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# What does a just transition mean for urban biodiversity? Insights from three cities globally

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## ABSTRACT

Just transitions – responses to environmental change that minimise negative impacts on the most affected people and places, while ensuring nobody is left behind – are gaining scholarly and policy significance in areas beyond their original focus on carbon-intensive jobs and sectors. Yet attention to what a just transition means for biodiversity, as another aspect of the global environmental crisis, remains limited. Given the critical role that biodiversity plays in supporting livelihoods and wellbeing, this is a notable gap. This paper assesses what a just transition means for biodiversity, focusing on urban environments as the spaces in which many people encounter biodiversity globally. We undertake interview research across three case study cities representing different geopolitical and environmental contexts: Bristol (UK); Yubari (Japan); and Cape Town (South Africa) and ask two questions: what does biodiversity tell us about the concept of just transitions in the lived environment; and what are the consequences of considering just transitions in the context of biodiversity in the lived urban environment? Based on our findings, we set out six principles for a just transition in relation to urban biodiversity, as areas for further empirical enquiry: a shared sense of what a just transition and biodiversity mean in the local context; diverse social and ecological knowledge systems informing decision-making; integration and cohesion across policies; inclusive, meaningful and early engagement; supporting communities during and after implementation; and measures for assessing the effectiveness of outcomes from an ecological and a social perspective.

## 1. Introduction

Momentum for just transitions – broadly understood as responses to environmental challenges that reduce socio-economic impacts on people and places who may be negatively affected by moves towards sustainable and zero-carbon societies – is growing within policy and legislation. For example, initiatives from national and regional governments (e.g. [Scottish Government Just Transition Commission, 2021](#)); environmental non-governmental organisations (e.g. [Platform-Friends of the Earth Scotland \(2023\)](#) campaigning on support for fossil fuel workers) and

trade unions (e.g. the UK [Trades Union Congress \(2023\)](#) on future-proofing jobs and infrastructure) explicitly embed the language of just transitions.

Critical social science research, spanning human geography, science and technology studies and beyond, has similarly explored just transitions for climate change, energy and the broader environment ([Heffron and McCauley, 2018](#); [Jasanoff, 2018](#); [Jenkins et al., 2020](#); [Morena et al., 2020](#)). Although a just transition has been proposed as a unifying concept for diverse struggles ([Heffron and McCauley, 2018](#), [Wang and Lo, 2021](#)), divergent interpretations remain. This has led to calls for the

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combination of energy, environmental and climate justice paradigms, with a clear focus on outcomes (Heffron and McCauley, 2018) and a shared focus on justice in process as well as distribution of risks and benefits (McCauley and Heffron, 2018; Abram et al., 2022). Scholars have also called for additional empirical studies on just transition, expanding scope to include a wider range of geographical and socio-economic contexts (Wang and Lo, 2021).

This paper engages with both these conceptual and empirical research drivers within another global environmental emergency where just transitions have received less explicit attention: biodiversity (IPBES-IPCC, 2021; Knapp et al., 2021). Attention to who benefits and who loses out in biodiversity management is especially salient given political interest in nature's contributions to people as a way of supporting livelihoods and societal wellbeing while responding to climate mitigation, adaptation and sustainability imperatives (ILO, 2022; NatureScot, 2020). The adoption of the Global Biodiversity Framework in 2022, which mentions just phase-out of incentives harmful to biodiversity and justice in access to biodiversity for local communities, illustrates the need for careful thought of what just transitions thinking means for biodiversity governance. Now is thus an important moment for understanding what just transitions thinking can contribute to global rhetoric on biodiversity, and also what biodiversity can bring to extant scholarship, policy and practice on just transitions.

Biodiversity management inevitably involves questions of land use, which are place-based and context-specific. This links well to academic insights about 'where' a just transition happens, focusing on the 'place' of just transitions (Heffron and McCauley, 2018; Raymond et al., 2023; Eadson et al., 2024). Raymond et al (2023) argue that including sense of place in decision-making is especially valuable to build support for urban just transitions; whilst Heffron and McCauley (2018) contend that where events that lead to inequality and injustice happen, and to what locations inequalities or injustices reach or occur, are important. For biodiversity, urban environments are the place most people globally will experience environmental change, but where specific understandings of both biodiversity (Knapp et al., 2021) and just transitions (Hughes and Hoffmann, 2020) are still emerging. Within the recognition of cities as drivers of socio-ecological transitions (McCauley, 2021; Berglund et al., 2023; Bulkeley, 2021), the contributions of biodiversity to people are increasingly advocated within 'nature-based solutions' that enable just transitions by improving urban environments while addressing socio-economic injustices (Raymond et al., 2017; Frantzeskaki, 2019).

Accordingly, the aim of this paper is to assess what a just transition in an urban context means for biodiversity, with a specific focus on the lived environment as the place in which this transition happens. We break this overall aim down into two sub-questions. First, what does biodiversity tell us about the concept of just transitions in the lived environment? And second, what are the consequences of considering just transitions in the context of biodiversity in the lived urban environment? To do so, we investigate three cities globally facing differing and complex biodiversity challenges: Bristol in the UK; Yubari in Japan; and Cape Town in South Africa.

We begin with a series of conceptual clarifications, and use these to develop a potential series of principles for a just transition for urban biodiversity. (Section 2). We then outline our research design (Section 3), and present the three case studies (Section 4), Section 5 presents our findings. We organise these around three themes: understandings of just transitions; responsibility for just transitions; and just transitions and biodiversity without labels. In Section 6 we reflect on how these themes – and our findings – add context to the principles proposed in Section 2, before returning to the overall aim and questions of the paper.

## 2. Conceptual background: just transitions, biodiversity, and the urban

To develop a framework for evaluating just transitions in urban biodiversity, we begin by synthesising existing work across scholarship,

policy and practice which has outlined principles for just transitions across different dimensions. After reviewing work on just transitions themselves, we turn our attention to biodiversity and then the urban, before presenting a series of principles for just transitions in urban biodiversity to be tested through the empirical cases.

### 2.1. Just transitions

In their report on decent nature-based work, the International Labour Organisation, United Nations Environment Programme and International Union for the Conservation of Nature explain that a just transition "seeks to maximize the social and economic opportunities of environmental actions – including climate action and protecting biodiversity – while minimizing and carefully managing any challenges related to impacts of these actions [and] aims to support workers, enterprises and communities negatively impacted by shifts away from certain sectors and seeks to ensure that no one is left behind" (ILO, 2022: 37). The UN Framework Convention on Climate Change (2020), building on work from the ILO, identifies six characteristics that comprise a just transition. These are: understanding the impacts of a policy; research and early assessment of the impacts of policies on the workforce; consultation and social dialogue; training and skills development; social protection and security; and evaluative assessment of just transition measures and their sustainability.

Although the understandings of a just transition promoted by actors such as the ILO and UNFCCC are understandably focused on jobs and workforces from a policy and practice angle, they provide a useful organising framework for assessing what a just transition may look like across societal responses to other environmental challenges. This is important because scholarly interest in just transitions has broadened out to look at foundational changes that are required for just societies in a way that includes but goes beyond labour (Hughes and Hoffmann, 2020), exploring questions such as who benefits and who loses out on a global scale from the transition to a sustainable society (Swilling et al., 2016); what a move away from carbon-intensive industries and practices means for community and sense of place (Weller, 2019, Raymond et al., 2023, Eadson et al., 2024); and what a just transition means for adapting to the impacts of climate change (Schlosberg et al., 2017). Common across both the UNFCCC principles and these broader scholarly understandings of a just transition is the recognition that environmental actions can create winners and losers, but that through forward planning, early engagement and specific measures to support those at most risk, difficult decisions can be handled in a way that does not create new inequalities or intensify existing ones. It is this understanding of a just transition that we take as a starting point for our enquiry.

It is also important to acknowledge the difference between *transition* and *transformation*. While existing research has discussed just transformations in biodiversity (Pickering et al., 2022) and ecosystems (Bennett et al., 2019), our focus is on just *transitions* in biodiversity. Hoelscher et al. (2018) explain that although the two terms are not mutually exclusive, transition has mainly been employed to analyse changes in societal sub-systems (such as cities) with a focus on social, technological and institutional interactions; whereas transformation is more commonly applied to large-scale changes in whole societies. Given our desire to understand existing and ongoing empirical examples of how biodiversity can support those in greatest need within societal responses to environmental change, and our focus on actions at the urban scale, we thus bring a biodiversity contribution primarily to the literature on just transitions, rather than just transformations.

### 2.2. Biodiversity and just transitions

Biodiversity in its simplest form refers to the variability among living organisms from all sources; and the ecosystems of which they are a part (IPBES, n.d.). Díaz et al. (2015) explain that biodiversity and ecosystems feed into nature's benefits to people (in the form of ecosystem goods and

services), which in turn enable good quality of life and human well-being. Explicit engagement with just transitions in biodiversity-focused scholarship is limited, yet it is possible to identify multiple ways in which protecting and enhancing biodiversity could support people and places negatively impacted by responses to environmental challenges under a just transition approach. These include fair and decent jobs that maintain or enhance nature's contributions to people (ILO, 2022); reducing harm to people and places most at risk from climate-related weather extremes through ecosystem-based adaptation and disaster risk reduction (e.g. IPBES-IPCC, 2021; Sudmeier-Rieux et al., 2021); and supporting resilience to shocks and stresses by aiding physical and mental wellbeing and societal interaction (Marselle et al., 2019).

