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**Data Civics
Observatory**

Reviving the commons?

A scoping review of urban and digital commoning

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Table of contents

Abbreviations

AI: artificial intelligence
CBPP: community-based peer production
CWN: community wireless network
DAO: decentralised autonomous organisation
DLT: distributed ledger technology
FLOSS: Free, Libre and Open Source Software
P2P: peer-to-peer
ICT: information and communications technology
XR: extended reality (or augmented reality)
3D: three-dimensional

Summary

This report explores the contemporary revival of commoning practices in urban and digital contexts. It delves into the historical roots, current manifestations, and future potential of the commons as a paradigm for socioeconomic transformation, democratic innovation and sustainable community governance. The review aims to contribute to the growing discourse on the commons, highlighting its significance in contemporary societies and its potential as an alternative to traditional forms of socioeconomic and political organisation via the state and/or the market. Practitioners in the field argue that we are witnessing a revival of the commons in the 21st century. This report interrogates the nature of that revival and explores key concepts, examples, trends and debates in theory and practice, while outlining an emerging research agenda.

Overview of the chapters:

Chapter 1 sets the stage noting that an estimate two billion people globally manage resources as commons to meet their communities' needs. Yet, despite the increased visibility gained from Elinor Ostrom's Nobel Prize in Economics in 2009, this interdisciplinary field of research and practice is not yet prominent in the collective political imagination of many contemporary societies. The introductory chapter thus explores its historical significance – the reciprocity of human community life and its cultural, political and economic evolution over many centuries; the emergence of the digital commons from the 1970s onwards; and the powerful resurgence in the 21st century as entwined digital, urban and ecological commoning.

Chapter 2 explains the methodological approach taken, including the research questions guiding the review and the steps taken to source the literature. The chapter emphasises the scoping review's aim to synthesise key trends and challenges in the revival of the commons, focusing on digital and urban commons as entry points into the field. The limitations of the review are also recognised and discussed.

Chapter 3 delves into the various uses of the term 'commons' and related debates. It explores the commons as firstly: a community of practice focussed on coordinating the use of material, social, political, economic, environmental, spiritual and digital 'resources' – rather than, as has sometimes presented, non-rivalrous and uncoordinated open-access resources; and, secondly, as one or more political, economic, and cultural paradigms and social visions. The chapter also explores the complexities of social practices in relation to digital, urban, and ecological commoning and, in so doing, highlights the hybridity of digital and urban commons and the challenges of managing digital commons to prevent appropriation and enclosure and promote inclusion.

Chapter 4 addresses the revival of the commons, examining ongoing historical cycles and recent advances. It discusses the historical and cyclical role of the commons in political economic development, and the processes of cooperation, conflict and interdependence between commons, market institutions and the state in that transformation. It also considers, from the 1970s onwards, the interplay in the development of digital technology, the commons and neoliberal digital capitalism. The chapter also covers the emergence of a new sense of commoning revival post-2008 Global Financial Crisis, driven by various global challenges – i.e. austerity, social and geopolitical conflicts, the advent of the Anthropocene – and ever-increasing digital capacity globally and related urban complexity and connectivity (urban hybridity).

Chapter 5 provides an in-depth look at the current scope and diversity of digital and urban commoning practices. It scopes an initial range of examples across: open-source software, knowledge and culture, digital media, data, platform cooperativism and mobility (commons on the move). It illustrates and considers how digital and urban commoning are intertwined as makerspaces, community-based peer production, urban participation and democracy, within emerging place-based approaches, and social conflict and resistance. It also explores and discusses the complex linkages between the commons, state, and market, highlighting examples of/from market-orientated commoning, the pirate economy, smart cities and grassroots smart cities, new municipalism, institutionalisation and complex hybrids.

Chapter 6 outlines key issues for theory, policy, and practice relating to digital and urban commoning. It covers: challenges for commoning given current cultural, economic, and legal contexts; inclusive, democratic governance of digital and urban commons; the potential of commoning in ecologically-demanding times; approaches to coordinating complex commoning networks and related partnerships; their roles in democratic renewal across society and state; and the potential for different political economic and cultural visions and related aspirations for social transformation emerging from commoning movements. It recognises the particular importance of values of inclusion, interdependence (including the 'Nested-I'), equality and democratic participation in many commons and covers emerging strategies and thinking to support this.

Chapter 7 reflects on the findings of the review and suggests key themes for further research. It highlights the need for more interdisciplinary studies, deepening understanding of the commons in various contexts including the Global South, and exploration of the potential for the commons as a means for democratic renewal and social change. The chapter calls for further investigation into the historical and contemporary practices of commoning and their potential to inspire alternatives to currently dominant socioeconomic models.

