

Scotland's Circular Economy Strategy and NPF 4

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'Spatial planning is at the heart of the circular economy' (Batty and Wei Yang, 2022, p.17).

Planning as a means to move towards a circular economy

Scotland is taking a prominent role in aiming to transition to a circular economy (CE). *Making Things Last* (Natural Scotland, 2016) set out the strategy. It stated (p.3) that a more circular economy will benefit:

- the environment – cutting waste and carbon emissions and reducing reliance on scarce resources;
- the economy – improving productivity, opening up new markets and improving resilience; and
- communities – more, lower cost options to access the goods we need with opportunities for social enterprise.

Although this was a statement of national policy, the focus on the planning system was quite limited. There are three references to planning, all relating to the regulatory aspects in relation to infrastructure for waste management.

Similarly, the planning system has not been connected to the CE. A recent study commented 'The current operational framework of planning does not line up directly with the development of a circular economy and achieving the goals of net zero. They quite often operate in parallel worlds' (Batty and Wei Yang, 2022, p.19). However, the planning system should be seen as a key means of steering Scotland towards a CE. Specifically:

- Planning is future-oriented;
- Planning is a means of stimulating and directing investment into a CE;
- Planning can regulate construction and development to prevent or reduce waste and to require recycling of materials;
- Planning can influence the use of land and water to protect natural ecosystems;
- Planning is place-based and cross-sectoral, addressing, e.g. transport, housing, climate change, economic development etc.
- Planning is a key interface between national policies and local implementation;
- Planning involves communities and so can educate, influence lifestyles and mobilise action.

"Humans have influenced and changed many ecosystems around the world... One way in which we can manage this influence and activity, including policies and strategies for conservation and restoration, is through careful land-use and marine spatial planning to balance economic, social and environmental trade-offs". H.M.Treasury (2021).

In this context, the Draft NPF4 is potentially a significant bridge to connect planning practice in Scotland to the CE, embedding zero-carbon as a working practice at all levels.

Understanding how different sectors and policies interact is central to a CE and to planning. However, such understanding needs to be much broader than it is in the Draft, and the policies set out in Part 3 need to be clearer. Clarity would free up some of the resources

needed to deliver a CE, by reducing planning appeals, which take up time and place heavy demands on planning authorities.

Circular economy in the Draft NPF4: An overview

Part 1 of the Draft, the National Spatial Strategy to 2045, includes six 'Spatial Principles', one of which is 'Conserving and recycling assets'. It states (p.10) 'Our focus is on making productive use of existing buildings, places, infrastructure and services, locking in embedded carbon and minimising waste, and supporting Scotland's transition to a circular economy.' In the same section (p.33) there is further mention of CE in relation to heat networks and energy storage as part of sustainable neighbourhoods, and then, again in relation to energy, on a masterplan for the Forth Valley (p.35).

Section 2 identifies 18 National Developments. One of these is 'CE Materials Management Facilities' (p.50). It strikes a cautious tone and is not spatially specific. Reprocessing facilities will be required but their 'range and scale...is not yet clear' and the location is 'all Scotland'. However, the National Development for Hunterston Port and Hunterston A Power Station does connect development there to CE through renewable energy and a range of commercial uses.

The Planning Policy section references CE principles as part of 'Adaptable' as one of six qualities of 'Successful Places' (p.72). However, CE is not explicitly linked to policies such as a Plan-led Approach to Sustainable Development (Policy 1), Climate Emergency (2), Nature Crisis (3), Human Rights and Equity (4), or Community Wealth Building (5). It does feature in Zero Waste (Policy 20) (pp.92-93), which is mainly addressing waste infrastructure and the waste hierarchy. It does say that national and major developments should, 'where appropriate', 'reuse existing buildings and infrastructure; minimise demolition and salvage materials for reuse' and use design and construction methods to minimise waste and allow for disassembly and reuse. These and other details send a positive message that would see the planning system becoming a more ambitious regulator for a CE transition. However the 'where appropriate' caveat leaves many questions unanswered, and will enable developers to argue that CE principles are not appropriate for their development: for example, might they impact adversely on viability of a new housing development or building refurbishment? The consultation asks whether the policy will help achieve a CE?

CE is also mentioned in passing in relation to Policy 28 on 'Historic Assets and Places' (p.100). Protection is seen as contributing to the CE. However there is no CE reference in the Delivery section of the Draft. An 'infrastructure first' approach is promised, but with no caveats in respect of a CE focus.

'A circular economy is one that is designed to reduce the demand for raw material in products; to encourage reuse, repair and manufacture by designing products and materials to last as long as possible in line with the waste hierarchy.' A diagram illustrates the waste hierarchy. Glossary, Draft NPF4, Annex C.

The recognition of the need to transition to a CE is welcome. This iteration of the NPF goes further than the previous three in recognising the need to connect planning to the climate and biodiversity emergencies, while community wealth building (CWB), equality and

economic disadvantage also get mentioned (though not social inclusion). However, the conception of CE is rather limited, as the definition quoted above shows. Despite the use of the word ‘transformation’ one foot of the Draft remains anchored in the past. We do not have a clear elaboration of how the linear economy, and planning policies that have supported it, and are impacting on land, resources and places.

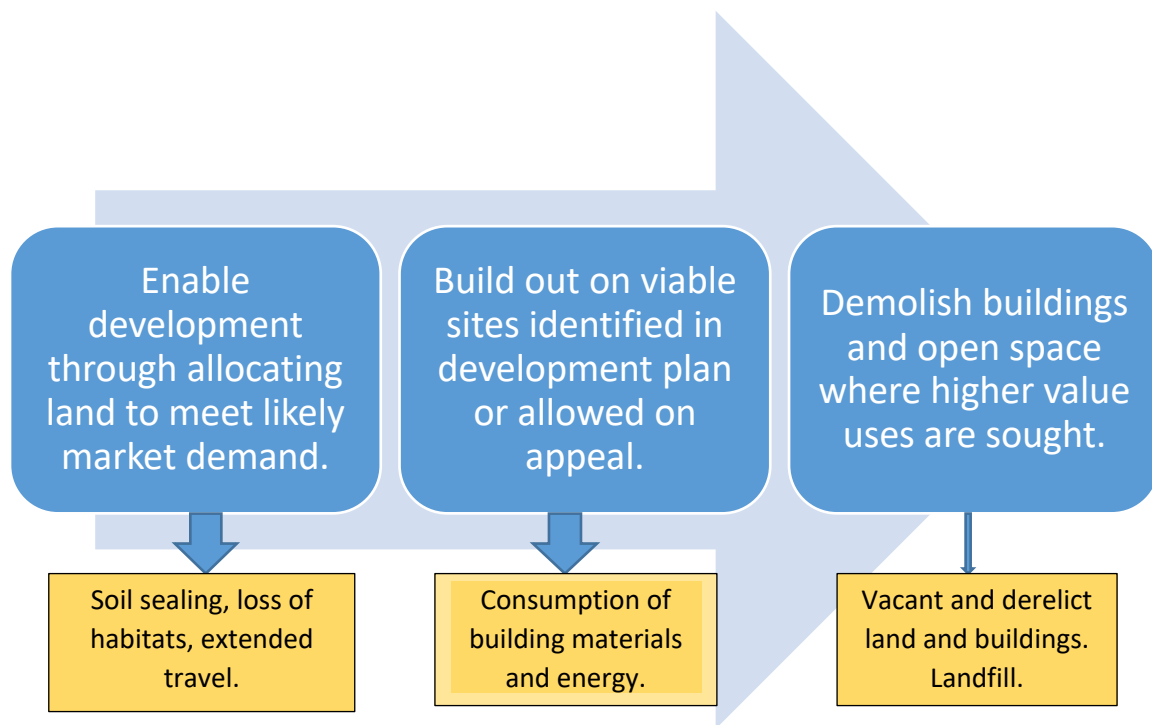


Figure 1: Planning for a linear economy

Source: Author

Figure 1 gives a simplified picture of how aspects of the planning system facilitate a linear economy. Of course, the system is more complex than that, e.g. it seeks to reuse derelict land, protect historic buildings etc. However, if planning is to be a positive driver of a CE, there must be recognition of aspects of the current system that pull in a different direction. Figure 1 illustrates some of these.

Defining a circular economy

There are many definitions of CE. One frequently cited is that of the Ellen MacArthur Foundation, which defines the circular economy as an industrial system that is restorative and regenerative by intention and design (Ellen MacArthur Foundation, 2015). Another definition is that of the European Commission (EC), which presents the CE as ‘an economy where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised’ (EC 2015, p.2).