A just transition in biodiversity may also involve redressing past harms to nature, through ecological rehabilitation of degraded environments in landscapes formerly associated with resource extraction (Nowakowska et al., 2021; Krzysztofik et al., 2022). A just transition that considers those who stand to lose most must also acknowledge communities whose livelihoods depend on contributions from biodiversity, especially in agrarian contexts, and ensure that global rhetoric of biodiversity conservation in the name of sustainability transitions does not disadvantage such resource-dependent communities (Alarcón et al., 2022).

Biodiversity can thus be seen as a critical building block for realising transitions to sustainability, given its role in supporting quality of life and wellbeing. Moreover, if, as we suggest, a transition is to be 'just' in the sense of supporting those who are most affected and leaving nobody behind, then it follows that the contributions to people from biodiversity need to be distributed equitably across society and space, that past harms to biodiversity ought to be redressed, and that the needs of those who currently rely on biodiversity for livelihoods or wellbeing are respected. Pickering et al (2022) outline five principles to enable just biodiversity governance: policies that comply with norms that biodiversity ought to be protected; integration of biodiversity across different policy areas; fairer decision-making processes; mobilisation of resources in the form of funding; tangible examples of implementing strategies in practice; and measures for monitoring, evaluation and accountability. Although these principles reflect just transformations rather than just transitions specifically, they nonetheless illustrate how just transition definitions developed in a decarbonisation context may be adapted for biodiversity.

### 2.3. *The urban as a site for just transitions and biodiversity to interface*

The above sections illustrate the value of considering biodiversity through a just transition lens, given the role of biodiversity in supporting livelihoods and wellbeing. A critical challenge, however, is to understand what a just transition in biodiversity may look like in practice – especially given ongoing calls for more empirical examples of just transitions in a wider sense (Wang and Lo, 2021); and of the need for a results-based approach to just transitions (Heffron and McCauley, 2018). As outlined in Section 1, there is growing interest in where and how just transitions happen and where claims to injustice may arise. The urban is a key site at which biodiversity just transitions may take place, and as such is a vital interface and point of departure for understanding just transitions and biodiversity. As Puppim de Oliveira et al (2011) note, it is often at local government level that biodiversity rhetoric is turned into reality, through actions such as land use planning and enforcement of environmental regulations. It thus follows that the local government level is the scale at which one can understand a just transition in biodiversity in practice. However, there is a strong rural focus to existing empirical examples of just transitions through biodiversity (e.g. ILO, 2022). Given the interest in urban areas as key sites for biodiversity conservation under an urbanising global population (Knapp et al., 2021) and also growing consideration of what a just transition means for the urban and built environment (Hughes and Hoffmann, 2020), empirical exploration of the interface between just transitions

and biodiversity in an urban context is an important gap in understanding how a biodiversity just transition may be experienced in the lived environment for many people globally.

### 2.4. *Conceptual framework and research questions*

Our work therefore brings together just transitions, biodiversity and the urban to address two overarching questions. First, acknowledging concern about the proliferation of just transitions research and associated loss of conceptual clarity (Heffron and McCauley, 2018; Wang and Lo, 2021), what does biodiversity tell us about the concept of just transitions in the lived environment? And second, expanding on Raymond et al (2023) and wider work into just transitions and urban nature, what are the consequences of considering just transitions in the context of biodiversity in the lived urban environment? To guide our enquiry and pinpoint what is distinct about biodiversity and just transitions, the conceptual framework in Fig. 1 integrates principles from the different bodies of literature reviewed above, and uses these to distil six possible features of a just transition in the biodiversity context: a shared sense of what a just transition for biodiversity means locally; a diverse base of knowledge systems in decision-making; integration and cohesion across policies; inclusive and meaningful engagement; supporting communities; and measures for assessing effectiveness of outcomes. We return to these principles in the Discussion, and use them as a point of departure to reflect on our two overarching research questions.

## 3. Methodology

### 3.1. *Research design*

We adopted an exploratory multiple case study approach, selecting cities with different urban development and socio-political-economic characteristics across the Global North, Global South and Global East (Yin, 2014). This approach enabled us to study the links between just transitions and biodiversity across different urban sites. Each city was chosen to highlight key contrasts between cultural, developmental and political settings, as emphasised by Swilling et al's (2016) comparison between South African and East Asian contexts in their analysis of the capacities of socio-political regimes to drive sustainability transitions. The cases hence represent one city with a strong local government vision for biodiversity and climate justice but also pockets of deprivation and exclusion (Bristol); one shrinking city with a direct history of fossil fuel extraction, where biodiversity is returning to the lived environment in a largely unplanned manner due to the absence of humans (Yubari); and one rapidly expanding and less-well off city, where biodiversity imperatives need to be considered against socio-economic development, poverty alleviation, and social justice imperatives (Cape Town). Section 4 provides a fuller outline of each of the characteristics of the case study locations. Case study selection was also informed by where the authors have recent or ongoing research experience to strengthen contextual understanding of the case studies, given that the study attempts to synthesize experiences (Gerring, 2016). Prior experience of the cases also aided with recruitment, especially of less empowered groups, and with navigating any sensitivities or issues of research fatigue that can arise with emotive environmental and societal issues.

### 3.2. *Data collection*

Data collection and analysis for this research, which received full ethical approval via the University of Bristol, was conducted between September 2021 and August 2022. 23 semi-structured interviews were undertaken with 25 people across the three cases plus broader biodiversity and just transitions expertise. This was broken down into six interviews for Bristol; five for Yubari; and eight for Cape Town. Four interviews with participants able to give a more high-level and cross-cutting overview of the interface between just transitions and



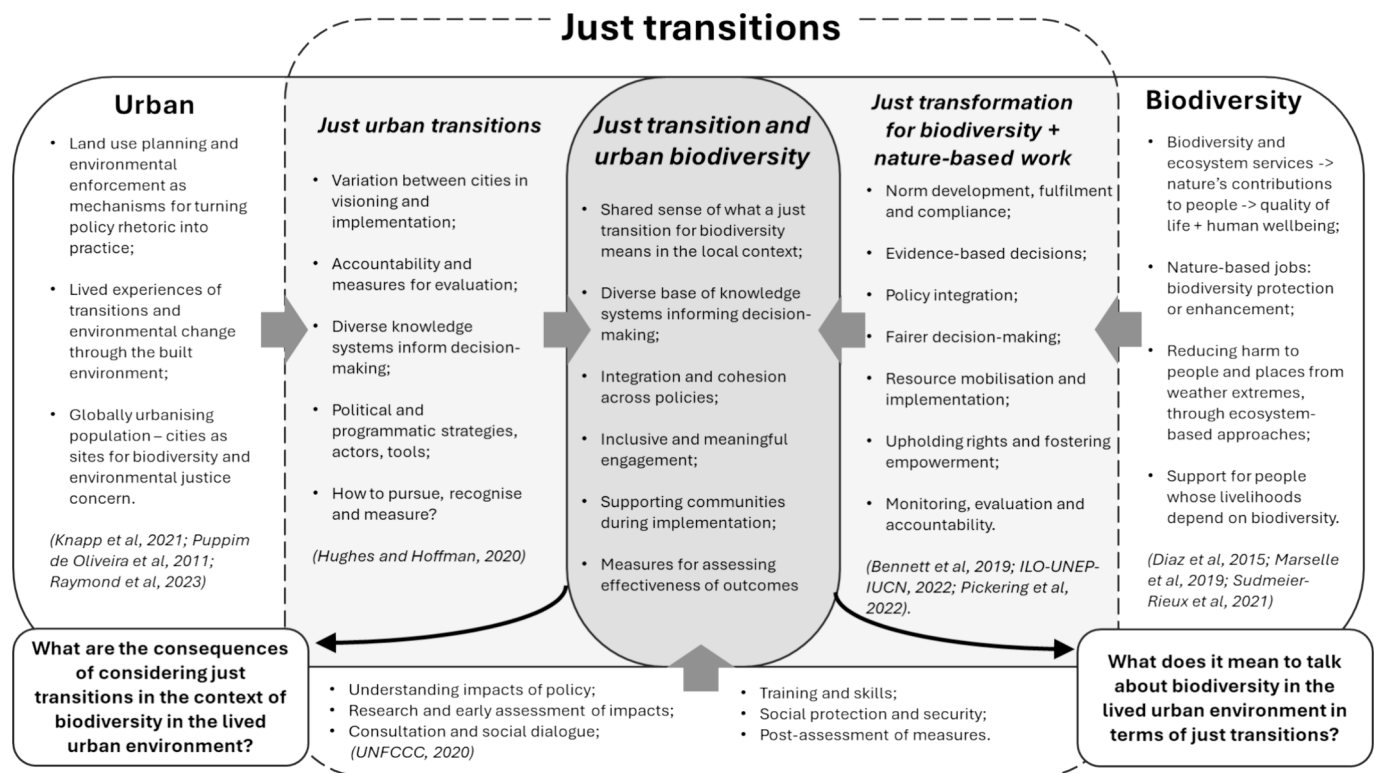


Fig. 1. Conceptual framework, with principles for a just transition in urban biodiversity and overarching research questions.

biodiversity due to their position were also conducted. Participants were recruited through existing networks and snowballing techniques. Sampling sought to cover people involved in different sectors in each city, especially harder-to-reach perspectives, e.g. people working for small organisations and local activists. While designed to target the same research questions, the semi-structured interview protocol allowed some flexibility to reflect specific local challenges and maximise contributions from each individual participant based on their experience and area of expertise (see Table 1).