Key findings:

1. **Revival of the commons:** The commons as a social practice of coordinating the use of resources (material, social, economic, ecological, political, spiritual, digital) can be understood as experiencing a revival across the last decade or so – from the 2008 Global Financial Crisis onwards. This is driven by a combination of social, economic, geopolitical and environmental crises. This resurgence is evident in the proliferation of digital and urban commoning practices that are challenging traditional notions of property, governance and the production and provision of goods and services.

2. **Diversity of digital and urban commoning:** The review identifies a wide array of commoning practices and examples, ranging across digital open-source software, cultural and knowledge commons, data and mobile commons, and urban commoning initiatives like makerspaces, community-based peer production and platform cooperatives. These practices are often intertwined with efforts to democratise and mutualise the use and control of technology, economy, and urban spaces (the 'Right to the City').

3. **Ecological commoning:** Environmental, natural and ecological commons, both old and new, are growing in numbers, significance and complexity, and often in conjunction with and through digital and urban commoning.

4. **Challenges and opportunities:** Commoning faces legal, economic, and cultural challenges, particularly

in resisting appropriation and enclosure by private and state interests, and including state privatisation initiatives. However, it also presents opportunities for fostering more inclusive, democratic, emancipatory and sustainable forms of social organisation that can be based on the 'Nested-I', community-based approaches, the social (welfare) commons and social/cooperative enterprise networks.

5. **Social transformation and strategies for change:** This literature identifies some of the emerging social visions from this revival of the commons including: libertarian commoning, social commoning, post-capitalism and more. Similarly, it flags related developing strategies for advancing commons-based visions of social and political economic transformation. These include fostering critically reflexive commoning movements, building alliances with broader social movements, and exploring alternative currencies and decentralised technologies.

6. **Governance and democratic renewal:** Effective governance of the commons requires innovative approaches to ensure inclusion, participation, and accountability. Some emerging digital platforms illustrate how technology can support participatory democracy and technological sovereignty and, likewise, align for mutual benefit with state policymaking initiatives related to alternative smart cities, contemporary urban place-making and new municipalism.

Recommendations for further research

The review highlights several areas for further investigation, including:

• **Historical and global perspectives:** Expanding the scope of research to include diverse historical and contemporary contexts.

• **Challenging western cultural norms, values and assumptions:** learning from commoning practices from the Global South, including tribal cultures and first peoples, and challenging mainstream western thinking on the roles and potential of the commons.

• **Inclusive governance:** Deepening understanding of how to foster democratic governance within commoning practices.

• **Ecological commoning:** Exploring the intersections between digital, urban, and ecological commoning in addressing environmental challenges.

• **Coordination and networks:** Examining the coordination of complex networks of commons, including the role of alternative currencies and federated systems.

• **Engagement with the state:** Investigating the dynamics of collaboration and tension between commons initiatives and state institutions, and the potential for more productive policy and practice.

• **Visions and strategies:** Exploring the range of emerging visions and strategies within actually-existing practice, rather than using theory as the entry-point, and increasing transparency about the values, assumptions and thinking at work across current practices.

Conclusion:

The revival of the commons represents a critical area of inquiry and practice, offering potential pathways toward more equitable, democratic, and sustainable futures. The review sets the stage for further research and discussion on how the commons might serve as a complement or alternative to state and market mechanisms in addressing global challenges.

Box 1. Key concepts: Commons and Commoning

We explore terminology in section 3, but here are some basic definitions to start with:

Commons:

Material or social resources that are managed and coordinated (and sometimes owned in a formal legal sense) by a community of place, practice, identity, or interest. Their stewardship is guided by norms and values for sustainable community governance without sole dependence on either state control or market mechanisms. More broadly, the commons can also represent an alternative paradigm for social, economic and political organisation and development, based on principles and practices of co-production, solidarity and democratic governance.

Commoning:

It refers to the social practices undertaken by communities to create, develop, sustain or govern common resources. Typical amongst such practices are collaboration, co-production, participation, and deliberation.

For a variety of examples, listen to David Bollier's podcast Frontiers of Commoning.

1. Introduction

Globally, there are an estimated two billion people who currently manage fisheries, farmlands, forests and water resources as commons in order to meet the everyday needs of their communities (Bollier, 2014:2). In the last few decades other social and material resources, for example in the economy, urban development or the digital world, have been developed and governed as commons – rather than as private or public property.

However, despite the visibility brought to the commons by Elinor Ostrom's 2009 Nobel Prize in Economics, this interdisciplinary field of research and practice is not yet prominent in the collective political imagination of many contemporary societies. Practitioners in the field argue, nonetheless, that we are witnessing a revival of the commons through the political, economic and cultural convulsions of the first decades of the 21st century (Bollier and Helfrich, 2019).

This report interrogates the nature of that revival and explores key concepts, developments, trends and debates. In doing so, the report contributes to a growing body of work that seeks to make the revival and advance of the commons more visible in current research narratives about democratic innovation and socioeconomic transformation.

