range of radical policy developments, driven by multiple challenges including climate change and its impacts, the poor environmental performance of agriculture, expanding urbanisation and its implications for feeding urban populations and, in the context of this chapter, Brexit, which excludes the UK from the Common Agricultural Policy, the European Commission's emerging Farm-to-Fork Strategy and its 'parent', the European Green Deal. In response to these differentiating dynamics, we ask:

- How can rural and urban ESS delivery features be examined with the help of the binary concepts of land sharing and land sparing?
- How do contrasting land use optimization orientations affect rural-urban dynamics and ESS governance?

In the case studies which follow, Dutch circular farming ideas focus on agro-ecological versus agro-industrial inspired rural ESS delivery futures, as an outspoken rural representation of the LSh versus LSp binary. This rural representation is notable in the light of population densities in Ede municipality[1] (373/km^2) and

[1] https://www.citypopulation.de/en/netherlands/admin/gelderland/0228__ede/ accessed 8th March 2023.

Gloucestershire county (242/km^2) (Census, 2021), which highlight their peri-urban characters. The UK case introduces an urban equivalent by linking various ESS including biodiversity, flood risk management and access to green space through urban expansion plans. As such, both cases depict ongoing policy searches for novel ESS governance arrangements characterised by different stakeholder configurations, including various controversies that may arise within them.

The chapter aims to contribute to existing research in two distinct ways, firstly, by linking and relating urban and rural perspectives to the realisation of ESS. The rural perspective is distinctive in Ede's ongoing agro-ecological versus agro-industrial circular farming debate and its accompanying land-sharing versus land-sparing ideas. Gloucestershire's urbanisation plans reflect particularly urban claims on adjacent agricultural land which may involve shifts away from agricultural land use in favour of alternative ESS delivery. Such potential shifts are controversial, given calls for a more diverse and less export-dependent UK food supply system, already *'dangerously dependent on just two countries (the Netherlands and Spain) for the lion's share of its fresh vegetable imports'* (Garnett et al., 2020).

Secondly, the chapter complements existing ESS literature in relation to emerging mapping and valorisation techniques and approaches (Burkhard & Maes, 2017; de Groot et al., 2010, 2012; Hein, 2011; Maes et al., 2016; Pieninger et al., 2013; Salzman et al., 2018; Scott et al., 2018), implications for planning, remuneration and governance challenges (Allen, 2003; Braat & De Groot, 2012; Fisher et al., 2009; Gomez-Baggethun & Muradian, 2015; Herzon et al., 2018; Primmer et al., 2015; TEEBagrifood, 2018) and rapidly growing attention for urban ESS delivery potential (Bolund & Hunhammar, 1999; Radford & James, 2013; Wolch et al., 2014; Yang et al., 2015). So far, these ESS literatures have paid little attention to the question of how to understand and theorise rural-urban interrelations, interdependencies and synergy potentials as crucial components and prerequisites of promising and sustainable ESS delivery futures.

The chapter proceeds as follows. After some methodological clarification, it continues by revisiting longstanding land sharing versus land sparing debates. In the third section, the two case study regions are introduced, followed by a comparison of their principle differences in terms of ESS delivery orientations and some concluding reflections on their significance in relation to future place-based ESS research and governance.

11.2 Methodology—The Case for Comparison

This chapter builds primarily on the activities, experiences and outcomes of the Living Lab (LL) approach (adapted from Voytenko et al., 2016) as applied in the ROBUST project (see Chap. 1). ROBUST was a collaborative learning effort that joined research and policy partners in their aspiration to work on rural-urban synergy potential. To do so, the project considered the following potential synergy fields; (1) ecosystem services; (2) sustainable food systems; (3) public

infrastructure and social services; (4) cultural connections and (5) business models and labour markets, of which each project partner prioritised 3 principle fields of interest. LL Gloucestershire and LL Ede both included ecosystem services and sustainable food systems in their principle fields of interest. In order to elaborate a joint research and innovation agenda for the LL, partners engaged in a lengthy and systematic process of local inquiries, especially literature and policy research. The resultant research and innovation agenda became a guide for further Living Lab activity, which comprised complementary data-collection methods, including interviews with key actors and multistakeholder workshops around how to foster ESS delivery in relation to rural-urban synergy building. Both LLs highlight some interesting comparative analysis, which in this paper is supported by literature review with a focus on scholarly work that concentrates on how to approach and understand the linkages between (i) ESS delivery, (ii) rural-urban land use features and (iii) spatial planning. In summary, Ede and Gloucestershire were LLs in the ROBUST project that both explored how rural-urban links could be strengthened through a more synergistic approach to ESS. While the experiments operationalised to achieve such strengthening are discussed elsewhere in this volume, this chapter compares the synergistic potential of ESS in Ede and Gloucestershire. The key point of comparison lies in the rural and urban perspectives that each LL brings in aiming for synergies, which we emphasise by overlaying local LL data onto the LSp-LSh concept.