These definitions rather focus on product design and waste management (an ‘industrial system’). ‘Reuse’ and ‘repair’ are given more prominence than ‘reduce’, though, as quoted above, ‘reduce’ features in the NPF4 definition. Marin and De Meulder (2018, p.2) argue that ‘a substantial amount of circular economy theory and practice tends to forget about

social equity and “reducing” materials use, prioritizing recycling in growth-oriented economic systems.’

Fidélis et.al. (2021) noted that ‘While having a variety of definitions the concept can appear with unique features in different places’: in other words a definition can be context specific. For example, water conservation tends to be given more prominence in parts of Europe susceptible to droughts.

As is explored more fully in the following section, the spatial dimension of a circular economy has also been insufficiently developed. As Marin and De Meulder (2018, p.3) note, ‘the “circular city” remains a rather blurred image’. These are not merely matters of semantics: embedded in the definitions are assumptions about the scope, and even the purpose, of a CE, how change will come about and who will be the drivers of change, and consequently, where effort and resources, policy and legislation should be directed. Even if we leap over these questions to look specifically at the role that planning can play, Williams (2013), in discussing low-carbon urban infrastructure, provided a typology of three planning approaches – collaborative, systemic and market shaping.

A circular economy is ‘an economic model based on the renewability of all resources such as energy, materials, water, soil, land, and air while retaining or creating value, promoting positive systematic impacts on ecology, economy, and society, and preventing negative impacts.’, Sileryte et al. (2018, p. 190).

So, in seeking a definition for CE in the context of Scotland’s NPF, it is necessary to look beyond definitions that highlight only production and waste, and which focus primarily on the role of business and product design. See, for example the definition by Sileryte et al. in the box above. It is also important to link CE with sustainability: CE is a means to an end; some forms of circularity may not be sustainable, e.g. by creating lock-in that becomes a barrier to innovation and adaptation. Similarly, Sileryte et.al. say that ‘integrated spatial development strategies for Circular Economy... need to be specific for the place at hand, transdisciplinary, eco-innovative and promote the use of waste as a resource’ (p.191-192).

NPF4 is a public policy document that aims to inform the practice of a wide range of stakeholders across different sectors. Ultimately, it is about behaviour change in respect of the use and development of land. It is an overarching document targeting biodiversity recovery, net zero, a just transition, climate action, CWB and action on disadvantage, amongst other concerns, to achieve synergies, not least with health. Therefore, as well as following established CE principles, a definition of CE for NPF4 needs:

- To be rooted in public policy;
- To recognise explicitly the connections to place;
- To recognise land and water as key resources to be managed;
- To be systemic and integrative, informing the range of concerns in all four parts of the NPF;
- To recognise the need for cooperation and coordination, and the central role of planning to achieve this.

The following definition is therefore proposed:

‘A circular economy is designed to reverse the degradation or exhaustion of finite resources, and thus to equitably and sustainably manage Scotland’s built and natural environmental resources through a place-based, conservation-led approach to spatial planning and development management leading development decisions at all scales and across all sectors.’

Above all, this definition seeks to be relational. Rather than assigning CE to its own ‘box’, where it is only about waste management and renewable energy, important as these matters are, the definition connects CE to the whole environment, and to sectoral policies (e.g. transport, business, housing, etc.) and to an approach to delivery through the planning system as the interface with communities and businesses at different scales. It seeks to reflect the generally recognised features of a CE – ‘prevent, reduce, reuse, repair’ – but within the specific framing conditions for implementation in Scotland and through the NPF as the long-term statement of ‘how our approach to planning and development will help to achieve a net zero, sustainable Scotland by 2045’, as the Minister put it in his introduction to the Draft.

The place dimension of a CE: the National Spatial Strategy

Although writing on CE is often couched in general terms, in practice place and local conditions matter. Fundamentally, there is a two-way relationship between place and a CE. Firstly, the attributes of a place will influence how best to move to a CE there. For example, waste recycling can be done at scale in large settlements well connected to a catchment area and so giving competitive advantages. Similarly, if we look to potential conservation of existing infrastructure or recycling of construction waste, then the bulk of those resources are in the existing urban areas. But the shift to a CE will also change places, impacting on jobs and forms of development (e.g. eco-industrial parks) and on cultures (e.g. the milieu for innovation). NPF4 could be strengthened and have a further reach if this interplay between place and CE was fully grasped.

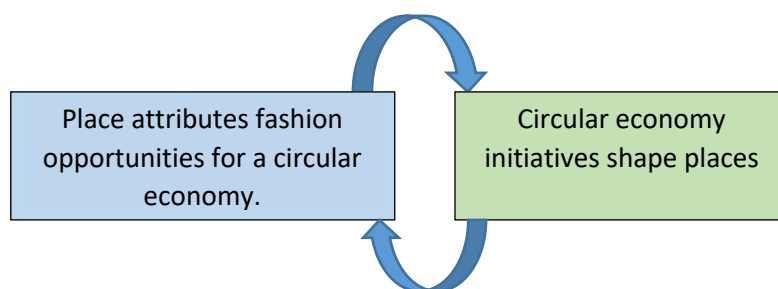


Figure 2: The relationship between place and a circular economy

Source: Author

The ESPON CIRCTER research project identified and analysed seven territorial (i.e. place-related) factors relevant to a circular economy. Of these, the most relevant to NPF4 are land-based resources, agglomeration economies, and accessibility conditions. Others

discussed are knowledge- and technology-based enablers, governance and institutional drivers, and territorial milieus. Figure3 illustrates them.

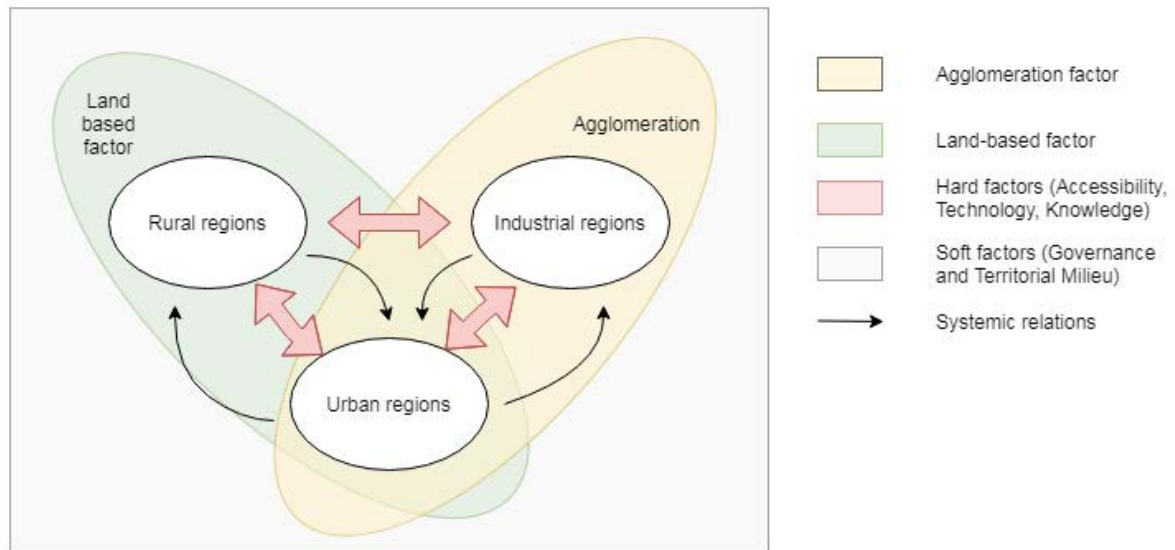


Figure 3: Territorial factors and their interactions in different types of regions
Source: CIRCTER (2019a).

Incorporating, but also building upon the CIRCTER research, it is possible to identify implications for the Spatial Strategy in the Draft NPF4.

‘Understanding the territorial specificities of different areas becomes crucial to envisage a successful transition to a circular economy’ Tapia et.al. (2021).

Land-based resources

Land is a vital, finite resource, integral to natural ecosystems but also to much economic activity and community benefit. The Planning Act defines managing ‘the development and use of land in the long-term public interest’ as the purpose of planning in Scotland, so how does a CE perspective add substance to that general purpose? NPF4 aspires to ‘transform the way we use our land’ (p.6), and a holistic understanding of CE, as outlined above, should be seen as integral to achieving that.

The Spatial Principles, notably those on compact growth and on conserving and reusing assets, embrace CE approaches, while the ‘local living’ principle speaks of building ‘local circular economies’. However, here as elsewhere, the lack of data is a weakness: loops connecting evidence and policy are crucial; a CE is a learning economy that adapts and innovates. To better understand the challenges of transition it would be useful to have information on trends in soil sealing and in reuse of vacant and derelict land, so as to assess how effective past policies have been, and therefore to better grasp the scale of policy and behavioural change now required. This is particularly pertinent in relation to the later section on planning policy for housing.