The notion of the commons has been around for almost a thousand years, developing as rural commons and urban guilds during early Western European feudalism (Arvidsson, 2020). More generally, the related notion of a general 'reciprocity' within community life, as postulated by economic sociologist Karl Polanyi (2001 [1944]), represents an alternative to the modes of social and economic coordination via state redistribution and market exchange. This notion of reciprocity suggests that contemporary commoning draws on ancient and fundamental human skill-sets for organising ourselves and sharing material and social resources as communities of people.

Commoning, and related social practices, have played and continue to play a crucial role in political economic development –e.g. the transition in Western Europe from feudalism to early industrial capitalism and the then rise of the cooperative movement and trades unionism (19th and early 20th centuries); and more generally in the myriad ways that community life and organising has continued and is continuing across the globe.

The grand narratives that dominated the field of political economy in the 20th century gave limited space to the commons, in part because their focus was on developments in the Global North. For example, the Keynesian Welfare State emerging from the 1930s in the developed economies of Western Europe and North America emphasised the combined roles of the state and the market. In turn, the command economies of the post-war Soviet bloc prioritised the role of state control and ownership. This context diminished the visibility of the commons as an alternative form of socioeconomic organisation and development.

However, the 1960s and early 1970s marked a certain return to a policy focus on community in Western Liberal Democracies; for instance, through the 'War on Poverty' in the USA and 'British Community Development Projects' (Cochrane, 2007). Hardin's (1968) infamous 'tragedy of the commons' article ironically has come to represent a point of transition towards revival by bringing greater focus to the commons. Hardin's misrepresentation of the commons, subsequently used to justify privatisation, ignited rebuttals showing that his concern was about the tragedy of unmanaged 'free-for-all' resources, rather than

commoning as understood historically and empirically (see section 3.1). It would be more accurate to name Hardin's tale as 'the tragedy of the market' (Bollier 2021:13). In this sense, it seems paradoxical that neoliberal economists adopted Hardin's thesis to bolster free-market ideology worldwide, given that his critique of the commons can be read as an indictment on laissez-faire capitalism driven by unconstrained private interests.

Crucially, Elinor Ostrom's (1990) work took the influential but misleading narrative of the 'tragedy of the commons' to task. Her long-term body of research into ecological and social commoning across the world provided a robust evidence-base illustrating that effective local and regional commons can be well-organised and coordinated through a community of social practice, thus providing civic institutions animated by principles and practices distinct from the state and the market.

The rise of the global digital capitalist economy from the early 1970s, and the parallel and associated rise of digital and urban commoning (e.g. 'right to the city' initiatives, hacking cultures, the digital commons software movement, the digital knowledge commons) played a crucial role in this revival. In myriad ways over the last five decades, and across hybrid digital, urban and ecological spheres, the commons has become a paradigmatic reference towards political, economic and cultural change. The emergence of community-based peer-to-peer production (CBPP) during the 1990s and 2000s has further emphasised the key role of digital commoning in global economic change. In particular, it has shown capacity to effectively support and coordinate digital development and technological change through an alternative approach to hierarchical corporate management structures and private sector incentives (Benkler, 2006).

However, in this literature review, we flag the 2008 Global Financial Crisis as marking the emergence of a further sense of revival for the commons (Arvidsson, 2020; Leontidou, 2020). There have been a range of ongoing tensions and crises during the 2010s across different parts of the globe, including: economic austerity and precarity; rise in income and wealth inequalities; population displacements and migration; the Arab Spring and related conflicts; European Sovereign Debt Crisis; social polarisation and challenges to the Western Liberal Democratic model(s); rising authoritarianism and autocracies; and, the impacts of climate change and escalating environmental crises. These challenges and changes have combined with ever-increasing digital capacity, urban complexity and ecological necessity, to renew thinking and action towards new digital, urban and ecological commoning.

The literature reviewed in this report illustrates the diversity of commoning across a multitude of inter-relating areas: 'old' commons and 'new' commons; digital knowledge and cultural commons; ecological/natural commons; the Social and Solidarity Economy/commons and cooperative development; food commons; forestry and farming; micro-credit/finance; public and common goods; financial commons; and health commons (Bance and Schoenmaeckers, 2021; Van Laerhoven, Schoon and Vallamayor-Tomas, 2020).

The report is structured as follows:

* Chapter 2: outlines the methodology.

* Chapter 3: explores the complex current language of commons and digital, urban and ecological commoning.

* Chapters 4, 5 and 6: address the core research questions that animated the review.

* Chapter 7: concludes by flagging themes for further research and sharing overall reflections.

2. Methodology

The research brief for this report was to:

- conduct a scoping review of research literature on the 'revival of the commons', focusing on digital, urban and environmental commons;

- synthesise key trends and challenges in the revival of the commons.

Scoping reviews are a modality of literature review particularly suitable for areas of study with broad research questions or themes. They are designed to enable transparent review and synthesis of key sources, ideas and debates.