11.3 Revisiting the Land Sharing Versus Land Sparing Debate in Relation to ESS

Land sharing and land sparing are not new terms, with roots in European scenario studies on the future of farming, food productivity, land use optimization from the early 1990s, and a shift in the conceptualisation of protected areas, towards the goal of achieving ecologically beneficial land management patterns (Rabbinge et al., 1994). The main message of earlier studies was that, at European level, it would be preferable to concentrate food production in regions with the most favourable agricultural conditions and, conversely, to end farming in regions where land use change would benefit nature conservation and landscape preservation. Implicitly, therefore, LSp is a (rather narrowly-framed) land use optimization plan that advocates a (further) segregation of food production from other types of ESS delivery. The scenario study by Rabbinge et al. (1994), '*Ground for Choices*', reflects a dated preference for further modernisation of agriculture, a strong confidence in agro-industrial optimization processes, as well as little sensitivity for the political reality at that time. Consequently, the outcomes of the study never reached prominence in European policy making, its ideas were not widely embraced by many agricultural and rural scientists and gradually disappeared from discussion on the future of farming. Even so, its principle ideas are more indirectly present in later debates, as illustrated in the

Dutch circular farming case below. Direct references to the binary notions shifted towards scholars with other disciplinary backgrounds. Ecologists, for instance, associated LSp and LSh with the ecological pros and cons of more bundled versus single ESS delivery (e.g. Grass et al., 2019).

While LSp and LSh ideas emerged in rural scholarship, there are some equivalents with special attention to urban spatial dynamics. Scholars of urban sprawl, for instance, address the various negative externalities of spatially fragmented urbanisation processes (Bengston et al., 2003; Cespedes Restrepo & Morales-Pinzon, 2018; Holden, 2004; Irwin & Bockstael, 2007; Wadley, 2012). Following similar lines of thought, concepts including the 'compact city', 'functional segregation' and 'spatial quality' flourished in the Netherlands with the overarching aspiration to prioritise spatially more restricted and delineated urbanisation processes (Boelens, 2011; Busck et al., 2009; Fertner, 2012).

In the UK, urban Green Belts around cities have been protected in planning as a way to avoid creeping urbanisation. In practice Green Belts mainly constitute farmland, irrespective of the quality of the land and soils. From an ESS perspective, this type of thinking primarily associates ESS delivery with 'external' green or rural space. More recently, growing scholarly interest can be seen around the societal benefits associated with, and need for, internal urban ESS delivery, in order to benefit public health, urban quality of life and climate change mitigation (Bolund & Hunhammar, 1999; Allen, 2010; Haase et al., 2012; Castan Broto et al., 2012; Radford & James, 2013; Wolch et al., 2014; Yang et al., 2015; Pauleit et al., 2019; Elmqvist et al., 2015, 2018). This emerging research corpus on urban ESS delivery may be perceived as a move towards the internalisation of ESS delivery in urban space, further illustrated by the growing popularity of associated notions as urban green metabolism (Kennedy et al., 2011; Perrotti & Stremke, 2020) and, as illustrated in Gloucestershire, green infrastructure is:

> *a strategically planned network of natural and semi-natural areas […] designed and managed to deliver a wide range of ecosystem services* (cited in Rolf et al., 2020).

More broadly, green infrastructure (GI) has been closely associated with the reconciliation of nature conservation and economic development, especially as a contribution to sustainable urbanism (Grădinaru & Hersperger, 2019).

In summary, the LSp versus LSh binary has its origins in both rural and urban scholarship, as part of wider debate on the pros and cons of functional integration versus functional segregation in rural and urban settings and spatial planning characteristics. Analytically, this scholarly debate differentiates ESS delivery orientations, as visualised in Fig. 11.1.