Given the nascent nature of scholarly and policy engagement at the interface of just transitions and biodiversity, a smaller and more focused sample of people who could talk in-depth about issues relating to just transitions and biodiversity in their local context was considered more important than a larger sample of people able to engage with the issues in less depth. Having respondents with deep contextual knowledge was especially important given our interest in understanding what is distinct about a biodiversity and just transitions framing for urban nature. Where required, existing documentary material relating to each case (for example, local strategies, position papers, published academic and literature on the case studies) is also cited to evidence or support the points made.

### 3.3. Analysis and data presentation

A qualitative thematic analysis of the data was undertaken (Clarke et al., 2015). The content of each interview was coded manually by at least two coders, with preliminary codes focusing on capturing different understandings of biodiversity and just transitions in urban contexts, reflecting the design of the interview questions to ensure construct validity. Subsequently, substantive analytical themes were identified inductively through dialogue among the research team in order to emphasise participants' perspectives (see e.g. Byrne, 2022). In line with the emergent nature of research at the just transitions and biodiversity interface, an analytical approach which was guided by the initial interview questions, yet also contained significant analytical flexibility

to allow participants' own ideas and interpretations to be drawn out of the data, was considered appropriate. Following the 'prevalence' approach proposed by Sandelowski (1998), the findings (Section 5) are structured around reporting the three most prevalent themes in the data. Sandelowski argues this approach to data presentation is useful for situations where the aim is to show convergence and divergence of factors in divergent groups of people experiencing the same event, which fits well with our sample of different people in different locations experiencing just transitions and biodiversity in different contexts. Following Drisko (2005), the discussion (Section 6) and conclusions (Section 7) are structured around links back to prior literature and our conceptual framework, as well as drawing out conclusions.

### 4. Case study cities

Table 2 summarises the main urban, social and environmental characteristics of each of our case study cities. Differences in space and power when it comes to biodiversity and just transitions between each of the cities are apparent, and are discussed in more detail in the subsections below. Bristol is a case where rapid expansion of housing, driven by market trends and population increase, is putting pressure on biodiversity; Cape Town is similarly a case where population growth, driven by national trends of rural–urban migration, leads to expansion of housing and puts pressure on land; and Yubari, conversely, is a case where rapid population decline, caused by long-term national demographic trends and energy transitions, leads to un-managed return of biodiversity. Bristol reflects a case where action and policy is very much driven from the local government level, and where the city authorities seek to position themselves as being leaders nationally on climate and biodiversity action. Both Yubari and Cape Town, conversely, are cases where national level rhetoric on just transitions runs up against the messy realities of complex societal challenges at the local level, and where negotiation of what a just transition means locally is ongoing. In short, Bristol is a city faced with declining natural spaces as more housing is developed; Yubari is negotiating a largely unplanned return

**Table 1**  
Interview participants.

City	Sector	Participant ID
Bristol	Former councillor and current community worker	Bristol 1
	Specialist Support Worker and advocate at city farm	Bristol 2
	Arts practitioner and advocate at city farm	Bristol 3
	Director at city farm	Bristol 4
	Founder of local environmental protection campaign	Bristol 5
	Inter-disciplinary social scientist and former community development worker.	Bristol 6
Yubari	Director of community enterprise and heritage organisation	Yubari 1
	Community nature warden	Yubari 2
	Japan director for international environmental NGO and Policy researcher for international environmental NGO	Yubari 3a, Yubari 3b
	Researcher for Japanese environmental NGO	Yubari 4
	Local government official for urban planning division	Yubari 5
Cape Town	Researcher specialising in just energy transitions	Cape Town 1
	Program Director for non-profit housing rights/advocacy group	Cape Town 2
	Former Director for non-profit housing rights/advocacy group	Cape Town 3
	Attorney specialising in constitutional housing rights and Researcher specialising in urban planning	Cape Town 4a, Cape Town 4b
	Founder/director of environmental project based in informal settlement	Cape Town 5
	Manager in local government environment and conservation division	Cape Town 6
	Researcher specialising in public health, and chair of group opposing development on sensitive land.	Cape Town 7
	Researcher specialising in poverty, inequality and sustainable development in Sub-Saharan Africa, and Researcher specialising in urban political ecology	Cape Town 8a, Cape Town 8b
General	Director of policy and research for UK-based wildlife trust	General 1
	Independent researcher and consultant	General 2
	Director of landscape and placemaking for UK-based housing association	General 3
	Climate officer for trade union organisation	General 4

to nature as a result of demographics and historical energy transitions; and Cape Town has a legacy of spatial politics that have left deep inequalities and hurt amongst local people, and also faces declining natural spaces as more housing is developed.

#### 4.1. Bristol

Bristol declared both a climate and an ecological emergency in 2020 (Bristol City Council, 2020a,b). Bristol has a history of environmental activism and frames itself as an environmental leader. The city has developed networks of ‘green governance’, notably the Green Capital Partnership which aims to work collaboratively with city government, utilities, NGOs, developers, universities and local communities to build consensus for change. However, there are growing concerns that social inequalities are reflected in the diversity of the environmental movement in Bristol, including a lack of diversity in environmental governance. The city also faces significant social inequality challenges, with 15 % of Bristol’s population living in the most deprived 10 % of areas in England in 2019 (16 % in 2015), with 21 % of all children and 17 % of older people living in income deprived households (Bristol City Council,

**Table 2**  
Characteristics of case study cities.

	Bristol	Yubari	Cape Town
Population (approx.)	459,000	7,000	4,600,000
Main environmental challenges identified at local level	Sea level rise, reduction in rainfall, heatwaves, decline in biodiversity.	Reduction in snowfall, rising summer temperatures, legacy of coal mining infrastructure.	Reduction in rainfall leading to extreme pressure on water resources, pressure on biodiversity and green infrastructure from urban development.
Main urban policy challenges	Pressure on green spaces due to rapid expansion of housing; significant social inequality.	Empty and abandoned buildings spread over large area; rapidly ageing and declining population.	Rapid population increase; pressure on land from both biodiversity conservation and expansion of formal and informal housing; high (albeit deteriorating) poverty rates among non-White groups.
Main environmental policy drivers relevant to biodiversity and just transitions	Climate and ecological emergency declared (2020); Bristol City Council Climate Emergency Action Plan 2022–25.	Yubari City Government declaration of intent to become a ‘zero carbon city’ (2023).	Cape Town Resilience Strategy (2019)
Consideration of just transitions in local policy/governance	Incorporation of just transitions into local government climate emergency action plan 2022–25.	National government promotion of local net-zero plans; advocacy of just transitions approach from local NGOs (Sato, 2022).	National government adoption of just transitions framework (2022).

2022).

Recognising the importance of tackling climate change and social inequality in an integrated and coordinated way, as well as the importance of enabling a more inclusive and diverse city governance, Bristol’s climate and ecological emergency strategies have been framed under the umbrella of a place-based governance approach, centred around the Bristol One City Plan (Hambleton, 2020). That said, most strategies have not yet been developed into action plans and remain high-level. This is also true of the principle of just transition, incorporated into the Council’s Climate Emergency Action Plan 2022–2025 (Bristol City Council, 2022). Yet population growth and demand for housing are putting pressure on green spaces and biodiversity in Bristol. A number of green spaces in the city were previously designated for housing, prior to the city’s ecological emergency declaration. One of the most high-profile controversies involves plans to build 260 homes on the city’s Brislington Meadows, with regional environmental NGOs explicitly citing loss of wildlife and habitats in opposition (Avon Wildlife Trust, 2021).

Bristol hence offers insight into a locality which has made explicit mention of just transitions in a climate and biodiversity context at a local level. However, the ongoing controversy over housing expansion in the city also means Bristol can offer insight into how well just transitions policy rhetoric can protect biodiversity in the face of market-driven housing expansion.

## 4.2. Yubari

Yubari is a former coal mining city in Hokkaido, the northernmost island of Japan. From a peak of nearly 120,000 people in the 1960s, the population of Yubari declined in line with the winding-down of the city's mines as Japan transitioned away from coal and towards oil, gas and nuclear in its energy mix. The last mine closed in the early 1990s. Owing to a shrinking population, a lack of taxation revenue and a legacy of mining-related infrastructure to maintain, Yubari's city government effectively declared bankruptcy in 2007.

Yubari has an ageing population, with 53.9 % of the population aged 65 or over as of December 2022 (Yubari City, 2022). The most recent available data at the time of writing indicates the annual per capita income in Yubari is 1.96 million Yen, compared to 2.39 million Yen for Hokkaido and 2.75 million Yen for all Japan (Yubari City, 2011). Yubari's financial strength index is in the bottom 15 % of all Japanese local governments (Ministry of Internal Affairs and Communications, 2021). In a radical effort to reduce costs and make Yubari liveable for the remaining 6,800 residents, Yubari has since 2012 embarked on a programme of relocating residents from peripheral areas of the municipality to a new 'core' and allowing formerly inhabited areas to return to nature (Mabon and Shih, 2018). The challenges of managing a transition to a smaller sustainable urban form are made more acute in Yubari by the legacy of coal mining, which has left slag heaps, mine shafts and mining-related buildings in the landscape; however the city government is supported in its initiatives through a number of community-led organisations that support key public services such as snow clearing, libraries and preservation of cultural heritage (Mabon et al., 2023).

Yubari offers an opportunity to understand several interrelated issues: the role of biodiversity conservation and enhancement in transitions for former fossil fuel economy cities, where extractive industries may leave specific spatial and infrastructural legacies; the benefits of urban re-naturing for less empowered residents in post-industrial cities; and how the rehabilitation of nature and biodiversity interplays with potentially contentious urban governance issues (in this case planned relocation) which arise as part of a just transition.