Scoping reviews are different from systematic reviews in that they do not assess the quality of the studies (Arksey and O'Malley 2005:20). Instead, they seek to provide an overview of the topic in question as a foundation for subsequent work (e.g. fieldwork; analysis).

Although they are highly structured, scoping reviews require flexibility and ongoing judgement. Below we summarise key steps followed in the work that informs this report.

2.1 Research questions

The research questions were refined and finalised as the literature search and early analysis developed:

- **RQ1** In what ways can a focus on 'the commons' be said to be reviving?

- **RQ2** What is the current scope and diversity of digital and urban commoning? What examples are emerging of developing practice across the globe?

- **RQ3** What are the key current issues for theory, policy and practice relating to digital and urban commoning?

2.2 Literature search, analysis, interpretation and writing

Step 1: Peer-reviewed academic literature search

This was pursued via the University of Edinburgh's DiscoverED database – which taps into the most widely used academic repositories. The following steps were taken to select sources. The table in Appendix 1 charts progress in finding suitable criteria for selecting sufficiently-focused material, starting with:

Search A. A variety of search terms including 'commons', 'digital commons', 'urban commons' etc. were used against the criteria below – each resulting in a selection of millions of publications.

1. Time frame: 2007- 2022

2. Geography/Language: English

3. Types of sources: All

4. Relevant fields: Interdisciplinary

5. Relevance: assessed according to the definitions and research questions

In refining the search terms and related selection criteria, an exploration followed across Search A through Search K (see Appendix 1), as the number of items uncovered through each search gradually reduced to more manageable proportions.

Search K. Here 'Commoning AND Digital AND Environmental AND Urban' and then 'Commoning AND Digital' were used to select 162 and 350 publications respectively on the basis of the following criteria for inclusion:

1. Time frame: 2017-2022 (10.02.22)

2. Geography/Language: English

3. Types of sources: Peer-reviewed

4. Relevant fields: Interdisciplinary

5. Relevance: assessed according to the definitions and research questions

Step 2: Appraisal of abstracts

The literature selected via 'Commoning AND Digital' (349 items) was selected over 'Commoning AND Digital AND Environmental AND Urban' (162 items), given the very focused nature of the latter which may miss key recent literature and issues, as well as the potential for 162 items to result in too few publications after applying the selection criteria.

Closer examination of the abstracts relating to 'Commoning and Digital' highlighted 103 publications as either explicitly relevant or potentially relevant to a focus on 'digital' – many with links to other themes including urban and environmental commoning.

Step 3: Other (or 'grey') literature search

Google.com was used for exploratory search of additional literature. The inclusion/exclusion criteria for this search was as follows:

1. Time frame: not relevant to this type of search

2. Geography/Language: Global/English

3. Types of sources: all sources – including academic

4. Relevance: Assessed according to the definitions and research questions

5. Search terms: 'digital commoning'

We checked a sample of the first 30 items and 18 were broadly relevant. After closer review, only 6 items met the criteria and they related to four peer-reviewed articles already located during the DiscoverEd search.

Given the limitations of the 'grey' literature search, we drew on our own previous reading of other relevant literature – namely, influential or seminal texts over the last five decades in relation to commons and community, if not necessarily digitally-focused commoning. These are included within the second section of the Bibliography, although many of them are also acknowledged and cited within the peer-reviewed literature (those listed in first section of the Bibliography).

For instance, these include:

- commons as a social practice: Elinor Ostrom (1990); David Bollier and Silke Helfrich (2019)

- Community economy: John Pearce (1993); John Kretzmann and John McKnight (1993); Julie Gibson and Katherine Graham (Gibson-Graham, 1996); John Pearce and Alan Kay (2003)

- Community organising: Sherry Arnstein (1969); Saul Alinsky (1971)

- CBPP: Yochai Benkler (2006); Michel Bauwens and Petar Jandrić (2021)

- Conviviality and convivial communities: Ivan Illich (1973); John McKnight (1995)

- Cultural political economy: Karl Polanyi (2001 [1944]); Bob Jessop and Ngai-Ling Sum (2010)

- Post-capitalist commons policy platforms: Francine Mestrum (2016); Anna Coote (2017); Guy Standing (2019)

Step 4: Exploring key themes

Building from Step 2 and the 103 peer-reviewed articles, a listing of key themes and terms was generated and organised under seven broader themes – as presented in Appendix 2. An initial sample of 10 publications for initial scoping was selected according to these criteria:

- Each illustrating a different type or example of the diversity of digital and urban commons relevant to one of the seven broad themes: history and definitions; digital developments; urban developments; state and wider 'commoning'; social, political and economic transformation; digital, urban and ecological commoning.

- Each giving emphasis on one or more of the other six broad themes.

- Where possible, each extending geographic coverage or international context.

- Spread to include authors across the alphabetical order reflected in the 103 references.