So far, such differences in rural and urban ESS delivery orientations have been largely analysed in isolation. Land sparing versus land sharing (or, in overlapping terminology: multifunctionality versus monofunctionality) arguments appear prominently in discussions of farmers' roles and positions in food chains, food systems and wider rural development processes (e.g. Van der Ploeg, 2022). The internalisation versus externalisation debate, especially, resonates in urban space optimization and priority setting discussions, and includes references to multifunctionality (e.g

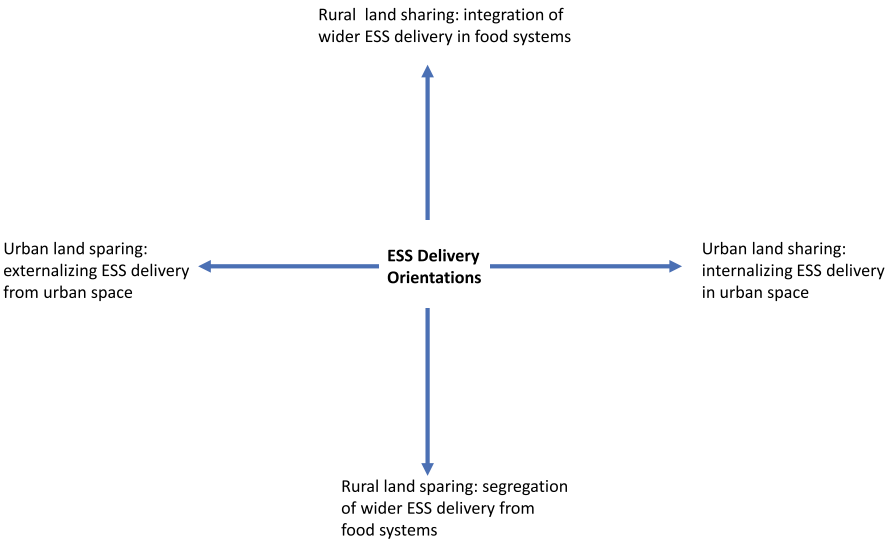

Fig. 11.1 Rural-Urban ESS delivery orientations

Ghafouri & Weber, 2020). In the next section, the two ROBUST case-studies are introduced to demonstrate that it is particularly the place-specific interaction patterns and alignment efforts of rural and urban ESS delivery orientations that illuminate synergy prospects.

11.4 Case Studies

(a) ***Circular Farming in Ede municipality***

Located in the heart of the Netherlands, close to important east-west land and water transport corridors, Ede municipality has about 100,000 urban residents and 20,000 rural dwellers. Being a typical example of Dutch poly-centric urbanisation processes, Ede's urbanisation is connected to a history of military training, textile industry and, more recently, international transport, logistics and agro-industrial sectors. Ede has poor, sandy soils accommodating small-scale family farming which, since the 1950s, has increasingly focused on animal production (especially poultry, dairy and pigs), intensification and scale-enlargement, and major agricultural labour productivity gains, facilitated by adjacent Wageningen Agricultural University. A strong dependency on fodder imports (principally soy) and food export markets (especially Germany) is associated with growing societal concerns about persistent regional agri-environmental problems including emissions, nutrient losses, loss of biodiversity, odour nuisance and particulate matter. Simultaneously, a diversification of agriculture and rural business models/entrepreneurship can be

witnessed, via the exploitation of a longstanding regional tradition of rural tourism: Hoge Veluwe Natural Park is partly located within Ede's municipal boundaries. The outcome of these multiple dynamics is a flourishing regional and rural economy, albeit increasingly facing tensions and conflicts between agricultural activity and alternative rural functions (Centraal Bureau voor de Statistiek, 2018; Ede Municipality, 2015).

Ede is actively involved in an inter-municipal policy collaboration called Food Valley. In line with the EU's smart specialisation objectives (e.g. McCann & Ortega Argiles, 2016), Food Valley aspires to become a smart specialisation region where research, innovation, education and industrial activity concentrate on sustainable and healthy food systems to foster economic development and prosperity. Food Valley initiates, stimulates and facilitates active collaboration between six municipal administrations and a multitude of regional agri-food businesses based on so-called triple-helix approaches (Ede Municipality, 2015; Regio Foodvalley, 2009, 2015, 2016): multi-stakeholder innovation processes with active participation of public, private and research actors. Food Valley's aspiration to enhance global food security implies that it pays relatively little attention to regional specific rural-urban relations and interdependencies. Certainly, it may support alternative, more multifunctional and nature-inclusive agrarian pathways within Ede's urban food policy aspirations, but primarily collaboration across globally operating agro-industry and food technology corporations is welcomed, prioritised and sought. This is reflected in a strategic research agenda around the so-called 'protein transition', which seeks to reduce dependence on external fodder sources by substituting legume varieties and using insects as alternative protein sources to sustain and safeguard regional intensive livestock production. Other contested proposals to reduce and mitigate negative agri-environmental impacts of intensive systems include manure surplus valorisation techniques, ranging from biomass-based renewable energy to its transformation into organic fertiliser for export to soy producing countries (e.g. Brazil) to restore current distortions in global nutrient flows (Gies et al., 2017).