## 4.3. Cape Town

Cape Town is South Africa's legislative capital, with over 4.6 million people. Cape Town is experiencing rapid increases in population (mainly from rural areas), pressures for land for both human settlement and biodiversity, and increasing informal housing, within and on the outskirts of the city boundaries. As a result of various challenges, the city has developed a Resilience Strategy (Cape Town Resilience Strategy, 2019), and there have been proposals to develop and safeguard green infrastructure in and around the city. While Cape Town's poverty statistics had been improving, with a reduction in the percentage of households living in poverty from 24.2 % in 2017 to 16.3 % in 2018, there was a marginal increase in poverty of 0.80 % from 2018 to 2019, in the majority of population groups, excluding the White group. The city authorities estimate that these high poverty and inequality rates are likely to have deteriorated from 2020 onwards, in line with the global post-pandemic trend (City of Cape Town, 2021).

Cape Town has notably experienced challenges with water, resulting in apocalyptic headlines about 'Day Zero' for the city running out of water. Some causal factors include climate change and low rainfall (Sousa et al., 2018). The water crisis provided a glimpse into how major environmental change manifests in a large city, and how the responses and differentiated impacts (Enqvist and Ziervogel, 2019; WRI, 2019) could affect different inhabitants. South Africa's national government in 2021 launched its Framework for a Just Transition in South Africa (Presidential Climate Commission, 2022), which makes mention of the role of biodiversity in a just transition in terms of creating green jobs and economic benefit as part of the "biodiversity economy". Against this backdrop of climate impacts affecting different groups of people in Cape

Town differently and national rhetoric on just transitions, Stålhammar (2021) however finds polarised views on biodiversity and urban nature within the city. Stålhammar (2021) reports that some biodiversity managers in the city see South Africa's dominant 'conservation' rhetoric as being too protectionist, arguing instead for planning and managing biodiversity in the context of Cape Town's development and equity challenges.

As such, in terms of biodiversity and a just transition, Cape Town offers opportunities to investigate whether programmes planned or under consideration with biodiversity and ecosystem services at their core are sufficiently (or at all) considering just transitions in the way that national rhetoric promotes. Cape Town also offers insight into what just transition and biodiversity thinking might look like in a highly unequal city, in a highly unequal country.

## 5. Findings

We divide our findings into three themes. The first is *understandings of just transitions*. This refers to how respondents understood (or not) just transitions in their own contexts, and the similarities and differences between how just transitions are understood across the cities. The second is *responsibility for just transitions*. Here, we explore who respondents saw as being responsible for putting a just transition into practice – and also the constraints faced by those who are expected to lead on bridging a just transition and biodiversity. The third theme is *just transitions and biodiversity without labels*. This refers to actions which were observed across the cases and which could be thought of as fitting with a just transition in biodiversity, but which interviewees themselves may not explicitly describe as relating to a just transition or to biodiversity. These themes were identified through qualitative thematic analysis, and as such reflect the central issues that emerged when participants talked about how they saw the relationship between biodiversity and just transitions. In the discussion in Section 6, we reflect on how these themes – and our findings – relate to the overall aim and questions of the paper, namely: what does biodiversity tell us about the concept of just transitions in the lived environment; and what are the consequences of considering just transitions in the context of biodiversity in the lived urban environment.

### 5.1. Understandings of just transitions

Our first theme concerns understandings of the term 'just transition'. Across the city contexts, there were different interpretations of what a just transition meant in a general sense, let alone in the context of biodiversity. This was illustrated by the breadth of responses that were given when participants were asked to explain how they would define a just transition:

"I suppose, another just transition might be the other way, is that you know someone saying, we want to chop this tree down but be like, you know, a just transition would be you're not going to try and chop that tree down until the tree other trees you've planted, or at this height, and you know that's the that's kind of a compromise" (former councillor and current community worker, Bristol)

"There's a lot of opposition to places that are relying on coal mining and coal power, and Japan's coal-fired power plants are being shut. There are places that have been carried by coal in the past and have come into a bad situation, so I wonder how they will maintain their living in the future [...] The problem of unemployment, alcohol dependence, the problem of deteriorating security, etc. It's certainly a problem that we really have to think about when transitioning to maintain people's happiness in their lives." (community NGO, Yubari)

"It doesn't make sense to have a transition that makes things worse than they are right now, you know. If you find that you have a situation where there's high inequality. You know, by taking steps

towards a just transition, it means that you have to make sure that those inequalities are eliminated, to a certain point or totally by the transition that you're making." (just transition researcher, Cape Town)

Immediately notable here are the different definitions of a just transition that exist within and between locations, with emphasis on *replacement* of what is lost (Bristol); *maintenance and rehabilitation* of quality of life under industrial decline (Yubari); and *improvement* on the status quo (Cape Town). Across the city contexts, there were also different levels of willingness to explicitly engage with just transitions. On one hand, there was a good sense of the value of just transitions messaging in Yubari, given the prior experience of a transition from fossil fuel extraction towards new forms of employment and economy. One respondent saw explicit use of a just transitions approach as a helpful strategic move that placed local governments and Japan as a whole in a global context:

"... we're saying, like, the rest of the world is phasing out coal, and they have a plan. So we don't just want you [the Government] to phase out coal power, we want you to plan for it and do it properly. And that's kind of the role of just transition." (Japanese environmental NGO)

And in Cape Town, respondents saw the language of just transitions as being a useful organising concept for making explicit the *processes* that need to be followed to realise nature's contributions to people equitably across the city:

"what processes do we need to put in place for us to be able to achieve that sort of ideal state of justice as it relates to the equitable distribution of biodiversity and its ecosystem goods and services to all the people in the city, so how does everybody have access to a good amount of clean water, how does everybody have access to flood mitigation to fire mitigation to good soils, etc, regardless of your social economic standing." (researcher specialising in urban political ecology, Cape Town)

"I agree that there's a possibility to have a just transition that is about social nature. Society and nature is like an intertwined vision" (researcher specialising in poverty and inequality, Cape Town)

For others, however, explicit use of the language of just transitions did not carry any political or organisational benefit, and in fact served only to create confusion and exclusion:

"When you say just transition, that to me doesn't have anything to do with justice. I would say, why is it not called then a fair and equitable transition? I know that's another couple of words, but so just transition for me, that doesn't grab me [...] So yeah, certainly it feels like that wording feels a bit exclusionary..." (director at city farm, Bristol)

Our findings indicate, therefore, that the language of just transitions is understood differently across and within our city contexts, and that different stakeholders in different locations have differing views on the value of just transitions framing in promoting a fair and equitable response to environmental challenges. While these responses echo the diverse understandings of just transition identified by academics, the data also demonstrates a shared concern with social justice in biodiversity management, despite the varied framings of a just transition. Moreover, these responses indicate that a just transitions approach may be of value in planning ahead, emphasising the desired end status for biodiversity and its benefits to people during transitions, for instance while recalibrating the local economy (in Yubari) or while building more housing (in Bristol and Cape Town). This raises the question of responsibility, the next theme from our analysis.

## 5.2. Responsibility for just transitions

The second theme from the data concerns who has responsibility for implementing transitions in a locality, and what the remit for biodiversity within a just transition ought to encompass. When respondents were asked who they thought should take the lead on implementing a just transition, there was a common expectation that the local or municipal government – and the people working within it – should drive integration of a just transition with biodiversity, and act resourcefully to create the conditions for a just transition to happen:

"I think that each staff member [of the local government] should acquire the ability to solve problems and be able to connect separate problems to each other, and to be able to think that if they can't ask for a budget as usual, it's not the end. If there is no subsidy and you couldn't do it until now, if there are possibilities in different directions then we can think about, so not giving up and doing things slightly differently. I think that's necessary. We have to be prepared to put energy in." (local government employee, Yubari)

"there are some things that can be done within the current kind of legislation and policy, there are some things that need to be amended and tossed out....So into a 2014 2015 when the last legislation around planning past it has given the city of Cape Town, the authority to decide how it plans and they determine the planning by-laws so in many ways, you know the spatial development plan and the planning bylaws could speak to where you can develop a language to preserve the language we develop and how it should be developed so that it doesn't impede on land that sensitive, you know I manage its biodiversity much better." (former director for non-profit housing rights group, Cape Town)

Nonetheless, it was also acknowledged that even if local governments have a responsibility to act, limited resources and the slowness of administrative process means communities may have to take the lead themselves on embedding biodiversity into a just transition:

"there's this one project that I know. It's not big, but it's very inspiring, because there's a lot of hope around it [...] they just started the garden there you know, without funding, even without even the right to, because they tried all of the avenues, and they couldn't get the right to anything or support. And they just started the garden. So, there are little micro projects like that in Bristol, that is, you know, creating a new paradigm in certain communities" (arts practitioner and advocate at city farm, Bristol)

Another issue is historical responsibility for ensuring transitions are just, especially when it comes to rehabilitation of damaged ecosystems, and what happens if the institutions responsible for causing harm or damage no longer exist. This was illustrated in the context of slag heaps that have become nature hotspots in Yubari:

"I'm guessing that it might be complicated. For example, all the places were used by Hokkaido Coal, but some of them were rented from the state-owned land. I think it's possible that they borrowed it from the state, so now, for example, it may have been managed by Hokkaido Coal, but when Hokkaido Coal withdrew, they might have returned it to the state. When it comes to that, if one of the slag heaps collapses, if the state-owned land collapses, I wonder if it will be the responsibility of the country?" (director of community enterprise and heritage organisation, Yubari)

Respondents in Cape Town also discussed the challenges that legacy issues – in this case the legacy of Apartheid – posed for the planning system and for biodiversity:

"[Urban migration] is obviously coupled with a particular form of like housing policy that's prevailed in South Africa which kind of almost reinforced the Apartheid spatial planning in the country, which meant that a lot of the development that was taking place for



the poorer communities was taking place in the benefit of the city, often on grounds which were quite sensitive and land that was particularly sensitive from a biodiversity perspective.” (former director for non-profit housing rights group, Cape Town)

These responses add some granularity to the question of what a just transition might look like in the context of biodiversity, namely: rehabilitation of natural environments and biodiversity following the departure of extractive industries; redressing historical injustices and inequalities that lead to present-day uneven access to urban biodiversity and its contributions; and embedding biodiversity considerations alongside other just transition considerations (e.g. housing, economic development) in the locality. Again, they illustrate the emphasis research participants put on the need to plan ahead, with a clear end-state in mind.