Analysis via NVivo of these 10 articles supported a better understanding of the range of themes potentially relevant to the research questions – approximately 60 codes across six broad themes.

Step 5: Thematic analysis and final sampling

NVivo thematic analysis helped generate an initial structure for this report, describing the 'language of the commons' (Chapter 3) and engaging with the research questions (Chapters 4, 5 and 6). Once the 10 sampled publications were analysed in-depth, and a stronger structure emerged, further peer-reviewed publications were selected to extend the scope of the literature review. This selection was directed by these criteria:

- Work mentioned in the Step 3 literature search: Kostakis (2018), Ossewaarde and Reijers (2017), and Reijers and Ossewaarde (2018) each engage with one key debate on the theme of 'the illusion of the digital commons' –covered in section 3.2.2.

- Emphasis on current research agendas and trends for the commons and digital commons: Foster (2019); Thompson (2020); and Van Laerhoven, Schoon and Villamayor-Tomas (2020).

- Material that could deepen discussions of the themes from the initial sample.

The review continued until the constraints of the time available for the review were met, resulting in 23 of the original 103 references being reviewed.

2.3 Limitations of this review

The main limitations of this review are:

- The research had to be tailored to the funded time available and therefore limited to a sample of just over 1/5 of the literature that met the inclusion criteria. We are confident that the themes in this report are reflective of many of the key current developments and debates. However, this is not a fully comprehensive review, and it may contain significant gaps.

- The choice of only one language (English) is a clear limitation on at least two accounts. It excludes the vast body of research available in other languages, and it also has an impact on the geographic coverage of the material selected. Many of the largest commons are in the Global South. Our review does not do justice to this crucial geopolitical dimension of the field, and this is a significant limitation to any claims we tentatively make about current trends and debates.

- The scope of this review is also limited by the fact that there is a vast amount of material to review in a field that is fast-paced and growing in momentum. Even with a focus on the period after the 2008 Global Financial Crisis, the quantity of material is unmanageable within the constraints of a small research project.

- Our initial intention was to cover digital, urban and environmental commons, but it wasn't practically possible. Early work did reveal considerable overlap across those domains, and therefore by anchoring the literature search on one of them (digital) we were still able to cover some important aspects of the others.

- Reviewing existing research is a limited proxy to understand what is happening in practice, as many developments in the field outpace the capacity and awareness of researchers. Nonetheless, we think it is a proxy that can offer relevant insights about how the field evolves at the intersection of research and practice.

- Finally, a scoping review entails ongoing judgement calls and choices, which are unavoidably shaped by the priorities of the researchers. We do not see this as a limitation, but as something that requires transparency and reflexibility. In this sense, we have tended to pay particular attention to questions of political economy, community development, democratic innovation, and social change.

3. Exploring the language of the commons and related debates

3.1 The commons: varieties of usage of the term

This review points to three uses of the term, which we cover below. The first and central use is the commons as a community of shared practices that coordinates the use of interconnecting resources –both social and material. The other two are distinctive uses of the term. One is now seen as a misnomer, and better named as open-access resources, but it raises important questions about the care and coordination of resources. The other, the commons as political vision, often entails variations on the theme of a post-capitalist political economy in the era of the Anthropocene.

3.1.1 Commons as a community of shared practice for coordinating resources

There is general agreement that modern uses of the terms 'commons', certainly since Ostrom's (1990) influential work, are concerned for a particular type of civic institution[1] that works via a community of practice. That is, a group of commoners who undertake the process of commoning in support of the usage, production and sustainability of 'common pool resources' –as per Ostrom's terminology; classic examples of natural common pool resources include fisheries, irrigation systems, farmlands and forests.

Dulong de Rosnay and Stalder (2020), for instance, present a commons as being coordinated through horizontal relationships focused on working 'in common' and building shared values and practices to sustain and produce a range of resources. They argue that this is a distinctive way of coordinating the shared use and production of resources (material, social, digital) and different to those offered either by the price-mechanism of the market or by the centralising, often hierarchical and bureaucratic decision-making of the state (citing De Angelis, 2017).

Lynch's (2021) discussion of the commons emphasises the connectivity between people and their active participation in creating situated forms of knowledge and practices in relation to resources. Kostakis (2018) and Ossewaarde and Reijers (2017), likewise, put emphasis on a commons as involving shared or pooled resources and being co-governed by a user community through their shared practices and norms.

Arvidsson (2020, citing De Angelis, 2017) argues that current thinking in the field would see these communities as actively defining their commons and giving value to them by coordinating their use and distribution as assets relevant to agreed productive goals: 'The commons are thus not simply a form of property or governance. They are also a way of making something valuable, by singularizing it, or which is the same thing, giving it magic.' (p. 8).

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[1] By 'civic institution' we mean an organisation or collective that is populated and co-led by citizens and community actors, in contrast to state institutions or corporate institutions.