Agglomeration economies

Industrial clusters have long been recognised as a facet of agglomeration economies that confer competitive economies on the basis of place (for a brief summary see Hague, Hague and Breitbach, 2011, pp.47-53). In broad terms, these advantages come from access to raw materials, component suppliers, distributors, networks, knowledge spillovers, and availability of a pool of labour with the right skills. Increasingly, within a knowledge economy, urban agglomeration economies have been valued increasingly. Cities – the bigger the better, success breeds success – provide markets, and access to capital, knowledge and ideas. These stand over and above the advantages within an industrial cluster, and attract people, as well as helping business. Students, for example, study in a big city and can find part-time and post-graduate jobs there.

However, there are also downsides, which perhaps too often have received too little attention. These will include the generation of waste and pollution, consumption of finite resources and the risk of complacency in business cultures. In addition, large, growing settlements are places where good quality land is most at risk of being lost from food production, and where market demand is strongest for demolition of existing buildings and replacement by new development.

Agglomeration does not really get featured in the Draft NPF4, maybe because Scotland does not have really large cities by international standards. However, size does matter for the transition to as CE. In general terms, there are two reasons why NPF should make a stronger connection between Scotland's cities and the transition to a CE. These are scale: effect change in the cities and it impacts at national level; and because cities are recognised internationally as first movers (Ellen MacArthur Foundation, 2022a).

More specifically, the CIRCTER researchers argued that 'industrial areas are the only possible setting for several circular economy strategies, ranging from industrial symbiosis schemes to product remanufacturing. These are more likely to spring in those territories where a diverse industrial ecosystem is already in place (industrial symbiosis) or where the products are originally manufactured (remanufacture).'

There may be scope to foster repair networks within Scotland's cities, such as that in Vienna, which was founded in 1999, and has been a pioneer in developing quality standards for repair services and highlighting the importance of repair and reuse for a sustainable and resource-efficient economy (European Circular Economy Stakeholder Platform, 2022).

Industrial regions in decline, transition or deindustrialization may also find opportunities in the emerging markets of secondary raw materials thanks to the availability of industrial plots, old factories and other facilities that could host circular processes, including both material storage and transformation/recovery' (CIRCTER, 2019b, p.8).

The Draft NPF4 (pp.34-35) discusses the potential of the Falkirk/Grangemouth Investment Zone for low-carbon manufacturing as a focal point for 'energy with the circular economy' in the Forth Valley. However, the idea of industrial symbiosis is not explicitly discussed. Given the centrality of industrial symbiosis to the CE, this omission should be addressed. The essence of it is the creation of loops of technical or biological materials to minimizing

leakage and waste. The oft quoted example is the Kalundborg industrial park in Denmark, which brings together a number of partners that are currently exchanging 20 resources, as diverse as biomass, gypsum, and steam (Interreg – IPA CBC, 2020).

Similarly, more spatially informed work is going to be needed to move the NPF4 Spatial Strategy to be a driver for the CE. For example, reclamation plants need economies of scale to be financially viable, and the lower the value of the materials, the greater the quantity that needs to be collected. What does this imply for Scotland’s spatial strategy? Should there be a focus on the biggest cities, or a ‘national’ collection point with maximum accessibility, given Scotland’s geography?

Amsterdam aims to be a leader in the move of cities to a circular economy. It seeks to live within environmental constraints while also meeting social needs. Importantly it believes that there will be economic advantages because demand for clean technologies will increase and investors are ‘greening’ their portfolios. It is focusing on three value streams – food and organic waste streams, consumer goods and built environment.

In relation to the built environment, policies seek to :

- Stimulate circular area development through urban design, an integrated approach and climate-proof construction, with special attention paid to closing cycles.
- Use circular criteria in land allocation and tendering of all construction and infrastructural projects and in the public space.
- Develop buildings with adaptable functions and systems.
- Scaling up circular disassembly and separate collection for the purpose of high-quality applications.
- Use renewable and secondary building materials.
- Stimulate circular renovation in private and social housing.

(Gemeente Amstrerdam, 2020).

Tapia et.al. (2021, p.1444) point out that often ‘urban areas are the only possible setting for profit-driven circular business models, as most of them require a certain “critical mass” to become financially sustainable’. While innovation is seen as something that is more likely to happen in cities, it can happen in rural areas too. Much of the drive for a CE has indeed come from mayor-led city-level local governments with greater autonomy than the Scottish cities enjoy, see for example the C40 Cities Network (<https://www.c40.org/>), or examples such as Amsterdam. Similarly, Tapia et.al. (2021) note that grassroots innovation for sustainability and CE practices in the not-for-profit sector are often found in cities. However, in Scotland we have also seen strong local level innovation in rural areas linked to renewables and community buy-outs. All sections of the Spatial Strategy could be strengthened by probing these matters more fully, and by linking planning more strongly to the work of the Scottish Land Commission.

Accessibility

As suggested above, accessibility is likely to be very important to the viability of commercial activity for a CE. While some forms of accessibility may be non-physical, e.g. through organizational links, spatial proximity and accessibility matters, and so, therefore, does infrastructure. However, provision of new infrastructure rather contradicts the principles of a CE. Thus NPF4 should give more attention to the potential of existing hubs in transport networks – ports, airports, stations, motorway interchanges – and to inter-modal transport connections and logistics hubs within and between the five ‘action areas’.

The port of Antwerp contains a major industrial cluster, waste-processing companies and logistics premises. It believes that there are numerous opportunities for a greater focus on circularity. One company's waste substance could form the raw material for another, for example, and collaborations are possible. To this end the Port is investigating the technological and economic feasibility of CO2 infrastructure to support Carbon Capture Utilisation & Storage applications, along with 7 chemical and energy companies.

The Port also plans to make the 88-hectare site a hotspot for the circular economy, aimed at the sustainable processing and manufacturing industry. Circularity is the norm for the new NextGen District business park. Port of Antwerp is developing part of the site as a place for demonstrating innovative technologies, such as chemical recycling technologies. The reuse of CO2 as a raw material is also among the possibilities. In addition the Port of Antwerp is exploring the economic and spatial potential for setting up a Recycling Hub with a view to closing the plastic circuit.

(Port of Antwerp, 2022).

Infrastructure

The Draft NPF4 highlights the importance of blue and green infrastructure and makes welcome points about adopting an infrastructure-first approach to development. As infrastructure was privatised and the planning system was moved to be reactive to developer leads, so the coordination of development and infrastructure became weaker. Though the Spatial Principles recognise the importance of embedded carbon in existing infrastructure (p.10), overall the importance of the existing infrastructure is not sufficiently grasped. Given that deindustrialisation took place in Scotland at scale some decades ago, the housing stock constitutes the main form of infrastructure that needs to be repaired and conserved to avoid degeneration, a threat exacerbated by a future of more extreme weather events and also by any decline in real incomes.

The Housing Policy section of the Draft concentrates far too much on new development and continuity with past policy. The Spatial Strategy needs to embed CE so that ‘infrastructure-first’ becomes ‘existing infrastructure first’. This perspective should be reflected across all the Action Areas, but again in terms of impact, the biggest and quickest CE benefits would come from area-based housing insulation and maintenance initiatives in the urban areas. The success of the Housing Action Areas in the 1970s and 1980s shows what can be achieved.

Transport and the 20-minute neighbourhood

It is well known that transport, along with agriculture, industry and the built environment, is a key source of carbon emissions. The NPF Spatial Strategy mainly addresses carbon reduction in transport through the 20-minute neighbourhood. The spatial principles seek to promote 'local living' and so 'reduce the need to travel unsustainably' and so, amongst other things 'build local circular economies' (p.10). Home working could also help, and should be flagged up and supported.

It is perhaps beyond the scope of the NPF to fully spell out just how the 20-minute neighbourhood concept can be made operational, particularly in existing development. However, affordable and reliable public transport clearly has a role to play everywhere. It is disappointing then to find that in the Action Areas, it is only discussed in respect of more rural areas.

Town centres

Arguably, given current circumstances, Scotland's town centres are the front line for a sustainable economy. The problems they face were well documented even before the Covid pandemic. From the 1980s onwards, planning policy was not sufficiently robust to prevent the proliferation of large car-dependent retail developments on or beyond the edge of towns and cities. Then came e-shopping and internet banking. The result was a substantial shift in patterns of retailing. Department stores proved to be very inflexible buildings: their large areas of open floorspace are not easy to convert for reuse for smaller enterprises, for example. Their closure also has a spillover effect accelerating the decline of a whole retail centre.

However, town centres were never exclusively places for shopping. Sadly, their civic functions have also been stripped out. The 'rationalisation' of local government in 1975 left former town halls without a function – a classic linear economy approach. Similarly, where a council headquarters was still required a number of councils relocated to new premises, sometimes on the outskirts, leaving empty property in the centre to spread the decay to the kind of services that benefited from the custom of town centre workers. A similar story could be told of high schools, where the value of land was used to effect a relocation and new build.