The responses also emphasise an expectation that local governments take a central role in linking just transitions and biodiversity, through tools such as planning and land use systems, environmental management and enforcement mechanisms, and allocation of funding. In Yubari and Cape Town especially, a just transitions framing becomes a way of situating responsibility for managing the transition process along a clear timeline from the past into the future, by setting out what ought to happen, and who is responsible historically. The question of who benefits from such actions in the locality is our final point of consideration.

### 5.3. Just transitions and biodiversity without labels

Although there were different interpretations between and within cities of the value in thinking about a just transition in biodiversity, with some participants not acknowledging (or even outright rejecting) a just transitions framing, there were nonetheless examples of actions in support of biodiversity that fit with how a just transition is understood in the scholarly literature. This reflects our third theme: actions towards biodiversity within a just transition, which are not explicitly labelled as such.

Our findings in this regard revealed different perspectives on who and what ought to benefit from a just transition in urban nature. Notably, respondents talking in more generic terms about ‘green space’ tended to emphasise the benefits to people with regard to health, exercise and wellbeing:

“Well, I have, I have social justice, but I’m definitely green space and relationship with nature and that kind of thing, because obviously it has impact on people’s wellbeing, and I think mental and physical health.” (social scientist and former community development worker, Bristol)

Other respondents were more willing to talk about the intrinsic benefits of biodiversity, or of the importance of healthy and biodiverse ecosystems for bringing a range of contributions to people:

“[Yubari is] a city that was kept moving by coal, so it’s not going to be the case that everyone suddenly wants to protect nature this time because things became bad. It takes a lot of time, but [...] we can tell children that it is important to protect that nature through education from home, and we must continue to convey the consciousness that human beings are also a part of nature without giving up.” (nature warden, Yubari)

“what processes do we need to put in place for us to be able to achieve that sort of ideal state of justice as it relates to the equitable distribution of biodiversity and its ecosystem goods and services to all the people in the city, so how does everybody have access to a good amount of clean water, how does everybody have access to flood mitigation, to fire mitigation, to good soils, etc, regardless of your social and economic standing.” (local government environment and conservation manager, Cape Town)

However, respondents did have concerns about whether a just

transition – whether explicitly labelled as such or not – would really be a just transition for nature itself, and not merely a means of bringing benefit to humans. This was illustrated by respondents who were asked to give examples of key biodiversity and conservation conflicts in their locality:

“For the time being, not only Mt. Yubari but also Mt. Ashibetsu is a natural park with a very wide range. There are experts who believe that the value of the park is high enough to be a national park, but at the level of Yubari City Government and the citizens of Yubari, they don’t really notice the value or richness. And because the local people don’t really have any motivation, there isn’t any drive from the country to make it a national park either. Many of the people who live in Yubari, like the older men and women who are from the generation when there was coal mining long ago, perhaps have less of a sense of wanting to protect nature.” (nature warden, Yubari)

“In private [they] support us but they’re worried about speaking publicly because, are they going to lose funding for going against the build, build, build narrative [...] It’s the same with [names eNGO]. They work quite closely with the council, and I think they’re very conscious of speaking out against things, but they did in the end.” (founder of local environmental protection campaign, Bristol)

On the other hand, respondents from Cape Town were especially cautious about the possibility of environmental protection, and a strong emphasis on biodiversity, being mis-appropriated to actively block social justice:

“So, I think it also requires the creativity, then, in that case and an openness and also a calling out of moments when the environment is used as an instrument to prevent social justice, not because, in fact, in very substantive ways you have environmental impacts, but because environmental impact becomes a way to prevent the other.” (researcher specialising in poverty and inequality, Cape Town)

These responses indicate several challenges for putting an explicit biodiversity focus into just transitions. First, there may be practices which are not explicitly labelled as just transitions, and may be undertaken by people who do not engage with the language of just transitions or the institutions promoting it. This can be especially so for those working in sectors more closely aligned with ecology or with community development and social justice instead of energy and climate, where just transitions language has not yet taken root to the same extent. Second, there may be tensions and trade-offs between a just transition *through* biodiversity versus a just transition *for* biodiversity. Whilst respondents are often aware of the difference between protecting biodiversity for the benefit of humans versus protecting biodiversity for its own value, the responses from Cape Town in particular illustrate how protection of biodiversity in its own right will not necessarily enable a just transition, and in fact may inhibit moves towards social justice. This emphasises the importance of focusing on winners and losers, and facilitating early and meaningful engagement in decision-making at the interface of urban biodiversity and just transitions that can capture a breadth of perspectives.

## 6. Discussion

In Section 2 (Fig. 1), we outlined a series of principles for a just transition in biodiversity, drawing on existing frameworks from just transitions, biodiversity, and urban transformations. We first reflect on these principles in relation to our findings and highlight implications that are geared towards policy and practice. Thereafter, we use our findings and the principles to return to our two overarching research questions on concept and the consequences, and identify contributions to critical social sciences on just transitions.

6.1. Principles for a just transition for biodiversity

We described a just transition as a process of recognising that environmental actions have the potential to create winners and losers, but that through forward planning, early engagement and fair processes to support those at most risk, difficult decisions can be handled in a way that does not create new inequalities or intensify existing ones. Table 3 summarises how the three themes around which our Findings are structured provide insights which develop the six possible principles of a just transition for urban biodiversity developed in Section 2. The first principle was a *shared sense of what a just transition for biodiversity means in the local context*. Hughes and Hoffmann (2020) explain that a just urban transition will not look the same in each city because what counts as a ‘just’ city will vary. Our findings indeed show very different interpretations of what a just transition in the biodiversity context means for Bristol, Yubari and Cape Town. Reflecting calls for attention to the places in which just transitions happen (Heffron and McCauley, 2018; Raymond et al., 2023; Eadson et al., 2024), the centrality of local ecological, urban development and land use characteristics means that a just transition for urban biodiversity will inevitably be place-specific. Establishing a shared sense among local governments, residents, third sector organisations and private sector developers of what a just transition for biodiversity is likely to involve in a locality, including who is responsible for rehabilitating degraded environments, is thus an important starting point for putting an urban biodiversity just transition into practice. A critical challenge, and one which requires further research, is how to identify and engage with the perspectives of actors who may be concerned with justice and fairness in local biodiversity, but may not explicitly use the language of just transitions.

Second, *diverse knowledge systems informing decision-making*. Existing just transitions policy work advocates evidence-based decision-making and research into impacts (UNFCCC, 2020; ILO, 2022); whereas urban just transitions research argues for co-production of knowledge with urban communities and networks (Hughes and Hoffmann, 2020). For biodiversity, citizens’ own knowledge and expertise of the species and ecosystems in their lived environment can be vital in understanding what needs to be protected, and what needs to be rehabilitated, as part of a just urban transition. In Yubari, for example, the embodied and experiential knowledge of volunteer nature wardens was critical in making the case for protecting the city’s surrounding nature from further development, even in the face of pressures to create alternative industries to replace coal mining in the early 1990s. Further empirical demonstration of how urban planners and managers tasked with environmental protection can incorporate diverse knowledge systems is especially important for just transitions in a biodiversity context, given trends towards incorporating traditional, indigenous and local

knowledge into biodiversity governance more widely.

Third, *integration and cohesion across policies*. Cohesion across diverse policy areas (Pickering et al., 2022; ILO, 2022) and a good sense of what is possible and what is not within existing governance structures (Hughes and Hoffmann, 2020) are identified across the literature. Indeed, for biodiversity, both Cape Town and Yubari show how a lack of integration or cohesion across different policy areas can make it difficult to realise the societal benefits from biodiversity initiatives, or to scale up beyond discrete projects. Creating fora within local government to make links between biodiversity protection and policy areas such as social protection that support those most at risk are thus vital if biodiversity is to be part of a just urban transition. Moreover, the experience of Bristol also reveals a tension which requires additional empirical enquiry and policy and planning action: namely, how to embed just transitions and urban biodiversity within existing land-based planning systems that are predicated on delivering housing, where national policy imperatives and the legal framework may challenge biodiversity or justice concerns.