(b) ***Green Infrastructure in Gloucestershire***

Gloucestershire (populationc. 650,000), is located on the border with Wales, north of the regional capital Bristol (population c. 480,000), and about 160 km west of London. Its democratic local authority structure is 'two-tier': Gloucestershire County Council operates schools, libraries, police, fire and rescue, flood risk, housing and a range of other public services. The county is further divided into six district councils, which have their own elected members and, of particular relevance to this chapter, authority over land use planning. In common with Ede, the county has a polycentric urban pattern, with two adjacent urban centres—the administrative capital Gloucester, and the former spa town of Cheltenham—which between them account for about 40% of the county's population. These two urban districts were joined by a third, Tewkesbury (population c. 95,000) to form a collaborative planning vision called the Joint Core Strategy (JCS, adopted in 2017). The three remaining rural districts are Stroud, Cotswold and the Forest of Dean. Each of the latter lie partly within designated landscape areas, namely the Cotswold National

Landscape and the Forest of Dean National Forest Park. The county contains small parts of two further cross-border National Landscapes —the Wye Valley in the west, and the Malvern Hills in the north. Consequently, in considering development opportunities, the Gloucestershire planning authorities are restricted by designated rural landscape character such as the National Landscapes and the Forest, as well as within ecologically or geologically sensitive areas of national importance, such as Sites of Special Scientific Interest, of which there are 120 in the county (GWT, 2015). Taken alongside the urban Green Belt (which is spatially and not qualitatively characterised) and high flood risk areas, there is very little room for manoeuvre in building allocation in the county. This has a knock-on effect for farmland. Historically, planning authorities would have exempted so-called 'best and most versatile' agricultural land but planning regulations have been revised by successive governments to facilitate development.

In the last decade, a range of planning consultations have examined potentials for economic growth in the county, notably along the M5 motorway corridor. A participatory visioning process called Glos2050[2] identified new ecological and economic development opportunities, including the idea to expand Gloucester and Cheltenham into one 'supercity'. While that proposal was not adopted, it remains a strategic economic priority in the JCS to expand west Cheltenham, for residential and commercial uses (on land owned by Tewkesbury Council), thereby enhancing the county's economic potentials by expanding the cybersecurity industry. Cheltenham is the home of the Government Communications Head Quarters (GCHQ), the UK's national cyber-intelligence service, and substantial levels of cyber-related commercial and residential development are envisaged. For example, Policy A7 in the adopted JCS envisages 1000 new homes, in association with and in addition to 45 hectares devoted to the expansion of cyber-security and high-tech commerce. Overall, the JCS suggests 1525 new homes a year are needed over 20 years to meet the county's housing needs (paragraph 2.28), while Policy SP1 outlines the need for over 35,000 new homes and 192 hectares of 'B-Class' employment land (offices, light industry and storage). A question arising from these development plans is how to ensure the opportunities they unlock also enhance local ESS, rather than compromise them in the process of building on green space.

An important concept to influence urbanisation plans in Gloucestershire has emerged (as in the Netherlands) from national policy, in the shape of *natural capital net gain*. In 2018 the UK government introduced its 25-year Environment Plan (25YEP), in which objectives to enhance natural capital (NC) are outlined. Natural capital frames the environment as a valuable natural asset producing vital and cost-free ecosystem services, signalling a shift in the impact of development on the environment. The prominent elements of NC in the 25YEP are clean air and water, reduced risk of environmental hazard (i.e. flood and drought), sustainable use of natural resources and greater human engagement with natural heritage and beauty (Defra, 2018: 23). Explicitly, rather than reducing the 'value' (i.e. condition) of the

[2] https://glos2050.com/ accessed 24th November 2020

Table 11.1 ESS delivery characteristics of Ede and Gloucestershire (Glos)