Again there is a spatial dimension that is relevant. The bigger cities have suffered less. Their retailing was of a critical mass to be able to ride the storm. In addition they retained other private services such as cinemas that generate footfall and spillover benefits to restaurants, cafes etc. The country's major museums, concert halls and galleries are also in the centres of bigger cities in many cases, and help sustain those centres. Public sector services and jobs, not least higher education and public administration are also there. In contrast, Scotland's small towns have suffered disproportionately. The reorganisation of the system of District Courts, and the closure of local bank branches, leaves empty prominent buildings at the heart of a town, fuelling a sense of decline. Public sector employment, and the spending power it generates, is the life blood of many Scottish small towns but is draining away. The long period of austerity has devalued local assets and resources, trimming maintenance and repair.

Scotland's Town Centre Action Plan Review Group recommended:

- Strengthen the formal positioning of towns and town centres in national planning, including requirements to produce town and town centre plans, co-produced with communities and enhance data collection and use at town and town centre level.
- The Scottish Government should review the current tax, funding and development systems to ensure that wellbeing, economy and climate outcomes, fairness and equality are at their heart.
- Funding of demonstration projects in towns and town centres. For example, projects around themes of housing sector incentivisation in town centres; skills development for businesses and enterprises, and extended uses of various technologies, to understand and change behaviours in town centres; encourage local small business, community enterprises and entrepreneurship around local and circular economies, and build on existing programmes with a view to enhancing the resilience of town centres against climate change.

Town Centre Action Plan Review Group (2021).

The combination of these multiple aspects of a linear economy mean that town centres have in effect been thrown away. Finding ways to reuse them and their embodied carbon is critical to achieving a CE, and should be a stronger focus in NPF4, particularly in relation to small towns, where the town centre will be part of the desired 20-minute neighbourhood for many citizens.

Food systems

Food is predominantly consumed in urban areas but produces outside those areas. Thus there is a spatial dimension, which includes distribution networks and retailing (e.g. the links to a 20 minute neighbourhood).

Transitioning to a circular economy means moving towards a food system that builds natural capital and allows nature to thrive.

Regenerative food production means growing food in ways that generate positive outcomes for nature such as healthy and stable soils, improved local biodiversity, improved air and water quality.

It is implemented through practices tailored to local contexts such as using diverse crop varieties and cover crops, rotational grazing, and agroforestry (growing trees around or among crops or pasture) and results in agricultural land that more closely resembles natural ecosystems like forest and native grassland, providing habitat for a wide range of organisms.

Ellen Macarthur Foundation (2022b).

Recognition of issues around food is stronger in the Draft than in previous iterations of the NPF. As with the CE, this is welcome, but the connection to CE should be strengthened. Food is primarily discussed in relation to commercial opportunities, though issues of food security, and to health and child poverty are also discussed. However, food production is loosely linked to land use and needs to be part of the CE.

The focus on food is strongest in the section dealing with North and West Coastal Innovation. In the Northern Revitalisation section there is reference to food miles and to community-led food growing networks, and the protection of higher quality agricultural land. Similarly, the North East Transition mentions the benefits of local food growing, though only in the context of rural areas. It comments that some of Scotland's highest quality agricultural land is in this area, but does not explicitly discuss its protection. Food growing on the urban fringe is mentioned in the section on Central Urban Transformation, but there is no mention of agricultural land protection around Edinburgh, despite (or because of) the strong growth pressure there. Surprisingly, neither agriculture nor local food systems are mentioned for the Southern Sustainability section.

There is a need to bring discussion of food systems in the context of a CE into sharper focus in all five divisions within the Spatial Strategy. Food waste recycling, for example, needs to be considered as a potential local level action, not least in places likely to generate it in volume, e.g. urban centres. In Melbourne, for example, the Degraes Street Recycling Facility operates from a basement car park, and processes food waste as well as collecting glass, steel, aluminium, plastic and cardboard generated from surrounding cafes and restaurants (Metropolitan Waste and Resource Recovery Group, Victoria State Government, 2020).

Of course, food production is an integral part of a CE, and deserves closer scrutiny in the NPF. The Italian Bioeconomy Strategy Implementation Group explicitly links a circular bioeconomy to national recovery from COVID-19, as well as to decarbonisation, ecosystem recovery, job creation, and opportunities for SMEs and start-ups (National Bioeconomy Coordination Group, 2020, p.2). It points to the potential of marginal lands for growing low input crops to improve the soil organic matter content and fertility. It argues that such measures could contribute to income diversification in rural and coastal areas. Might such ideas be embedded in relevant sections of Scotland's spatial strategy?

The food / health connection also has a spatial dimension. Food deserts are areas where people struggle to buy affordable fresh fruit and vegetables. Any discussion of the 20-minute neighbourhood needs to prioritise this issue, otherwise a successful rollout of such neighbourhoods, as NPF4 intends, could actually widen inequalities. Research by Sheffield University with Kellogg's has mapped food deserts in Great Britain, and reveals their geography within Scotland. They are concentrated in the Central Belt, and particularly in Clydeside (University of Sheffield, Faculty of Social Sciences, 2018). Again a stronger level of analysis is needed in NPF4 and a clearer lead within the spatial strategy.

Scales

Tapia et.al.(2021) probe the geographical scale of closed-loop systems. Some loops, such as reuse or repair of domestic goods, can be carried out at local level. There are opportunities

for the planning system to support sites and premises for such activity, e.g. flea markets or reuse of vacant shops as charity shops. However, things like solid waste management or remanufacturing are likely to require action at a city region scale. Reprocessing and recovery of secondary materials for reuse and action on energy is often a matter for regional/national scale action, and may link into global supply networks. NPF4 could usefully say more about how a CE could operate at and across different spatial scales.

Role of Spatial Planning

Williams (2020) argues that looping, regenerative and adaptive actions are central to circular development, and that city-region planning needs to provide space and infrastructure for all three. This is important since in growing market economies low value uses associated with recycling, for example, get squeezed out by speculative investment in land and property. Industrial properties and workshops are cleared for housing which brings a higher return. Thus, the spatial strategy should recognise that existing infrastructure and adaptation have key roles to play in Scotland's transition, and focus more strongly and analytically on them.

More generally, NPF4 presents an opportunity to realign planning as a leading driver of a CE. That will require imagination and making full use of the potential of the digital revolution.

'A linear planning environment focuses primarily on processing development proposals, while a vast amount of valuable data is never captured and the information on how places function after new development and redevelopment take place rarely feeds into the future decision-making process. At the same time, different government departments work in silos in terms of capturing and making information available.... Spatial planning involves a highly sophisticated sequence of interactions and decision-making and current processes need to be dramatically transformed to meet many new goals. What we need is an integrated digitally enabled approach to spatial planning which fully embraces the advances in digital technologies and data.... Through an integrated digitally enabled approach to spatial planning, different social, environmental, and economic dimensions of built and natural environment systems can be inter-connected'

Batty and Wei Yang (2022, pp.19-20).

Summary

There is several significant place dimensions to a circular economy. So far the connections have not been fully grasped. NPF4 offers an opportunity to break new ground and to lead practice internationally if it can incorporate these insights.

CE and National Developments

The preamble to Part 2 of the Draft NPF4 lists matters that 'delivery partners' are expected to address 'in taking forward national developments'. These include support for Community Wealth Building, biodiversity, climate concerns etc. However, there is no mention of working with the principles of a CE. Its absence weakens the capacity of the NPF to give

practical effect to the Scottish Government’s work to move to a CE (Natural Scotland, 2016). There should be an extra bullet point added:

‘In taking forward national developments we expect delivery partners to:

- Contribute to the transition to a CE by following the principles of “Prevent, Reduce, Reuse, Recycle”’.

The application of lifecycle greenhouse gas emission assessments for each of the 18 National Developments is a welcome step. However, to drive transition to a CE it would be helpful to have at least some assessment of the CE opportunities in each National Development.

CE Materials Management Facilities feature as a National Priority as an aspect of ‘Liveable Places’ in the list of National Developments. This Development relates to all of Scotland rather than to specific sites. The recognition that sites will be needed to help maximise the reuse of materials is welcome. However, ‘The range and scale of facilities required to manage secondary materials and their reprocessing back out into the economy is not yet clear’ (p.50). This uncertainty rather weakens the apparent resolve, and reflects an important gap that should be addressed by research. Place aspects of materials recycling have been identified above, and these should be reflected in the final version of NPF4. There needs to be dialogues with the industry to identify current capacities and locations, and to quantify potential scenarios for the future.