Fourth, *inclusive and meaningful engagement*. The necessity of fair process is recognised in both just transitions policy (UNFCCC, 2020) and biodiversity governance (Pickering et al., 2022) contexts. Early engagement is especially important in a just transition for urban biodiversity, where awareness of the terminology of both just transitions and biodiversity (as opposed to ‘nature’ more generally) may be low and there can be scepticism if not outright hostility to the use of new and unfamiliar language if it is forced on actors from on high. Our insights from Bristol, for example, show how some stakeholders can find the language of just transitions exclusionary, highlighting the importance of bringing everyone along from the outset when understanding what a just transition in biodiversity means for the local urban context. Linking to our first principle, further research may wish to explore who the intermediary organisations are who can initiate dialogue or consensus to plan a biodiversity just transition in localities where there may be a lack of trust or outright hostility to local authorities, due to previous negative experiences with urban and environmental planning decisions.

Fifth, supporting *communities during and after implementation*. This involves not only labour unions and employers fostering jobs and skills associated with biodiversity (ILO, 2022), but also local authorities and third-sector organisations working across environment and public health empowering residents and enhancing wellbeing through biodiversity actions (Pickering et al., 2022). This is relevant not only for resource-dependent communities in low-income contexts, but also for urban dwellers in wealthier nations. Both Bristol and Yubari show how the rehabilitation and stewardship of urban biodiversity can support residents’ wellbeing – and even build skills through paid or voluntary work – under times of environmental crisis. Supporting livelihoods in a just transition in urban biodiversity thus encompasses creating fair and

**Table 3**  
Fit of empirical findings with six principles of just transition in urban biodiversity.

	Shared sense of what a just transition for biodiversity means in the local context	Diverse base of knowledge systems informing decision-making	Integration and cohesion across policies	Inclusive and meaningful engagement	Supporting communities during implementation	Measures for assessing effectiveness of outcomes
Understanding of JT	Establishing shared sense that reflects local ecological and urban character	Collaborative understanding for the locality of what JT in biodiversity needs to encompass	Integration, cohesion and shared vision to enable exemplars to be scaled-up	Early engagement crucial to overcoming scepticism of JT terminology	Not only fair and decent nature-based work, but also wellbeing and health benefit	Encompass flows and distributions of nature’s contributions, as well as jobs and economy
Responsibility for JT	Understanding who is responsible to rehabilitate environment and avoid further harm	Respect for traditional, local and indigenous ecological knowledge systems	Local government fora to enable dialogue on biodiversity and JT across multiple policy areas	Intermediary organisations who can initiate dialogue and build consensus	Rehabilitation and stewardship of nature supporting work and also wellbeing	Collaboration between local government and researchers/ third sector on evaluation criteria
JT without labels	Identifying and engaging actors who do not use JT to discuss biodiversity actions	Existing citizen understanding of what ecosystems need protected or rehabilitated	Importance of non-environmental policy areas e.g. social protection	History matters: previous negative experiences reduce trust	Beyond employers and labour unions, also encompassing public health	Assessment over time against shifting climate, ecological and societal baselines

decent work, but also includes the longer-term wellbeing benefits from rehabilitating and maintaining local biodiversity.

Finally, *measures for assessing the effectiveness of outcomes from an ecological and a social perspective*. Evaluative assessment and monitoring of effectiveness of interventions are well recognised for just transitions (UNFCCC, 2020), and also provide a measure to ensure that the quality of outcomes, and not only the policy-making process, are assessed (Hughes and Hoffmann, 2020). Again, the incorporation of biodiversity means there is a need, as was articulated in the Cape Town case, to be able to assess flows and distribution of nature's contributions to people, as well as the measures of employment and societal wellbeing that are more commonly associated with a just transition. Cooperation between local governments and researchers on comprehensive measures for assessing effectiveness of outcomes is thus critical to knowing if a just transition in urban biodiversity is achieved in terms of supporting and enhancing ecosystem functions. However, because the time needed for ecosystems to develop means it may take decades for biodiversity actions implemented today to take effect, there is a methodological challenge in designing evaluation criteria that can assess the 'effectiveness' of a just transition in urban biodiversity over time against constantly changing climatic, ecological and social conditions.

## 6.2. What does biodiversity tell us about the concept of just transitions in the lived environment?

Having reflected on the framework for a just transition in urban biodiversity, we now return to our first research question: what does biodiversity tell us about the concept of just transitions in the lived environment? Our findings suggest one of the main factors distinguishing concerns for just transition in biodiversity from existing approaches to interspecies considerations within climate justice (e.g. Schlosberg, 2013), is the focus on a structured and managed transition process. As Hoelscher et al. (2018) explain, thinking about a transition focuses attention on 'how' change happens, paying attention to enablers and hindrances. Thinking about a just transition as a *process* in the context of biodiversity helps to understand who is responsible for redressing historical actions that have led to damages or inequalities to species and ecosystems in the present, and what the end-point of actions into the future are and who will benefit from them. This responds to the call of Heffron and McCauley (2018) in the wider climate, energy and environment context for attention to the timeframes over which just transitions occur, and also what the results of a just transition are. Just transitions thinking can thus provide an organising framework for understanding how the relationship between biodiversity and people can be managed within climate and sustainability responses, which can be interpreted locally in different contexts.

The idea of just transition as process was illustrated especially well in our second theme of responsibility for just transitions. Yubari demonstrates how a transition to a healthy and vibrant post-coal society in the near future may require actions to repair ecosystems that were degraded by fossil fuel extraction (reflecting Nowakowska et al (2021) and Krzysztofik et al (2022)). The Yubari example also shows, however, that institutions responsible for ecosystem degradation may no longer exist, and that others (e.g. local governments) may need to assume liability in their absence. In the case of Cape Town, present-day disparities in the ability of residents to access the contributions of urban biodiversity are the result of historical processes of discrimination and segregation. Reflecting recent work in the sub-Saharan African context (Venter et al., 2020; Shackleton and Gwedla, 2021), our Cape Town findings show how a just transition framing puts the emphasis on the specific planning and policy actions needed to rectify historical injustices in biodiversity contributions across the present and into the future.

As far as responsibility into the future goes, taking a just transitions framing makes the aim and end-point of a just approach to urban biodiversity explicit. Being clear about the end-point of urban biodiversity actions is important because, reflecting what has been observed

for just transitions in the context of carbon-intensive activity, it can shine a light on questions of in whose interest a just transition happens (Cha, 2020), and of how the character of place and the biodiversity within it may be affected under a transition (e.g. Evans and Phelan, 2016; Weller, 2019; Raymond et al., 2023). Our first theme, understandings of just transitions, illuminated the differing visions in the case studies of how a just transition ought to affect biodiversity, be it replacement (Bristol), maintenance and rehabilitation (Yubari), or improvement (Cape Town). Using a just transitions framing to situate biodiversity concerns in a broader suite of policies and plans also helped to move beyond vague appeals to 'justice' and instead highlight the potential for trade-offs between conservation and housing (Bristol, Cape Town) or conservation and immediate budgetary priorities such as elderly care (Yubari). Amidst growing critique (e.g. Haase et al., 2017) of the idea that urban nature brings win-win-win approaches across society, economy and environment, thinking in terms of just transitions thus foregrounds the potential for there to be winners and losers in the transition to a more sustainable society. At the same time, in highlighting the enablers and blockers to change (Hoelscher et al., 2018; Raymond et al., 2023), a just transitions approach can envision processes that ensure as many actors as possible feel the outcomes reached are equitable and just, for humans and biodiversity itself.

## 6.3. What are the consequences of considering just transitions in the context of biodiversity in the lived urban environment?

We now return to our second overarching research question: what are the consequences of considering just transitions in the context of biodiversity in the lived urban environment? Our findings indicate that thinking in terms of biodiversity makes two contributions to just transitions. Firstly, the language of biodiversity highlights the fundamental role that healthy and biodiverse ecosystems play in realising a breadth of contributions to people, and thus that biodiverse ecosystems are a 'must have' as part of a just transition rather than a 'nice to have' in the way that more generic language of urban nature may imply. Second, thinking in terms of biodiversity may help to make the links to relevant policy initiatives more apparent, and hence galvanise action towards a just transition through and for biodiversity.

First, findings from our third theme on just transitions without labels reflect existing literature (e.g. Garmendia et al., 2016; Mabon, 2022) which illustrate that whilst more novel terms associated with urban nature can enable dialogue between actors in urban environmental governance by acting as boundary objects that are interpreted differently by different communities but have enough commonality to enable shared working, this flexibility in interpretation can also cause confusion on what exactly is being protected and for what purpose. This was illustrated through responses in Bristol and Yubari, which prioritised the health and recreational benefits of 'green spaces' rather than a fuller range of climate risk reduction, air purification, and food and water provisioning contributions that biodiverse urban ecosystems can make. By contrast, respondents, especially in Cape Town and Yubari, who used the language of biodiversity and associated ecosystem services talked in much fuller terms about how biodiversity makes contributions to people, and how these contributions ought to be maintained and enhanced under a just transition.

Thinking in this way can also help to underline the importance of a just transition *for* biodiversity, rather than simply a just transition *through* biodiversity that creates jobs in conservation and restoration. Even though respondents in Yubari and Bristol discussed the preservation of nature as being the 'right' thing to do in terms of interspecies considerations, our responses also show that ensuring a just transition for biodiversity in its own right is valuable to realise longer-term benefits for humans. This becomes especially important if one considers that healthy and diverse ecosystems are a fundamental basis for realising a full suite of ecosystem-based disaster risk reduction and adaptation benefits (Sudmeier-Rieux et al., 2021) and contributions to health and

wellbeing (Marselle et al., 2019), and thus for equitably reducing risk of harm within a just urban transition.