Case study	Dominant ESS delivery perspective	LSh-LSp context	Rural-Urban synergy
Ede	From the **rural** outwards, especially interrelations between food production and other ESS: biodiversity, landscape values, sustainable water management, soil quality.	Focus on pros and cons of integrated vs. segregated **rural** ESS delivery with less attention for urban land use implications. Regional landscape scale ESS a key focus, but with links to global agri-food chains.	Competing (global versus regional).
Glos	From the **urban** outwards, with special attention to water regulation and biodiversity.	Focus on regional urban expansion and its impact on flood risk mitigation and biodiversity net gain. Regional and local landscape scales ESS are important as a **development** mitigation.	Complementary (regional rural-urban synergy potential)

environment, building development should enhance natural capital via 'net environmental gains' (Defra, 2018: 33). This ambition means that where development takes place, not only must environmental damage be mitigated, but the level of natural capital must be greater than it was before development, to be contractually agreed through conditions within planning permissions. Whether or not net environmental gain is to be a compulsory element of planning permission was, at the time of writing, still a matter for consultation, but its significance lies in its potential to internalise ESS delivery in urban development, via existing and new policy instruments. Key practical methods for achieving net gain include integrating habitat management and environmentally positive building methods into development plans and practices, and/or to identify areas outside the development zones for improvement as a form of compensation. In other words, Gloucestershire's planning dynamics mirror an urban LSp/LSh perspective compared to the rural perspective in Ede. Urban LSh makes ESS and NC opportunities intrinsically part of urbanisation, whereas urban LSp opts for compensating negative environmental impacts of urbanisation by enhancing natural habitats in rural areas elsewhere in the county. Such rural-urban perspectives are summarised in Table 11.1, below:

Having introduced the two case studies and their respective spatial perspectives on ESS delivery concerns and enhancement, the next section will further contextualise policy developments which facilitate or hinder the strengthening of rural-urban synergies.

11.5 ESS within Rural and Urban Policy Settings

(i) *Circular farming and the Ede Municipal Food Strategy*

The rural LSp-LSh debate in Ede municipality cannot be isolated from wider national and regional discussions around how to progress towards sustainable

farming futures. This discussion is characterised by contrasting circular farming logics, perspectives and practices. As part of regional Food Valley, Ede municipality associates circular farming prospects often with rest-flow recycling and remanufacturing with the intention to close nutrient and resource cycles through novel techniques. It covers topics including the transformation of urban food waste into fodder for animal production, urban carbon capture for high productive glasshouse horticulture and rest-warmth use from rural biomass energy plants for urban heating. In addition, there are circular farming ideas and practices that concentrate on returns to land-based farming with the intention to re-integrate food production with other ecosystem services such as soil quality and fertility, nature and landscape values, biodiversity, mitigation of flood and drought risks, etc. As such, this agro-ecological circular farming perspective redefines agriculture's role in rural development processes and underlines regional prospects of novel, more multifunctional rural business models. Table 11.2 below summarises the distinct attributes of circular farming, seen from the contrasting agro-ecological and agro-industrial perspectives, logics and aspirations in Ede (Graaf et al., 2018; Ministerie van Infrastructuur en Milieu, 2016).

This co-existence of contrasting ideas, practices, interests and aspirations makes it challenging for Ede municipality to profile itself unambiguously. In practice, it facilitates both agro-industrial and agroecological circularity pathways. Through its urban food policy it tries to shorten regional food chains, stimulate direct consumer-producer relations, facilitate food education and foster social cohesion. Other agro-ecological circular farming aspirations remain much less explicitly addressed in municipal urban food policy. These include a significant extensification of agricultural land use (and thus reduction of current food output volumes) to the benefit of agriculture's ability to strengthen the delivery of other ESS including biodiversity, pollination, water quality, drought and flood management, soil erosion prevention, preservation of landscape values, cultural heritage, etc. The same goes for

Table 11.2 Contrasting circular farming perspectives and practices in Ede

Agro-ecological inspired circularity	Agro-industrial inspired circularity
Strategic preference for rural land sharing	Strategic preference for rural land sparing
Preference for integrative food production	Preference to segregate food production from other ESS
High confidence in the transformative capacity of empirical diversity in farming practices & professional identities in agriculture	Less confidence in the role of farmers as co-shapers of farming futures and agrarian development pathways
High confidence in novel forms of territory-based collaboration, novel rural coalitions, novel producer-consumer relations and novel rural-urban partnerships	High confidence in novel alliances between agriculture and other industrial sectors, cross-sectoral innovation approaches and novel technologies
Strong belief in wider societal benefits of family-farming	No specific family farming concerns
Above all territorial spatial lens on sustainable rural-urban relations	Emphasis on increasingly dispersed and diffuse rural-urban interdependencies