The CE should certainly be retained as a National Development, but explicitly should be a cross-cutting one, relevant to ‘Productive Places’ and to ‘Distinctive Places’. The fundamental point is that while issues of waste recycling remain important, a CE is about much more. As noted above, it starts with ‘Prevent’, which if not possible then becomes ‘reduce, reuse, recycle’. So far NPF4 is focused mainly on ‘recycle’. Thus, to take one example, National Development 3 ‘Urban Mass/Rapid Transit Networks’ aims to have the effect of reducing ‘demand for private vehicle use’; this would assist transition to a CE, and should be recognised as such. That said, the scope to develop logistics hubs within urban areas to facilitate low carbon delivery systems such as cargo bikes should have been recognised. See, for example, the guidance produced in Germany, which argues that planning and municipal councils have key roles to play in developing such systems (Assmann et.al. 2019).

Within a city, different areas are differently suited for cargo bike logistics. Basic characteristics for a high suitability are:

- Inner city area, preferably with a strong residential component
- High or highest stop density in delivery
- Poor conditions for conventional vehicles (e.g. areas for pedestrians, access restrictions, etc.)
- Increased traffic problems (e.g. high proportion of second-row parking).

Assmann et.al. (2019, p.22).

Similarly, Blue and Green Drainage Solutions’ (National Development 4) are part of a CE and should be stated to be so. Likewise, Development 6, the Digital Fibre Network has the

potential to facilitate home working and so prevent energy use in commuting, another step forward. In short, the NPF4 Draft rather sells itself short by its failure to see CE as holistic, and by not recognising that ‘Spatial planning is at the heart of the circular economy’ (Batty and Wei Yang, 2022, p.17).

Not surprisingly then, the fact that CE is about economics, not just avoiding landfill, is glossed over in the Productive Places section. The Islands Hub for Net Zero, the Green Industrial Transition Zones, the Pumped Hydro Storage, the Renewable Energy Infrastructure, and aspects of the plans for Hunterston and for Chapel Cross all look positive from a CE perspective and should be stated to be so. There are debates about High Speed Rail (Development 13) in terms of resource and energy use. While a case can indeed be made environmentally for improving the competitiveness of rail travel, and economically in terms of improved accessibility for hubs on the network, a rigorous assessment of this option against other forms of transport investment is needed.

There is a case for including at the very least ‘encouragement’ for eco-parks in this section of the National Developments. Eco-parks have been defined as ‘self-sustaining systems that generate their own energy, harvest and clean their own water and produce their own food’ (Global Green, 2022). Alternatively, since eco-parks can include housing and community facilities, they could be included in the ‘Liveable Places’ section. The point should be to use NPF4 to flag up to developers and planners that place-based zero waste developments are to be actively pursued. Eco-park Anglesey is an example of an industrial eco-park – see Orthios (2022). Similarly, the Productive Places section could usefully make reference to support for industrial symbiosis (see earlier reference to the example of Kalundborg).

Eco-park Anglesey is transforming a 230-acre former aluminium works into a green industrial park. It seeks to fully integrate ‘waste processing with renewable energy production in an economically viable, socially responsible and eco-conscious way.’ One of the ‘major projects involves creating five x 30 MWe green energy centres on an area of the site which already has consent for a power station. These will supply power to the National Grid while also supporting large battery storage, green data centres and the group’s other sustainable living projects.’

‘The economic bounce-back made possible by these developments is already underway, with the creation of scores of worthwhile, full-time, jobs, including the employment and training of apprentices from the generation which will be required to continue addressing the climate and sustainability challenges left to them by the past.’

Orthios (2022).

The final section of Part 2 of the NPF focuses on National Developments for ‘Sustainable, Distinctive Places’. All five are major waterfront redevelopments. Recovery and reuse of derelict land is sought and this clearly desirable from a CE perspective, though again that link could be made explicit. While each place is unique, it would be worth looking at practical examples from elsewhere to strengthen the CE aspects. For example, the Port of Antwerp ‘is aiming to develop the port into a cluster of circular logistics chains that organise the return logistics of waste and end-of-life products’ (Vito, 2022).

Infrastructure to support the cruise ship industry is mentioned both in the Clyde Mission and Edinburgh Waterfront National Developments. This overlooks the extent to which many aspects of the industry currently undermine progress towards a CE. For example, there are concerns about emissions and waste disposal, involving air, land and water pollution, and adverse impacts of noise on sea life. Vessels have a life span of 35-40 years meaning that ships not attuned to future environmental standards are likely to be still using facilities on the Clyde and Forth in 2045. While the industry shows signs of belated recognition of environmental concerns, there could be scope for NPF4 to point to the need for CE compliance as a way of leading market change.

Similarly, the approach to the port-related National Developments needs to extend to encompass marine spatial planning. For example, dredging is often necessary to facilitate and maintain port access, but can pose environmental hazards, e.g. through release and migration of heavy metals, or more generally simply disposal of dredged materials. Caveats should be inserted in these National Developments to focus on such matters and on the ecology of the land/sea interface. In addition, disposal of waste and/or procurement of materials for new facilities should seek to minimise transport distances as a point of a CE-oriented form of planning aiming to close loops through reduction, recycling and reuse.

Embedding CE through planning policies

Part 3, the National Planning Policy Handbook, is particularly important, since it will very directly influence decisions on planning applications and at planning appeals.

Policy 1 is about a Plan-led approach to sustainable development. It reiterates the requirement from the 2019 Planning Act for local development plans to manage the use and development of land in the public interest. It does not explain that this requirement does not apply to development management decisions. That might not matter if the system really is to be plan-led, but NPF4 needs to make it explicit that development management should follow the development plan.

CE is not mentioned in the discussion about rebalancing the planning system to prioritise addressing ‘the climate and nature crises and...the planet’s sustainable limits.’ It should be.

Policy 2 on Climate Change makes the point that development proposals that will generate significant emissions should not be supported. Welcome as this is, it begs the question of what constitutes ‘significant emissions’ while also allowing an applicant to get planning permission when the level of emissions is the minimum possible to achieve ‘viability’, i.e. the level of return on investment that the investor seeks. The door is left very wide open for consultants and lawyers to press the case for developments that contradict ideas of a CE.

Similarly, Policy 3 makes valuable statements on enhancement of biodiversity and support of nature networks, but exempts fish farming developments from the need to demonstrate a positive contribution to biodiversity, despite the fact that fish farming can be detrimental to biodiversity (see, e.g. BBC, 2022).

Policy 4 briefly affirms conformity with Human Rights duties. Surprisingly it makes no reference to the mandate on human rights obligations as they relate to a safe, clean, healthy and sustainable environment. This omission should be corrected, and the links to a

CE explained, e.g. in relation to pollution, waste storage and disposal, and the need to understand a 'sustainable environment' in terms of systems in dynamic equilibrium. This policy could also reference the UN's Sustainable Development Goals.

Policy 5 marks a significant departure by stating that development plans should address community wealth building priorities. However, in contrast to many other policies it provides little detail, particularly in respect of development management. It should be extended to make clear the link to a CE: CWB seeks to recycle investment and returns within a local economy, and recognises that buildings and spaces can have value to a community, even if they are not tradeable assets. The text further omits any link to the work of the Scottish Land Commission, but often a transfer of land or buildings to some form of community ownership will be integral to CWB. These synergies should be made explicit, and guidance provided in respect of development management, e.g. strengthening the requirements to demonstrate that all options for transfers to community ownership and reuse have been explored before any demolition is permitted.

Policy 6 on Design, Quality and Place, contains good guidance on qualities to be sought, including 'resource-efficient, regenerative design and a sustainable environmental footprint' and 'future-proof planning of resources'. The call to build in 'flexibility in line with circular economy principles' is particularly welcome. However, the statement that 'Reusing and repurposing existing buildings and assets can also support our net zero ambitions and the circular economy' needs to be stronger, making clear that this is essential to supporting a CE through the planning system and should be the default approach.

Policy 7 explains and endorses the 20 minute neighbourhood idea. It could usefully include waste collection and reuse / recycling facilities in the list of items for which 'consideration should be given'. There is scope to be more ambitious and aim to match best international practice, e.g. the 'closed loop urban metabolism' approach pioneered at Hammarby Sjöstad in Stockholm (Nordregio, 2018; Envac, 2022).

Similarly, Policy 8, an Infrastructure First approach, should be supported, but waste reduction and management should be seen as part of the infrastructure. Hammarby Sjöstad again provides an example of how this can be done. However, planning policy on infrastructure also needs to embed a CE approach. As written, the policy does not recognise the scope for community inputs to CE infrastructure development. In contrast, in Vauban, co-building groups drove the inclusion of low carbon infrastructure (a biomass district heating system, solar photovoltaic (PV) systems, and combined heat and power systems) in the neighbourhood (Williams, 2013, p.687). Local Place Plans should be highlighted as a mechanism to foster such initiatives in Scotland.