Second, it is worth noting that ‘biodiversity’ has a much longer history in policy and governance than newer phrasing such as ‘urban nature’ or ‘nature-based solutions’, and hence can act as an entry point for local governments and actors tasked with putting just transitions into practice. Given that the principles for a just transition in urban biodiversity we fleshed out in Section 6.1. place considerable emphasis on local governments as key actors, this is a notable finding. Yet findings under our first theme, understandings of just transitions, indicate apathy or even antipathy to the introduction of ‘just transitions’ as an organising concept at the community or city level. It may thus be the case that a biodiversity framing can act as a more familiar point of entry to questions of transitions and fairness than new and emergent terms in international science-policy rhetoric. This could be especially important in Global South or non-English language contexts, where the literature on justice in access to nature’s contributions to people may be limited (though see Venter et al., 2020), but where there is a much longer tradition of enquiry into how conservation can be highly exclusionary towards the worst-off. Approaching questions of just transitions through the lens of biodiversity thus allows links to be made to existing literature on the justice concerns associated with conservation at a national or regional scale.

## 7. Conclusion

Our overall aim in this paper was to assess what a just transition means in urban biodiversity, with a specific interest in the lived environment as the place in which this transition happens. Building on recent scholarship at the interface of just transitions, nature and the urban (e.g. Pickering et al., 2022; Raymond et al., 2023), we sought to tease out what specific value is added by engaging with the terminology of just transitions when considering biodiversity. Through analysis of interviews with biodiversity and environmental stakeholders in each of the three case study cities, we argued that engagement with the ideas of just transitions puts the focus on ‘how’ and ‘where’ just processes and outcomes for urban biodiversity can be realised, and makes explicit the desired end-goal in a way that allows for fuller discussions on who and where wins and loses out under future visions for urban biodiversity. We also argued that engaging with the language of biodiversity helps to make apparent the importance of healthy and biodiverse ecosystems to realising a range of contributions to humans. Ultimately, more than a just transition through biodiversity via ‘green jobs’, there must be a just transition for urban biodiversity which supports ecosystem restoration, rehabilitation and integrity, if historical and present injustices are not to be repeated or intensified.

## CRedit authorship contribution statement

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

The data that has been used is confidential.

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## References

- Abram, S., Atkins, E., Dietzel, A., Jenkins, K., Kiamba, L., Kirshner, J., et al., 2022. Just Transition: a whole-systems approach to decarbonisation. *Climate Policy* 22 (8), 1033–1049. <https://doi.org/10.1080/14693062.2022.2108365>.
- Alarcón, P., Catalina, N., Diaz, C., Schwab, J., Peters, S., 2022. Policy Brief Rethinking “Just Transition”: Critical Reflections for the Global South. *TRAJECTS*: Berlin. <https://trajects.org/resource-library/item/81>.
- Avon Wildlife Trust, 2021. Protecting Green Spaces in Bristol and Bath. <https://www.avonwildlifetrust.org.uk/news/protecting-green-spaces-bristol-and-bath>.
- Bennett, N.J., Blythe, J., Cisneros-Montemayor, A.M., Singh, G.G., Sumaila, U.R., 2019. Just transformations to sustainability. *Sustainability* 11 (14), 3881.
- Berglund, O., Britton, J., Hatzisavvidou, S., Robbins, C., Shackleton, D., 2023. Just transition in the post-pandemic city. *Local Environment* 1–15. <https://doi.org/10.1080/13549839.2023.2173732>.
- Bristol City Council, 2020a, One City Climate Strategy, <https://www.bristolonecity.com/wp-content/uploads/2020/02/one-city-climate-strategy.pdf>.
- Bristol City Council, 2020b, One City Ecological Emergency Strategy, <https://www.bristolonecity.com/wp-content/uploads/2020/09/One-City-Ecological-Emergency-Strategy-28.09.20.pdf>.
- Bristol City Council, 2022, Bristol City Council Climate Emergency Action Plan 2022–2025, <https://www.bristol.gov.uk/files/documents/5241-climate-emergency-action-plan-file>.
- Bulkeley, H., 2021. Climate changed urban futures: environmental politics in the anthropocene city. *Environ. Politics* 30 (1–2), 266–284. <https://doi.org/10.1080/09644016.2021.1880713>.
- Byrne, D., 2022. A worked example of Braun and Clarke’s approach to reflexive thematic analysis. *Quality & Quantity* 56 (3), 1391–1412.
- Cape Town Resilience Strategy, 2019, [https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies%2C%20plans%20and%20frameworks/Resilience\\_Strategy.pdf](https://resource.capetown.gov.za/documentcentre/Documents/City%20strategies%2C%20plans%20and%20frameworks/Resilience_Strategy.pdf).
- Cha, J.M., 2020. A just transition for whom? Politics, contestation, and social identity in the disruption of coal in the Powder River Basin. *Energy Res. Social Sci.*, 101657.
- City of Cape Town, 2021, Voluntary Local Review [https://sdgs.un.org/sites/default/files/vlrs/2022-04/cape\\_town\\_vlr\\_2021.pdf](https://sdgs.un.org/sites/default/files/vlrs/2022-04/cape_town_vlr_2021.pdf).
- Clarke, V., Braun, V., Hayfield, N., 2015. Thematic analysis. *Qualitative Psychol.: Practical Guide Res. Methods* 222 (2015), 248.
- Díaz, S., Demissew, S., Carabias, J., Joly, C., Lonsdale, M., Ash, N., Larigauderie, A., Adhikari, J.R., Arico, S., Báldi, A., Bartuska, A., Baste, I.A., Bilgin, A., Brondizio, E., Chan, K.M.A., Figueroa, V.E., Duraipappah, A., Fischer, M., Hill, R., Zlatanova, D., 2015. The IPBES Conceptual Framework — connecting nature and people. *Curr. Opin. Environ. Sustainability* 14, 1–16. <https://doi.org/10.1016/j.COSUST.2014.11.002>.
- Drisko, J., 2005. Writing up qualitative research. *Families Soc.: J. Contemporary Soc. Serv.* 86 (4), 589–593.
- Eadson, W., van Veelen, B., Backus, S., 2024. Decarbonising industry: a places-of-work research agenda. *Extractive Ind. Soc.* 15, 101307 <https://doi.org/10.1016/j.exis.2023.101307>.
- Enqvist, J.P., Ziervogel, G., 2019. Water governance and justice in Cape Town: an overview. *Wiley Interdisciplinary Reviews: Water* 6 (4), e1354.
- Evans, G., Phelan, L., 2016. Transition to a post-carbon society: linking environmental justice and just transition discourses. *Energy Policy* 99, 329–339.
- Frantzeskaki, N., 2019. Seven lessons for planning nature-based solutions in cities. *Environ. Sci. Policy* 93, 101–111.
- Garmendia, E., Apostolopoulou, E., Adams, W.M., Bormpoudakis, D., 2016. Biodiversity and Green Infrastructure in Europe: Boundary object or ecological trap? *Land Use Policy* 56, 315–319. <https://doi.org/10.1016/j.landusepol.2016.04.003>.