For instance, Arvidsson highlights the valuing of both the soil and the people who farmed and lived together in feudal medieval Western Europe through complex social practices and shared culture and celebrations. This was an era before marketisation and 'enclosure' (see Box 2) turned both land and labour into commodities, and sought to discipline and control work, culture and the human body (citing Linebaugh, 2008). This spiritual dimension continues in some contemporary cultures, for example through the ecological spiritual language of some community-based approaches (e.g. Gaia, Mother Earth).

There are other related terms that also conceptualise the commons as a shared community of practice. For instance, Niaros, Kostakis and Drechsler (2017; also Kostakis, 2018) draw on the notion of 'commons-based peer production' (CBPP) to highlight a variety of approaches to digital and urban commoning in which shared goals and resources, and limited personal financial gains, support collective development of technology. Terms such as makerspaces, hackerspaces and hackers are part of this narrative, and point to an important relation between CBPP and market-orientated production and stakeholders, which will be explored later in the report.

Box 2. Key concept: Enclosure of the commons

The 'enclosure of the commons' historically refers to the legal process that expropriated common lands and resources (e.g. pastures, forests, wild game, water) from England's commoners since medieval times, repurposing them for private use (Bollier 2014:41). This advanced the concept of private property, turned land and other shared resources into commodities, and had far-reaching effects on urbanisation, the Agricultural and Industrial Revolutions, and modern property rights (Standing, 2019). Enclosure involved changing land rights, restricting commoners from traditional sustenance resources and activities like grazing and woodcutting, while empowering landowners to appropriate, consolidate and develop formerly shared resources.

The process of enclosure evolved over centuries through sustained dispossession of communities, punctuated by resistance and revolts, and eventually formalised in modern legal systems (Linebaugh, 2014). Enclosure was not merely about physical fencing but fundamentally altered land ownership rights, leading to significant socio-economic shifts. In this sense, enclosure can be understood as the 'private appropriation of shared wealth' (Bollier and Helfrich, 2019: 79). The impacts of enclosure were profound, shaping modernity and laying the groundwork for contemporary property structures and power inequalities.

The enclosure of the commons is not just a historical phenomenon, but a set of strategies of dispossession, extraction, exploitation, commodification, and alienation that continue to shape our contemporary political economies. As Bollier and Helfrich (2019:78-79) summarise:

Historically, enclosures were political initiatives by feudal lords and, later, by early capitalists and parliaments. Today enclosures are generally driven by investors and corporations, often in collusion with the nation-state, to privatize and commodify all sorts of shared wealth – land, water, digital information, creative works, genetic knowledge – dispossessing commoners in the process. Enclosures can be achieved through technical means such as digital rights management and paywalls; political means such as privatization, trade treaties, and financialization; and social means such as consumer culture, advertising, and the forced acculturation of people to Western capitalist culture. Enclosure is the opposite of commoning in that it separates what commoning otherwise connects: people and land, you and me, present and future generations, technical infrastructures and their governance, rulers and the ruled, wilderness lands and the people who stewarded them for generations.

3.1.2 Open access sources and resources as commons?

The commons is also often used as a term for open-access sources and/or resources, particularly those that are, or were at one time at least, freely-available; e.g. natural resources such as fresh water and rivers and lakes, the oceans, the air/atmosphere, land and forests; and, more recently, digital software and digitalised knowledge in forms where access can be global and free at the point of access. The assumption here has been that many of these resources are non-rivalrous and can be used by many different users without impacting on each other; rather than being rivalrous resources (or goods) where use (or consumption) by one prevents another from so doing. However, in the longer-term this has not always remained the case: Arvidsson (2020) for instance notes the increasing pressures on natural resources through urbanisation even in medieval Western Europe.

There are inevitably risks of over-use, mis-use and profit-maximisation of any open-access resources that are not suitably cared for and/or managed. Ostrom's (1990) counter to Hardin's thinking was that commons, from research examples of natural resource management, have a community of practice that can coordinate and value these resources and their uses – whilst open-access resources often lack such care, management and coordination, whether they are 'owned' by state, private interests, social interests or not owned at all in a legal sense (Uymaz, 2019; Dulong de Rosney and Stalder, 2020).

Hardin's (1968) thinking is, therefore, now generally regarded as a misunderstanding of the term 'commons'. However, Arvidsson (2020) recognises the historical and evolving connections between open-access resources that are freely-available (which he calls 'Commons 1') and commons as communities of practice (which he calls 'Commons 2') in that there can be movement between the two. For instance, the increasing pressures of human civilisation and development on largely-freely available natural resources and eco-systems in pre-feudal Western Europe ('Commons 1') could then be transformed in the developing medieval feudal political economy into rural commons ('Commons 2') – or enclosed by feudal lords. These commons ('Commons 2') were the result of social transformation and conflict, to be understood as culturally-sanctioned property, economic and community arrangements.