Housing, the focus of Policy 9, broadly follows past policies, without any evaluation of how effective they have been, not least in respect of a CE. It is supplemented by Appendix B and Question 57 which sets out the Minimum All-Tenure Housing Land Requirement (MATHLR) for each planning authority, the ten-year minimum for which housing land should be identified in development plans. This trajectory will result in substantial soil sealing, notwithstanding commitments to brownfield land developments. While stating that development should not be supported on land not identified within these allocations, it

provides for exceptions where build-out is more rapid: in effect, this allows the industry to determine future land conversion. Policy 9 needs to be read in conjunction with other policies, for example, Policy 10 (h) opposes car-dependent new developments. Nevertheless, Policy 9 currently is rather permissive and does not fully embrace the principles of a CE.

Policy 10, Sustainable Transport, seeks to decarbonise travel and should be supported. Similarly, Policy 11, addresses heat and cooling, and connects development plans to Local Heat and Energy Efficiency Strategies. Although CE is not mentioned, Policy 11 has the potential to better align Scottish planning to a CE. Policy 12 on Blue and Green Infrastructure is also supported. It points to the importance of management and maintenance plans 'wherever this is necessary'. This potential 'opt out' should be removed. The policy also fails to address the long term damage that temporary but intensive commercial uses can do to green spaces, as has been the case, e.g. in Edinburgh's Princes Street Gardens. The policy should make clear the need to require compliance with relevant British Standards Institute standards for protection of trees, for example.

Policy 13 on Flooding mainly focuses on flood plains but supports Sustainable Drainage Systems 'wherever possible'. Again the prevention of waste and reuse of water could be given a stronger emphasis in line with a CE. Planning policy should seek to steer developers to lead in the provision of water reuse (see also the Infrastructure First policy). Development plans should be a tool to help develop water reuse networks, as part of an integrated approach to urban water management. See Wilcox et.al. (2016) for a wide review of practices internationally, including the work of ZedBED in London.

Policy 14 on Health and wellbeing supports allotments and provision of space for community food growing, though stops short of urging this in new developments and 20 minute neighbourhoods, not least where developments are planned at higher net densities, which is where such spaces may be most needed. Similarly, community food growing should be explored as a way to tackle Scotland's food deserts. Policy 15 on Safety deals with major hazard site and is supported.

Policy 16 on Business and Employment seeks to mobilise the planning system to contribute to a green recovery from the pandemic and to net zero. However, once again the connection to a CE is not mentioned, and the perspective is largely of single developments on individual sites rather than a seeing such developments as linked to systems of heat, water, waste etc. Furthermore, commercial premises typically have a shorter life cycle than residential, so their significance for a CE is considerable, as recognised by Lewes District Council planners (Lewes District Council 2021). Lewes put an onus on a developer to explain why a property cannot be refurbished or repurposed.

Home-working gets broad support in Policy 16. There is again a statement that strikes the right tone but leaves the door open for a developer to argue that it does not apply: 16(e) says 'Conditions for **site restoration** at the end of the period of commercial use should be considered in appropriate instances'. Replace 'appropriate' by 'all'. Flexibility and potential reuse of commercial buildings and their components should be built into the process of scrutinising planning applications through adding such requirements to Policy 16.

Sustainable tourism is the focus of Policy 17. It does not have anything to say about unsustainable tourism (c.f. previous comments about cruise ships). It sets criteria that should be considered for tourism-related planning applications, but these do not include CE; they should.

Policy 18 includes being supportive of temporary uses for creative workspaces and other cultural activities in vacant spaces or buildings. This is consistent with a CE, and should not apply only to temporary uses.

Policy 19 on Green Energy is clearly of importance for a CE, though again the connection is not made explicit. It gives wide support in principle for all forms of green energy and low-carbon fuels, including wind farms in areas outwith National Parks and National Scenic Areas, and the expansion of existing wind farms. This endorsement comes with a long list of matters that need to be taken into account. Given how controversial wind farms have been this is not surprising.

Zero Waste is Policy 20. It can be welcomed and supported. However, there are again loopholes. For example, it says that ‘Development proposals should aim to **reduce, reuse, or recycle materials in line with the waste hierarchy**. All developments should aim to use materials with the lowest forms of embodied emissions.’ ‘Aim’ is not the same as ‘deliver’. This matters because it is common for details of development to change after a planning permission has been given (see Hickman et.al., 2021), and enforcement, which has been seriously under-resourced in planning over the past decade, can do little to rectify things once the development has taken place. Rather than aims, these statements should be cast as conditions on planning permissions. Similar caveated statements in Policy 20(b) and (c) (e.g. ‘encouraged’, ‘as far as possible’, ‘where appropriate’) need to be strengthened.

The London Plan (Mayor of London, 2021) goes further than the NPF is setting out how planning can work for a CE. Following Cheshire (2016), it seeks to minimise the use of new materials by:

- building in layers – ensuring that different parts of the building are accessible and can be maintained and replaced where necessary;
- designing out waste – ensuring that waste reduction is planned in from project inception to completion, including consideration of standardised components, modular build and re-use of secondary products and materials;
- designing for longevity;
- designing for adaptability or flexibility;
- designing for disassembly; and
- using systems, elements or materials that can be re-used and recycled.

A similar approach could be advocated in NPF4.

Policy 21 on Aquaculture recognises that open pen salmon and trout fish farms have adverse impacts on migratory fish species, and should not be supported. It also sets criteria for other fish farm developments. This is consistent with a CE approach.

Policy 22 concerns Minerals. It opposes fracking and (except in ‘exceptional circumstances’) applications related to fossil fuels. However, there is no overarching connection to a CE, and much of the policy is broadly permissive, e.g. as with housing requiring a 10-year landbank. There is not a sense of minerals as finite resources. There is a case for saying that proposals will be supported, in principle, if they demonstrate their compatibility with, or the furthering of, a CE.

Policy 23 is about Digital Infrastructure. Then Policy 24 and Policy 25 concern Centres and Retail, and seek to support town centres while opposing edge-of-town and out-of-town developments. Policy 26 sets out the Town Centre First assessment. These broad policies are appropriate, but reference should also be made about design and materials and flexibility, along the lines of the listing from the London Plan quoted above. In addition, reuse of existing retail units, and even whole malls should be supported. Policy 27 on Town centre living supports residential reuse of vacant upper floors, which clearly makes sense.

Policy 28 on Historic assets and places takes a rather narrow view, focusing on listed buildings, monuments, conservation areas etc. In a CE all buildings and spaces are valued and their maintenance, repair and reuse should have priority over new developments. We might call such an approach ‘conservation-led planning’ and it needs to be more strongly endorsed throughout the NPF. More specifically Policy 28(n) addresses development in historic assets or places that would otherwise be unacceptable. This could cover a very wide range of alterations, and understandably the proposition is that it ‘should only be supported where it can be demonstrated that development will secure the future of a historic place or asset at risk of serious deterioration or loss and what is being proposed is the minimum necessary to secure its restoration, adaptation and long term future.’ There are many issues here, such as installing disabled access into old buildings, and while caution overall is appropriate, maybe the word ‘serious’ should be removed to recognise the other benefits of a repair and maintenance approach.

Policy 29 concerns Urban edges and green belts. It supports green belts and indicates that development should not be allowed in them – but provides a significantly long list of exceptions, including mineral operations, renewable energy developments, horticulture and community growing. The Policy can be supported, though it remains a rather negative and protectionist approach, and does not connect, for example to food networks, as it could do.

Policy 30 on Derelict and vacant land is another where no explicit connection to a CE is made, though the policy is clearly compatible. It seeks to direct development away from greenfield sites, but without explaining why such sites should not be used. This omission should be addressed. In addition, there is another loophole in that greenfield development can be supported when ‘there are no suitable brownfield alternatives’. The word ‘suitable’ is crucial: who decides whether investment returns or CE principles should determine what is a ‘suitable’ alternative? The primacy of a CE approach needs to be made explicit.

Policy 31 recognises the diversity of Rural Places, and again supports developments such as reuse of buildings, vacant, derelict and brownfield land where return to a natural state is not likely. Development on prime agricultural land is not supported, though again there are some exceptions. The policy does not really address the importance of water, land and

biodiversity in rural areas, and an ecosystem services approach to managing rural areas. The Policy could usefully steer development plans in that direction.

There are hints of such an approach in Policy 32 on Natural Places, where biodiversity is mentioned, for example. As with Policy 28, the focus is directed at ‘special’ rather than natural places. Thus the precautionary principle is endorsed ‘where the impacts of a proposed development on nationally or internationally significant landscape or natural heritage assets are uncertain but there is sound evidence indicating that damage could occur.’ In effect, this places a restriction on the precautionary principle. There should be a suitably sensitive approach to all natural places and their natural systems when considering possible development impacts.