agro-ecological circular farming claims on potential positive spillovers into the wider rural economy and ESS performances. The food policy reflects municipal reluctance to explicitly embrace alternative, more multifunctional rural business models by prioritising LSh in future rural spatial planning. Agro-ecological circular farming advocates claim that such business models might bring more internal remuneration incentives and mechanisms for ESS delivery through their engagement in novel rural markets for high-quality food, leisure facilities and care and educational activities. These emerging rural markets would depend, at least partly, on such wider rural ESS profiles and qualities. These, it is claimed, could be further facilitated by CAP reform that establishes more convincing linkages between agricultural subsidies and farmers' wider ESS delivery capacity, willingness and performances. Prospects of rural business models grounded on rural LSh, multiple income sources, low external input farming and wider ESS delivery, could be further stimulated—and in contrast with prevailing food chain dependencies—by more regional cooperation between farmers and other rural entrepreneurs with ESS delivery, food proximity and circularity as different but simultaneously overlapping rural-urban synergy prospects.

Regional criticasters of foregoing agro-ecological inspired circular farming claim that such a perspective is no longer feasible after decades of agricultural modernisation, that such developments would even undermine food security and food affordability, not only nationally but also throughout the world, threatening Dutch agri-business and agricultural competitiveness. Hence, its potential societal benefits are downscaled, linked primarily to supporting small-scale farming which meets niche consumer demands, or farming continuity in less favourable ecological settings. Obviously, these associations with sub-optimal food systems are difficult to isolate from status quo interests, or what van Lieshout (2014) describes as the 'politics of scale'.

(ii) *Green infrastructure plan and biodiversity net gain in Gloucestershire*

Ede's story describes rural-centred approaches to ESS delivery, expressed through LSp vs. LSh debates. In Gloucestershire such debates have a more urban inflection, especially through the need to expand urban settlements (housing quotas are distributed from national to local government). In addition, the (now superceded) 2017 UK Industrial Strategy, which gaves the circular economy a high profile, also stimulated arguments for urbanisation. It emphasised that productivity relies on the responsible use of resources and foresees technological advancements which will reduce the environmental impact of farming (Department for Business, Energy and Industrial Strategy, 2017: 75). Gloucestershire's Local Industrial Strategy highlights the attractiveness of the county's natural landscapes as a draw to investment and in-migration linked to high quality of life. The local environment helps make Gloucestershire a 'magnet county' rebalancing the current loss of young people to cities elsewhere (GFirst LEP, 2019: 4–5).

> We want to establish Gloucestershire as a leader in sustainable growth by developing a baseline to determine how best to protect, maintain and enhance our natural capital assets. (GFirstLEP, 2019: 6)

Gloucestershire's growth and productivity prospects are linked to its ability to recruit skilled workers, who, it is predicted, will be attracted by the 'magnetic' force of the county's high cultural ESS values. Two particular activities envisage the enhancement of GI and natural capital to mitigate urbanisation, which can be understood within LSp-LSh arguments. Firstly, the development of a regional park (another Glos2050 idea that did gain resonance) foresees further enhancement of the county's landscape attractiveness and the delivery of ESS in terms of flood risk management, the reduction of air pollution (linked to the expansion of public transport connectivity) and the consolidation and safeguarding of green spaces. The proposal is closely linked to a project of the Gloucestershire Nature Partnership called *Natural Improvement Areas*, which seeks to identify GI opportunities linked to planned developments.

In Gloucestershire, the Local Nature Partnership (LNP) is leading progress on the mapping and enhancement of natural capital, in both rural and urban settings. LNPs are multi-stakeholder networks established and funded by the government which implement environmental policy at the local level. Members include civil society groups (such as nature conservation organisations), universities, local councils and regional representatives of government environmental agencies. Natural capital mapping involves a detailed assessment of the county's habitats at the scale of one square kilometre. Each of these squares will be assessed for their current natural capital as a contribution to ESS. For example, woodland might offer flood risk or biodiversity value. After this first stage of mapping, the LNP will articulate opportunities for enhancing natural capital. This might envisage land use change, for example, reducing intensive arable production in favour of permanent pasture or woodland planting. In such cases, not only would there be a shift in the ESS type (from food to flood risk, in this example), but also a need to incentivise any optimal land use shifts. Significantly, the LNP led the collaborative process of natural capital mapping in order to develop a Strategic Framework for GI, in the absence of a GI Plan, a notable absence:

> *A county-wide Green Infrastructure Strategy is not forthcoming, but GLNP has worked hard to update and refine the Strategic Framework for Green Infrastructure. Many Districts are creating their own Green Infrastructure plans and strategies, all of which will have regard to, and be guided by, the principles contained within this framework.*[3]