Similarly, Arvidsson (2020) argues that in the recent development of digital capitalism, many sources of digitalised knowledge would seem to be open-access, non-rivalrous resources (Commons 1). Nevertheless, they may in the longer-term require effective management, coordination and/or care whether via market and/or state institutions, or alternatively as a digital commons (Commons 2).

In this report, we stay with the language of commons as communities of social practice that support coordination, stewardship and sustainability of a resource (as 3.1.1 above). We use the notion of 'open access resources' as distinctive from this, while holding onto Arvidsson's observation of the historical and ongoing links between the two as potentially generating useful questions and insights.

3.1.3 The commons as a political economic and cultural paradigm and vision(s)

The literature recognises the need to understand the commons, and the practices of commoning, as being worked out over time within the context, culture and political economy of their particular times and places. Birkinbine and Kidd (2020), for instance, whilst acknowledging the influence of Ostrom's (1990) thinking on the capacities of communities to self-organise, argue that current manifestations of the commons cannot

easily be separated from the workings of state and market because of:

- the hybrid nature of communities and commoning organisations, and their members, who are inevitably 'engaging' to some degree with market and state coordination;

- the ability of capitalism to incorporate commoning within its own institutions, systems and aims and/or to draw from and exploit the work of commoners; and,

- how the struggles of communities to resist state and market may affect their livelihoods, ways of living and local cultures.

Commoners and their supporters must thus consider carefully how their communities, organisations and movements may need to work with, avoid and/or resist the state, market and related political economic and cultural orthodoxies of the day.

Box 3. Historical note: Commoning in longer-term social transformations

Arvidsson (2020) brings a historical perspective to this and explores the complex roles that rural commons and urban guilds played in medieval Western Europe in creating, challenging and supporting the feudal order and powers of the time. Over the centuries the ongoing development of market systems and institutions in pre-capitalist Europe – alongside China, India and the Islamic Empire – through urban guilds and increasingly the rural commons, laid the ground for the emergence of the institutions of capitalist societies: as per Adam Smith's understanding of markets as a multitude of small-scale local producers. However, these institutions also ultimately undermined the rural commons and the urban guilds, accelerating the development from the 18th century of industrial capitalism through privately-owned companies and the enclosure of land.

Arvidsson argues that neoliberal digital capitalism has likewise developed through new forms of community-based petty production via commons-based peer production (CBPP), digital commoning and the generation of open-source software and other hybrid technologies. This is now sustained by highly-mobile, outsourced, low-cost and often global labour markets that, like open-source software too, has similarities to open-access, non-rivalrous resources (or 'Commons 1'): although not strictly-speaking 'freely-available' the scale of these unregulated, global labour markets makes them in effect a resource that international corporations can now access at will and without levels of market competition for labour that would drive up levels of wages and social/welfare benefits and improve working conditions. And, yet, these too might in the future be increasingly under some degree of threat, in the age of the Anthropocene and precarious, 'flexible' employment, as new forms of CBPP, digital commoning and neo-artisan ventures (e.g. in farming) support adaption to the emerging social-ecological crisis and might perhaps generate alternatives to capitalism.

Aspirations for political economic visions of 'post-capitalism' are often central to much of the literature in this review. Many of the authors explore the potential of the commons generally, and digital and urban commons particularly, in supporting such developments (i.e. Bauwens and Jandrić, 2021; Cardullo and Kitchin, 2019; Chatterton and Pusey, 2020; Dulong de Rosnay and Stalder, 2020; Ganzert, Ochsner and Stock, 2020; Kostakis, 2018; Leontidou, 2020; Lynch, 2021; Niaros, Kostakis and Drechsler, 2017; Ossewaarde and Reijers, 2017; Reijers and Ossewaarde, 2018). There is also a wider debate amongst practitioners, policy advocates and applied researchers about the commons as both local practices and post-capitalist political visions (i.e. Bollier and Helfrich, 2019; Coote, 2017; Mestrum, 2016; Standing, 2019; Henderson, Escobar and Revell, 2020).

Some authors note the potential for new visions of the state, for example under the banner of the 'social commons', where the production of public and common goods is intertwined in the provision of social services and economic development (Chatterton and Pusey, 2020; Dulong de Rosnay and Stalder, 2020; Uymaz, 2019).

However, Fritsch et al. (2021) and Dulong de Rosnay and Stalder (2020), acknowledge that there are also libertarian approaches to digital commoning concerned to support mainstream economic growth and investment in capitalist approaches. Van Laerhoven, Schoon and Villamayor-Tomas (2020) also observe an ongoing trend in the development of commoning – at first natural or ecological commons and potentially now digital and 'new' commons – to initially understand themselves as radical alternatives to mainstream state and market structures and institutions, but then over time to increasingly work together with these systems.