Policy 33 on Soils is concerned with peat and carbon rich soils, and should be supported.

Policy 34 concerns Trees, Woodlands and Forests, and connects these resources to carbon storage and sequestration. It sets policy to protect such areas, though 34© permits woodland removal where there are ‘significant and clearly defined additional public benefits’, in which case ‘developers will generally be expected to provide compensatory planting’. The problem with this is twofold. Firstly, if planning departments lack the resources to follow up, the extent of planting may become in question. Secondly, not all planting flourishes to become a full tree. Compensatory planting should aim to increase the total tree count, not just replace the previous one.

Policy 35 looks at Coasts. It mainly focuses on the threat of sea level rise and how to mitigate its impacts. While supporting nature-based solutions, the policy does not capture the critical nature of coasts and the interface between terrestrial and marine systems. For example, coastal zones are important for habitats and biodiversity.

Summary

Part 3 is likely to impact on day-to-day development management and planning appeals more than any Part of NPF4. It is of concern, therefore, that the ambitions set out in Part 1 are not rigorously embedded in these planning policies. Furthermore, there is no prioritisation amongst the 35 policies, and CE is almost entirely confined to Policy 20 on Zero Waste. What this means in practice is that CE concerns are unlikely to carry much weight within the planning system across the wide spectrum of developments across Scotland between now and 2045. Even where policies are implicitly supportive of a CE, there is usually an ‘escape clause’ with words like ‘encourage’, ‘appropriate’, or ‘significant’, which are not closely defined and provide an open goal for developers and their expensive QCs to argue that they meet the requirements for exception.

CE principles should be much more clearly stated, and explicitly prioritised across all policies. This is especially the case because NPF4, despite its aims for integration across policy fields, remains first and foremost a Planning document. The Scottish Government’s Strategy for Economic Transformation (Scottish Government, 2022) makes only four references to a CE in its 56 pages, and none in the Executive Summary. There is a clear risk that even in the planning system, linear economic growth will still be prioritised.

CE and delivery

Part 4 on delivering the strategy promises further engagement through workshops on delivery. Alignment with other Scottish Government programmes and with City Region Deals is emphasised, along with the infrastructure First approach. The preparation of regional spatial strategies is anticipated, but there is no indication that they will address CE. This is consistent with the lack of attention to the spatial dimension of a CE evident in Part 1, as discussed above. Similarly, a broad indication is given of the scope of local development plans, but there is no mention of a CE.

New regulations are to be brought forward on Local Place Plans, which are a new feature of the Scottish planning system. There is a suggestion that such plans may consider developments that link to local assets and environments, but again no recognition that a CE could be an organising focus for a Local Place Plan.

Another new feature from the 2019 Act, Masterplan Consent Areas, are also mentioned, though again without reference to a CE. Developers can propose these as a step to getting 'up front planning permission'. Eventual regulations need to specify that CE principles must apply in Masterplan Consent Areas.

There is a short paragraph about 'Investing in the Planning System', which offers little other than a hike in fees for planning applications. To make planning a key driver for 'transformation' and a CE, much more is needed. In effect the aspirations in NPF4 for Net Zero, tackling climate and nature crises, community wealth building and a CE become unfunded mandates. Real investment is needed to build the knowledge and skills in the planning system which, with political commitment at national and local level, could see it be a powerful driver for transition to a CE, as outlined by Batty and Wei Yang (2022), who explain how digital technology could support that transition.

Engagement with stakeholders is promised as part of the monitoring of NPF4. ZWS should press for CE progress to be part of that monitoring, and offer their expertise.

Discussion of delivery should be informed by research. Mention has already been made of the work of Batty and Wei Yang (2022). In addition, Williams (2020) has argued that planning 'potentially has a crucial role to play in the delivery of circular urban development', but to do this it 'will need to intervene in markets to provide space for low-value, circular activities.' She further argues that planning's role involves 'supporting the infrastructure required to implement circular actions and ensuring that urban form continues to support the systems adopted. Planners can create demand for circular activities and products through requirements placed on new developments' (p.915).

Williams (2013) has also pointed to a significant policy-implementation gap in the planning system in respect of delivery of low-carbon infrastructure. Summarising the work of a number of authors, she recognised that planning authorities attributed this to competing priorities and lack of resources, specifically knowledge about new technologies. There are clear warning signs here for NPF4.

In a wide-ranging review of international experience, Williams (2013) identified a number of planning approaches to delivery. One is very bottom up and best exemplified in Vauban. Rather than just involving stakeholders it encourages them to own, operate and manage low-carbon infrastructure, thereby nurturing long-term community support for a transition. However, this will not work if there are no community innovators, so results are likely to be patchy. It is also likely to be resource intensive for a local council.

Another is a strategic, systemic planning approach, which proved successful in Stockholm, Malmö and Freiburg, with leadership from the municipal council as key to delivering coordination and enabling projects, and generally being a catalyst for action. 'The power of the municipality in particular can greatly influence the potency of a systemic planning approach. Municipal control over resources—land, funds, utilities, and housing companies—strengthens the approach', though industrial innovators are also crucial (pp.698-699). To succeed there needs to be coordination and buy-in from all stakeholders, but then the outcomes can be at scale and systemic. This approach still takes time, requires skills from planners and investment in planning, and monitoring is important.

Finally, and closer to the current political economy of Scotland, is a market-shaping approach, seen in the USA as well as the UK. The planning system sets standards and guidelines, encouraging investors and reducing their exposure to risks. However, sustained support and leadership from local government level remains crucial for success. The approach offers flexibility, but the flip side of that can be a slow roll-out. Clear guidance on regulatory policies is necessary, along with consistent application. Initially at least, even this approach is likely to be resource intensive and extend the time taken in processing planning applications.

If the Scottish planning system is to be an effective force for the transition to a CE, the Scottish Government needs to consider research such as this by Williams, and elaborate a fuller and properly resourced approach to delivery.

Conclusions

The planning system could be a powerful means to help Scotland to transition to a CE. However, it currently operates in a more framework, as shown in Figure 1. In contrast, Figure 4 gives some indication of why and how planning could be rethought to work for a CE. Finally:

- NPF4 states that 'Our focus is on making productive use of existing buildings, places, infrastructure and services, locking in embedded carbon and minimising waste, and supporting Scotland's transition to a circular economy.'(p.10). However, this focus too often is blurred, and a linear economy will be perpetuated.
- A CE is largely equated with waste management and the waste hierarchy. The more holistic understanding in the quotation above should be the driver of the whole Framework.
- There is a territorial dimension to a CE – i.e. related to places, networks and scales. The Spatial Strategy needs to be informed by research on this.
- The National Developments offer an opportunity to put CE principles into practice at scale. However, while the National Developments are stated to support Community

Wealth Building, biodiversity, climate concerns etc, CE is not identified in that list. It needs to be.

- The Handbook of Planning Policies includes Policy 20 on Zero Waste, which is welcome. However, like many other Policies, this one allows for exceptions, seriously weakening the regulatory provisions. These loopholes need to be tightened in the final version.
- Delivery of the Framework is expected to include involvement of stakeholders. ZWS will have to play an active role if CE principles are to be embedded in planning practice.



Figure 4: Rethinking planning as a driver of a circular economy
Source: Author

Appendix

NPF 4 and a Circular Economy: What others are doing

This note explores moves to deliver steps towards a Circular Economy through spatial planning. It is compiled from secondary sources.

The London Plan 2021

The Plan aims to use the planning system to minimise use of new materials. It sets out circular economy principles to be taken into account at the start of the design process and, for referable applications or where a lower local threshold has been established:

- building in layers – ensuring that different parts of the building are accessible and can be maintained and replaced where necessary;
- designing out waste – ensuring that waste reduction is planned in from project inception to completion, including consideration of standardised components, modular build and re-use of secondary products and materials;
- designing for longevity
- designing for adaptability or flexibility
- designing for disassembly
- using systems, elements or materials that can be re-used and recycled

The plan also requires borough councils to identify sites for public water fountains to reduce use of plastic bottles.

There is a Policy on ‘Reducing waste and supporting the circular economy’:

A. Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by the Mayor, waste planning authorities and industry working in collaboration to:

1) promote a more circular economy that improves resource efficiency and innovation to keep products and materials at their highest use for as long as possible

2) encourage waste minimisation and waste prevention through the reuse of materials and using fewer resources in the production and distribution of products

3) ensure that there is zero biodegradable or recyclable waste to landfill by 2026

4) meet or exceed the municipal waste recycling target of 65 per cent by 2030

5) meet or exceed the targets for each of the following waste and material streams:

construction and demolition – 95 per cent reuse/recycling/recovery; excavation – 95 per cent beneficial use

6) design developments with adequate, flexible, and easily accessible storage space and collection systems that support, as a minimum, the separate collection of dry recyclables (at least card, paper, mixed plastics, metals, glass) and food.