- Gerring, J., 2016. *Case study research: Principles and practices*. Cambridge University Press.
- Haase et al., 2017. Greening cities – To be socially inclusive? About the alleged paradox of society and ecology in cities. *Habitat International*, 64, 41–48.
- Hambleton, R., 2020. The Bristol one city approach to city governance: new civic leadership in action. *Urban Research & Practice* 13 (2), 228–237.
- Heffron, R.J., McCauley, D., 2018. What Is the “Just Transition”? *Geoforum* 88, 74–77. <https://doi.org/10.1016/j.geoforum.2017.11.016>.
- Hoelscher, K., Wittmayer, J.M., Loorbach, D., 2018. Transition versus transformation: What’s the difference? *Environ. Innovation Societal Transitions* 27, 1–3. <https://doi.org/10.1016/J.EIST.2017.10.007>.
- Hughes, S., Hoffmann, M., 2020. *Just urban transitions: toward a research agenda*. Wiley Interdisciplinary Reviews: Climate Change 11 (3), e640.
- ILO, UNEP, & IUCN, 2022. *Decent Work in Nature-based Solutions 2022*. <https://www.ilo.org/publications/decent-work-nature-based-solutions-2022>.
- IPBES. (n.d.). Glossary: Biodiversity. Retrieved November 14, 2023, from <https://www.ipbes.net/glossary/biodiversity>.
- IPBES-IPCC, 2021. IPBES-IPCC Co-Sponsored Workshop: Biodiversity and Climate Change: Scientific Outcome. [https://ipbes.net/sites/default/files/2021-06/2021\\_IPCC-IPBES\\_scientific\\_outcome\\_20210612.pdf](https://ipbes.net/sites/default/files/2021-06/2021_IPCC-IPBES_scientific_outcome_20210612.pdf).
- Jasonoff, S., 2018. Just transitions: a humble approach to global energy futures. *Energy Res. Social Sci.* 35, 11–14. <https://doi.org/10.1016/j.erss.2017.11.025>.
- Jenkins, K., Sovacool, B.K., Blachowicz, A., Lauer, A. Politicising the Just Transition: Linking Global Climate Policy, Nationally Determined Contributions and Targeted Research Agendas. *Geoforum* 115, 138–42. doi: 10.1016/j.geoforum.2020.05.012.
- Knapp, S., Aronson, M.F.J., Carpenter, E., Herrera-Montes, A., Jung, K., Kotze, D.J., La Sorte, F.A., Lepczyk, C.A., Macgregor-Fors, I., Macivor, J.S., Moretti, M., Nilon, C.H., Piana, M.R., Rega-Brodsky, C.C., Salisbury, A., Threlfall, C.G., Trisos, C., Williams, N. S.G., Hahs, A.K., 2021. A research agenda for urban biodiversity in the global extinction crisis. *BioScience* 71 (3), 268–279. <https://doi.org/10.1093/BIOSCI/BIAA141>.
- Krzysztofik, R., Rahmonov, O., Kantor-Pietraga, I., Dragan, W., 2022. The perception of urban forests in post-mining areas: a case study of Sosnowiec-Poland. *Int. J. Environ. Res. Public Health* 19 (7), 3852.
- Mabon, L., Shih, W.-Y., 2018. ‘Management of sustainability transitions through planning in shrinking resource city contexts: an evaluation of Yubari City, Japan’. *J. Environ. Policy Planning*. <https://doi.org/10.1080/1523908X.2018.1443004>.
- Mabon, L., Hiratsuka-Sasaki, A., Chapman, A., McLellan, B.C., 2023. Just transitions at the local level: insights from coal communities in Japan. *Local Environment*. <https://doi.org/10.1080/13549839.2023.2249511>.
- Mabon, L., 2022. Governing the Urban Climate in Fukuoka City, Japan: What Can a Policy Narrative Approach Teach Us?. In: Miyauchi, T., Fukunaga, M., (Eds) *Adaptive Participatory Environmental Governance in Japan : Local Experiences, Global Lessons* Springer Japan: Tokyo, pp. 305-320. Doi: 10.1007/978-981-16-2509-1\_14.
- Marselle, M.R., Stadler, J., Korn, H., Irvine, K.N., Bonn, A., 2019. *Biodiversity and Health in the Face of Climate Change: Challenges, Opportunities and Evidence Gaps*. Springer, Cham. doi: 10.1007/978-3-030-02318-8\_1.
- McCauley, D., Heffron, R., 2018. Just transition: Integrating climate, energy and environmental justice. *Energy Policy*. <https://doi.org/10.1016/j.enpol.2018.04.014>.
- McCauley, D., 2021. Managing a just transition in urban contexts. In *Urban Planning, Management and Governance in Emerging Economies* (pp. 40-56). Edward Elgar Publishing.
- Ministry of Internal Affairs and Communication, 2021. List of major financial indicators of local governments in 2021 (in Japanese). [https://www.soumu.go.jp/iken/zaisei/R03\\_chiho.html](https://www.soumu.go.jp/iken/zaisei/R03_chiho.html).
- Morena, E., Krause, D., Stevis, D., 2020. *Just Transitions: Social Justice in the Shift Towards a Low-Carbon World*. Pluto Press, London.
- NatureScot, 2020. Research Report 1257 - Supporting a green recovery: an initial assessment of nature-based jobs and skills. <https://www.nature.scot/doc/natur-escot-research-report-1257-supporting-green-recovery-initial-assessment-nature-based-jobs-and>.
- Nowakowska, A., Rzeźnica, A., Sobol, A., 2021. Place-Based Policy in the “Just Transition” Process: The Case of Polish Coal Regions. *Land* 10(10), 1072. doi: 10.3390/LAND10101072.
- Pickering, J., Coolsaet, B., Dawson, N., Suiseeya, K., Inoue, C., Lim, M., 2022. Rethinking and Upholding Justice and Equity in Transformative Biodiversity Governance. In: Visseren-Hamakers, I., Kok, M. (Eds.), *Transforming Biodiversity Governance*. Cambridge University Press, Cambridge, pp. 155–178.
- Platform-Friends of the Earth Scotland, 2023. *Our Power: Offshore Workers’ Demands for a Just Energy Transition*. <https://foe.scot/wp-content/uploads/2023/03/Our-Power-Report.pdf>.
- Presidential Climate Commission, 2022 *A Framework for a Just Transition in South Africa*. Presidential Climate Commission: South Africa. <https://pcccommissionflow.imgix.net/uploads/images/A-Just-Transition-Framework-for-South-Africa-2022.pdf>.
- Pupim de Oliveira, J.A., Balaban, O., Doll, C.N.H., Moreno-Peñaranda, R., Gasparatos, A., Iossifova, D., Suwa, A., 2011. Cities and biodiversity: perspectives and governance challenges for implementing the convention on biological diversity (CBD) at the city level. *Biological Conservation* 144 (5), 1302–1313. <https://doi.org/10.1016/J.BIOCON.2010.12.007>.
- Raymond, C.M., Frantzeskaki, N., Kabisch, N., Berry, P., Breil, M., Nita, M.R., Geneletti, D., Calfapietra, C., 2017. A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. *Environ. Sci. Policy* 77, 15–24.
- Raymond, C.M., Stedman, R., Frantzeskaki, N., 2023. The role of nature-based solutions and senses of place in enabling just city transitions. *Environ. Sci. Policy* 144, 10–19. <https://doi.org/10.1016/J.ENVSCI.2023.02.021>.
- Sandelowski, M., 1998. Writing a good read: strategies for re-presenting qualitative data. *Res. Nursing Health* 21, 375–382.
- Sato, M., 2022. ‘Just Transition’ (in Japanese). *Hokkaido Shimbun*, 5 August 2022.
- Schlosser, D., 2013. Theorising environmental justice: The expanding sphere of a discourse. *Environmental Politics* 22 (1), 37–55. <https://doi.org/10.1080/09644016.2013.755387>.
- Schlosser, D., Collins, L.B., Niemeyer, S., 2017. Environmental Politics Adaptation policy and community discourse: risk, vulnerability, and just transformation. *Environmental Politics* 26, 413–437. <https://doi.org/10.1080/09644016.2017.1287628>.
- Scottish Government Just Transition Commission, 2021. *Just Transition Commission: A national mission for a fairer, greener Scotland*. Scottish Government: Edinburgh. <https://www.gov.scot/publications/transition-commission-national-mission-fairer-greener-scotland/>.
- Shackleton, C.M., Gwedla, N., 2021. The Legacy Effects of Colonial and Apartheid Imprints on Urban Greening in South Africa: Spaces, Species, and Suitability. In *Frontiers in Ecology and Evolution*, Vol. 8, p. 467. <https://www.frontiersin.org/article/10.3389/fevo.2020.579813>.
- Sousa, P.M., Blamey, R.C., Reason, C.J., Ramos, A.M., Trigo, R.M., 2018. The ‘Day Zero’ Cape Town drought and the poleward migration of moisture corridors. *Environ. Res. Lett.* 13 (12), 124025.
- Stålhammar, S., 2021. Polarised views of urban biodiversity and the role of socio-cultural valuation: Lessons from Cape Town. *Ecosystem Services* 47. <https://doi.org/10.1016/j.ecoser.2020.101239>.
- Sudmeier-Rieux, K., Arce-Mojica, T., Boehmer, H.J., Doswald, N., Emerton, L., Friess, D. A., Galvin, S., Hagenlocher, M., James, H., Laban, P., Lacambra, C., Lange, W., McAdoo, B.G., Moos, C., Mysiak, J., Narvaez, L., Nehren, U., Peduzzi, P., Renaud, F. G., et al., 2021. Scientific evidence for ecosystem-based disaster risk reduction. *Nature Sustainability* 2021, 1–8. <https://doi.org/10.1038/s41893-021-00732-4>.
- Swilling, M., Musango, J., Wakeford, J., 2016. Developmental states and sustainability transitions: prospects of a just transition in South Africa. *J. Environ. Policy Planning* 18 (5), 650–672.
- Trades Union Congress, 2023. *Climate emergency: winning a Just Transition*. <https://www.tuc.org.uk/climate>.
- UNFCCC, 2020. *Just Transition of the Workforce, and the Creation of Decent Work and Quality Jobs*: Technical Paper. UNFCCC, Geneva. <https://unfccc.int/sites/default/files/resource/Just%20Transition.pdf>.
- Venter, Z.S., Shackleton, C.M., Van Staden, F., Selomane, O., Masterson, V.A., 2020. Green Apartheid: Urban green infrastructure remains unequally distributed across income and race geographies in South Africa. *Landscape and Urban Planning* 203, 103889.
- Wang, X., Lo, K., 2021. Just transition: a conceptual review. *Energy Res. Social Sci.* 82, 102291.
- Weller, S.A., 2019. Just transition? Strategic framing and the challenges facing coal dependent communities. *Environ. Planning C: Politics Space* 37 (2), 298–316.
- WRI, 2019, ‘Responding to Day Zero Equitably: Water Crisis Lessons from Cape Town and Chennai’ <https://www.wri.org/blog/2019/10/responding-to-day-zero-equitably-water-crisis-lessons-cape-town-and-chennai>.
- Yin, R.K., 2014. *Case Study Research Design and Methods*, 5th ed. Sage, Thousand Oaks, CA.
- Yubari City, 2011. *Citizen Economic Survey: Summary* (in Japanese) <https://www.city.yubari.lg.jp/gyoseijoho/tokeidata/shiminkeizaikeisan.files/h20shiminkeizai.pdf>.
- Yubari City, 2023. *Yubari City: Zero Carbon City Declaration* (in Japanese). Yubari City Government: Yubari. <https://www.city.yubari.lg.jp/kurashi/gomirecyclekankyo/kankyohozen/zerocarbon20230301.files/zerocarbon20230301.pdf>.
- Yubari City, 2022. *Census Data* (in Japanese) <https://www.city.yubari.lg.jp/smph/gyoseijoho/tokeidata/index.html>.