In the case of urbanisation plans, a number of existing tools are available. Firstly, Section 106 agreements are contracts designed to finance social or environmental compensation in relation to a development. For example, if a new housing area creates additional transport mobility or educational demand, the developer may be required by the planning authority, through a S106 agreement, to finance road building or school expansion. Environmental projects such as habitat creation are also common. A feature of S106 is that mitigation measures are linked to the area within or around the development location. Recent reforms allow planning authorities to

[3] https://www.gloucestershirenature.org.uk/green-infrastructure-pledge accessed 9th December 2022.

decouple S106 investment from the development location, through a community infrastructure levy (CIL) charged at a variable area rate on housing and retail development. This creates opportunities to be more strategic about locating development mitigation, but also comes with challenges. For example, the CIL is at slightly different levels of introduction across the six district planning authorities. In addition, although the CIL can be assigned for strategic mitigation including for functions carried out by the county council—which retains planning control for services including transport, flooding and education—the CIL is paid by developers to the district planning authority. Meanwhile, S106 agreements may still be applied and can operate in parallel with CIL (Ives & Excell, 2018), thus potentially causing tensions in any case where a district's strategic objectives do not fully align with the county's.

Secondly, a voluntary scheme called *Building with Nature*[4] has been established by a network of architects, conservationists, planners, housing agencies and builders. This scheme, initiated by the Gloucestershire Wildlife Trust and the University of the West of England, promotes and accredits sensitive and restorative building work and provides professional training. In the adopted Minerals Local Plan, which sets out policies for the extraction, use, transportation and restoration of the county's minerals mineral resources (such as limestone and gravel), priority is given to developments which enhance natural capital and help facilitate Building with Nature adoption (GCC, 2018 §422). The whole plan, in fact, has been given *Building with Nature* accreditation, an accolade that, it is hoped, will be extended to district local plans.

The LNP remains the sole body with county-wide strategic engagement with GI, through the natural capital mapping agenda. The vision associates GI with the two urban centres, but also as a corridor linking other settlements with the Natural Landscapes and the Forest of Dean. While still an ideal vision, this implies attention to both integrated ESS delivery, via extensive GI around settlements, as well as externalisation of ESS, as evidenced by the roughly north-south axis following the M5 motorway.

Gloucestershire seems to offer possibilities for both LSh and LSp approaches in urban and rural settings following development. In contrast to Ede, where integrative land use is discussed at the level of the individual farm, in Gloucestershire land sharing and sparing options incorporate ESS delivery within wider urban and rural landscapes/uses. Sustainably constructed and environmentally sensitive settlements complement a regional park proposal and the quality of designated landscape areas. Equivalent challenges exist nevertheless, including the tension between different types of ESS:

> *Changes in agricultural land use could help change [i.e. lower] the flood risk level but that requires land managers to be able to pay for these changes, which may require a shift from food production. In some areas, food production is simply not a priority in terms of land use.* (Interview GL1)

[4] www.buildingwithnature.org.uk Accessed 8th July 2020.

This conservationist, interviewed as part of the ROBUST project, argues for a rebalancing of land use in favour of flood risk mitigation over farming. The importance of flood risk management in Gloucestershire is not to be underestimated. The county experienced severe inundation in 2007 and 2014 and unusually high floods in 2020 on the River Severn which, in its middle reaches, led to wide-spread urban evacuation. Gloucestershire needs to develop novel governance arrangements in order to reduce flood risk, especially where upper catchment fluvial and pluvial flooding is compounded with surface water run-off from urban hard surfaces and from floodplain agriculture near Cheltenham and Gloucester. However, this is complex. Regional experts feel that existing flood risk arrangements could be strengthened by focussing on the Severn river catchment, as a way to connect upstream rural land use and downstream urban settlements, offering a more integrated rural ESS delivery at landscape level to prevent urban floods. Although many nature-based flood interventions are made within individual farms, and rely on community support, in Gloucestershire ESS delivery is not principally framed as a farm business consideration, as is the case in Ede. In that sense, Gloucestershire's land sharing versus land sparing debate reflects a meso-level and urban perspective on land use in relation to regional natural capital objectives. GI opportunities are primarily linked to urban growth plans and a catchment-based approach that builds on the complementarity between nature-based upstream interventions and downstream hydrological engineering. As part of that, rural land sharing is predominantly associated with specific designated rural areas, whereas urban land sharing is thought to bring net environmental gain and enhancement of urban quality of life. Specifically, Gloucestershire's ongoing internalising of ESS delivery in its urbanisation plans take its food system less explicitly into account compared to the Ede case, although similar tensions in ongoing re-balancing and re-considering of regional land use can be observed.