B. Referable applications should promote circular economy outcomes and aim to be net zero-waste. A Circular Economy Statement should be submitted, to demonstrate:

- 1) how all materials arising from demolition and remediation works will be re-used and/or recycled
- 2) how the proposal's design and construction will reduce material demands and enable building materials, components and products to be disassembled and re-used at the end of their useful life
- 3) opportunities for managing as much waste as possible on site
- 4) adequate and easily accessible storage space and collection systems to support recycling and re-use
- 5) how much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy
- 6) how performance will be monitored and reported.

C. Development Plans that apply circular economy principles and set local lower thresholds for the application of Circular Economy Statements for development proposals are supported.

Another policy requires development plans to 'identify how waste will be reduced, in line with the principles of the Circular Economy and how remaining quantum of waste will be managed'. This is part of a much longer section on waste, which endorses the waste hierarchy and addresses waste infrastructure, all in the context of a shift to a circular economy.

<https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021>

Lewes District Council, Sussex

This planning authority has produced two Technical Advice Notes, one on Circular Economy and the other on Sustainability. The latter makes the important point that '*The sustainability of a development should not just be considered from a point of view of the resulting development. During construction, emissions come from the creation of the materials used in construction, from bringing people and materials to the site, and from the use of machinery. Once built, buildings are responsible for emissions from operational energy, such as heating, cooling, lighting and water, as well as energy use to power common place appliances.*'

There is a sustainability checklist which all developments are encouraged to consider, and submit along with the planning application. It further states that '*Demolition often leads to large amounts of waste, and can impact on the amenity of residents. Retaining a building can preserve the character of the surrounding area; therefore we would encourage the reuse, repair and refurbishment of existing buildings to new uses wherever possible. If your site includes an existing building which is proposed for demolition we will expect your submission to outline why it is not suitable for reuse.*' In addition, '*All development is encouraged to give early consideration in design proposals and landscaping schemes to the location of food growing spaces, the use of productive trees or other edible planting.*'

For the full checklist download the TAN from <https://www.lewes-eastbourne.gov.uk/planning-policy/supplementary-planning-guidance-and-supplementary-planning-documents/?assetdet3184c5c8-f61a-49cf-9c3f-4c18958be787=310341>

The Circular Economy TAN links to the East Sussex, South Downs and Brighton & Hove Waste and Minerals Local Plan. Policy WMP3a of the WMP promotes strategies for waste prevention and re-use, and encourages development that involves the preparation of materials for re-use. It also supports developments that involve the utilisation of materials, or energy, derived from waste as a resource. Policy WMP3d sets the objective for waste management during construction, demolition and excavation. The durability of the construction has to be maximised, and waste needs managed as far up the Waste Hierarchy as practicable.

The TAN highlights sustainable procurement of materials, including the use of recycled, low impact and sustainably-sourced materials through maximising materials ratings using the Building Research Establishment's Green Guide. It requires all developments to be designed to be adaptable and able to respond to change. 'Building design should also enable deconstruction in order to ensure the maximum value of building components can be recovered at the end of the building's life.' This means addressing both the choice of materials and components; and the way they are put together, e.g. through simple connections.

Netherlands

In 2016, the Dutch national government set a circular economy strategy, which provides goals, inspiration and ambitions to local governments. The aim of the national strategy is to achieve a waste-free economy by 2050. The National Strategy for Spatial Planning and the Environment 2020 (NOVI is the Dutch acronym) sees a move to a circular economy as a way of future-proofing the Netherlands. It focuses on resources and materials used in buildings, roads and engineering structures such as viaducts and bridges so that they retain their value so that no waste flows remain following the use phase. However it also notes that a circular economy requires new logistic concepts and a 'stable ecological system with sufficient biodiversity'. It warns that 'The consequences of this transition on transport flows, use of space, the environment and security remain uncertain'.

The Strategy highlights the role of municipalities, who 'are responsible for creating the necessary conditions for space where used products and natural resources can be collected, sorted and made suitable for reuse, by business. To ensure that the necessary mass of used products is achieved while at the same time establishing a suitable number of collection locations, provinces will supervise this role and monitor the combined efforts.' Thus the national strategy is cascaded down through the regional scale Provinces to the local Municipal Councils. It identifies 'energy-intensive clusters' where such spaces are most urgently needed.

One such municipality is Groningen in the rural north-east. The municipality's bio-based economic vision aims to strengthen the position of Groningen as an agro-food city. There are three strategic lines: waste collection and management; economic policy areas; and knowledge. One of the ambitions of the bio-based strategy is to reach 20% of the energy produced in the city through biomass by 2035.

The Groningen-Assen Regional Alliance is a voluntary platform of co-operation at the scale of the functional urban area. The platform includes the provinces of Drenthe and Groningen and seven municipalities. The alliance identifies construction and waste as strategic sectors to develop joint circular economy projects. The Northern Netherlands Alliance (*Samenwerkingsverband Noord-Nederland, SNN*) is a partnership amongst the three Northern provinces – Drenthe, Friesland and Groningen – and the four largest cities in the region, Assen, Emmen, Groningen and Leeuwarden. The circular economy is one of the topics incorporated into the alliance’s future actions, aiming to reuse energy and waste materials at their highest quality level, while strengthening the links between natural and social capital.

<https://www.oecd-ilibrary.org/sites/e53348d4en/1/2/2/index.html?itemId=/content/publication/e53348d4-en&csp=e9d823f942c6a9ba0723563f20f8c93a&itemIGO=oecd&itemContentType=book#section-d1e5222>

Finland

In 2016 the Finnish Innovation Fund published its road map to a circular economy. It has been updated. There are four strategic cross-sectoral goals:

1. Renewal of the foundations of competitiveness and vitality;
2. Transfer to low carbon economy;
3. Natural resources are regarded as scarcities;
4. Everyday decisions working as a driving force for change.

As well as stressing how municipalities can help through procurement, it advises them as follows:

The built urban environment, buildings and the management of land offer a lot of circular opportunities in towns. The circular economy must be integrated into regional planning. The efficiency of construction and choices of materials can be affected through land-use planning.

In urban planning, priority must be given to light traffic and public transport. The expansion of recharging and refuelling networks for alternative forms of power enables longer journeys. New on-demand mobility services that flexibly respond to demand and supply offer a noteworthy mobility alternative to driving a car.

Looking to local level implementation it foresees that by the mid-2020s’ municipal strategies will have been reformed: *land-use planning will offer incentives for efficient land use or changes in the form of land use to promote the circular economy. An increasing share of passenger mileage will be in the form of walking, cycling or public transport.*

The pressure for new land development will have decreased because of the greater reuse of built areas or because of the offsetting of the degradation of the living environment in one area by improvements in other areas.

Source: <https://www.sitra.fi/en/projects/critical-move-finnish-road-map-circular-economy-2-0/>

Deloitte studied CE initiatives in Finland's six largest cities. It found that use of recycled or renewable materials in city developments, and urban planning related to the use of zoning and public spaces to support circular economy development were the most common actions. A City Representative is quoted as saying **'The city is in charge of urban planning, infrastructure, services, public transport, energy, and more. By having responsibility for all those things, the city has quite a tool box that it could use for bringing about circularity.'**

Deloitte urged the Finnish cities to adopt more disruptive approaches to break the traditional linear economy. These included regulation.

<https://www2.deloitte.com › Documents › risk › thecircularcityinFinland.>

Boulder, Colorado, USA

Boulder has committed to becoming a zero waste community by 2025. This ambition is closely linked to its climate goals. The city has worked with Dutch consultants Metabolic to produce a Materials Flow Analysis – essentially an input/output analysis of materials used in the city. Another feature is the recognition that like most cities, Boulder has a 'footprint' far across its boundaries, e.g. in production of food or goods consumed in the city but manufactured elsewhere. This has highlighted the potential for industrial symbiosis and for eliminating food waste.

Boulder has high house prices, with more affordable housing generally outside the city itself. Commuting from those outer neighbourhoods needs to be factored in to calculations of waste.

A road map has been produced to progress Boulder to become a circular city.

<https://www.metabolic.nl/publications/circular-boulder/>

The City of Boulder 'Green Points' programme requires applicants for new construction permits to demonstrate that a minimum of 50% of construction scraps are recycled. Deconstruction permits require at least 65% of material, by weight, be diverted from disposal.

Boulder has also implemented a solar access ordinance which guarantees access to sunlight for homeowners and renters in the city. The ordinance sets limits on the amount of shading permitted by new construction. The city is zoned into three different areas, each with different solar access requirements dependent on existing urban form. The ordinance provides those investing in new solar systems with assurance of their continued ability to operate them effectively.

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