11.6 Conclusion

As visualised in Fig. 11.2, Ede and Gloucestershire reflect rather different rural-urban ESS delivery orientations as overall outcomes of their rural-urban land use features, interaction patterns and stakeholder priority setting. The Ede case underpins in particular the relevance of differentiating rural responses to changing urban ESS demands and concerns, going along with major land use planning challenges. After decades of rural land use segregation to the benefit of competitiveness in globalising food markets and compact city planning ideologies with little attention for urban ESS delivery, regional spatial disbalances in and fragmentation of ESS delivery profiles require a serious re-balancing and re-calibrating of both rural and urban ESS governance, as illustrated by recent outbursts of farmers protests[5] against further agri-environmental policy restrictions.

[5] https://112ede.nl/page/Nieuwsdetail/54811/massaal-protest-boeren

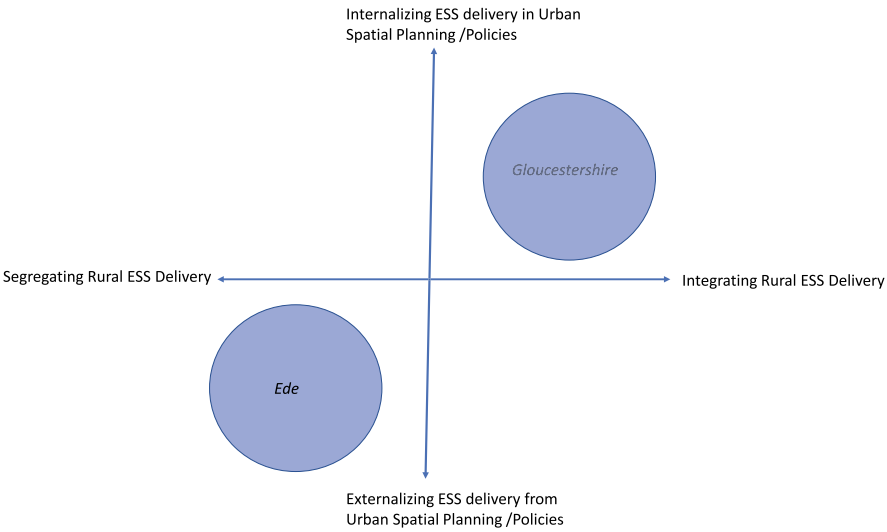

Fig. 11.2 Contrasting ESS Delivery Orientations of Gloucestershire and Ede

In Gloucestershire, climate-change related flood risks mobilised urban policy actors to reconsider regional ESS delivery vulnerabilities and to start a process of internalising ESS delivery in urban planning and policy making. It may bring novel rural-urban alliances and partnerships around ESS delivery. Yet, so far outcomes of ongoing urban internalisation attempts remain rather uncertain due to the complexity of multi-level land use planning procedures. This means that ongoing urban ESS engagement and its implications for future rural land remain in flux. Rural land sharing prospects will be strengthened if urban flood risk management becomes part of cross-municipal, well-balanced and mutually beneficial rural-urban policy measures. Ongoing calibration of rural-urban spatial planning policies will have negative impacts in case of straightforward annexation of rural space to the exclusive benefit of urban ESS delivery concerns. In other words: progressing towards synergistic ESS governance hinges on regional stakeholders' ability to align urban internalisation efforts with rural integration opportunities and prospects. One of Gloucestershire's challenges in that respect concerns a GI strategy that follows administrative rather than ecological boundary setting procedures. For that reason, its Local Nature Partnership might be a more promising platform for place-based and synergistic ESS governance.

By revisiting LSp and LSh debates, and by associating both notions to wider land use and ESS delivery debates in rural and urban settings, ESS delivery orientations have been distinguished and compared. The case studies emphasise that ESS delivery cannot be isolated from societal challenges around how to optimise, accommodate and facilitate rural-urban interaction. Although ESS comprise an interesting and promising lens to strengthen rural-urban links, stakeholder perspectives might bring particular ESS priorities to the fore, at the expense of others. It is desirable,

therefore, that rural-urban interactions deserve more explicit attention from ESS scholars, with particular regard to the intertwining of ESS governance and other rural-urban synergy prospects that have the potential to foster well-being as a facet and outcome of economic development.

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