In sum, this particular literature points towards the commons in a variety of guises as central elements in ongoing political economic and cultural change and societal transformation –both historically and in contemporary times. The commons therefore often become a focus or rallying point for political and social movements that seek to advance some variation of post-capitalism. However, the types of change that result will likely prove unpredictable, particularly given the adaptive capacities of capitalist markets and institutions (Wright, 2021; Fraser, 2022).

3.2 Understanding the digital, urban and environmental commons

3.2.1 The complexities of the digital commons

Arvidsson (2020) notes the spread of the World Wide Web in the 1990s, and social media a decade later, as widening use of digital technology and communication in neoliberal digital capitalism. In parallel to this, and interconnected, has been the development of the digital commons and the sharing and coordination of the development of digitalised knowledge, communications and data. Dulong de Rosnay and Stalder (2020: 2) describe a similar narrative and present a definition of the digital commons that allies to the broader notion of the commons outlined earlier, as communities of practices around shared resources, whilst also recognising political dimensions in the need to protect these commons from exploitation and widen access to them:

… the digital commons are a subset of the commons, where the resources are data, information, culture and knowledge which are created and/or maintained online. They are shared in ways that avoid their enclosure and allow everyone to access and build upon them. The notion of the digital commons lies at the heart of digital rights, the political fight to expand, rather than restrict, access to information, culture and knowledge.

Further, Dulong de Rosnay and Stalder (2020) highlight a key difference between digital commons and their material counterparts: they are not in danger of over-use because they are non-rivalrous and not depleted by use. They suggest, therefore, that for digital commons there is less reason for a strongly-bounded community to coordinate their use; although they may nevertheless require management to sustain, maintain and repair them.

This same argument, however, would also suggest that digital commons do need care and attention from a committed community of practice; and albeit in theory they are non-rivalrous, in practice they may still be damaged by misuse, exploitation and/or poor maintenance in the longer-term if not suitably stewarded. Indeed, Lynch (2021, citing Mies, 2014) argues that all commons need a community and related skills to build, protect and sustain them. He points to the Internet rather as privately-owned by a handful of vast global corporate monopolies – an oligopoly – and/or nation states: each of whom may close down or discourage access if this suits their goals. Open-access digitalised knowledge and resources, seemingly freely-available, but without a community to sustain them – or not provided as a committed public service by the state – will likely be or will become privately-owned in capitalist societies. However, Lynch concludes, that whilst the Internet can and often is captured and so potentially enclosed, this not inevitable or ever fully the case.

Bance and Schoenmaeckers (2021) note the role of commons-based open-source software in the development of the Internet, while also highlighting key corporate beneficiaries. For instance, Zoom has used open-source software to help build its online meeting technology; the development of Linux (open-source software) has been supported by corporations such as Dell, Microsoft and Google, who value the creativity of this type of commons-based working. However, they also argue that the current platform economy falls short of promoting inclusive societies: some apparent digital commons, and the participatory and sharing economies emerging from them, can end up supporting profiting-making and contributing to inequalities. This divergence from the vision of the commons as solidaristic and egalitarian raises concerns about the impact of capitalist digital platforms on society.

3.2.2 The illusion of the digital commons?

This sense of the digital commons as a complex phenomenon that might not always live up to commoning values is taken further in the debate between Ossewaarde and Reijers (2017; Reijers and Ossewaarde, 2018), and Kostakis (2018) as to the potentially illusory nature of the digital commons.

Ossewaarde and Reijers criticise the 'illusions of the digital commons' on the following grounds:

- 'Hybrid' digital commons (which encompass digital and material aspects), often involve practices shared with capitalist digital platforms, such as those seen in the 'sharing economy' of companies like Uber or Airbnb: they are built on technological mediation of abstracted identities and reputations that shape shared practices and transactions, rather than on actual human relationships.

- Such technological mediation is dependent on tools developed to support capitalist purposes or, when developed initially by commoners, are later captured by capitalist organisations. Over time, whether directly or indirectly, this brings monetary exchange into the process such that its concerns for efficiency, better products, and financial returns become central – rather than community practices, values, commitments and care.

In effect, these authors argue, that digital commons will lack a sufficiently inter-related active community of practice to sustain themselves as commons. An apparently 'apolitical' and technical rationality becomes the driving narrative or logic: users of digital commons instead of committing to their community and resisting appropriation tend to migrate to other digital platforms (citing, Illich, 1992) in response to the price mechanism, while the emancipatory and political potential of the commons is lost. They recognise that critical reflexivity within commoning networks might be used to counter this, as proposed for instance by Gibson-Graham (1996), Negri (2008) or Hardt (2010). Yet, they argue that digital commoners are failing to achieve this – giving examples such as: the loss of the hospitality exchange platform CouchSurfing into the for-profit 'sharing economy'; and Wikipedia's willingness to take funding from the corporate sector for specific projects.

Kostakis (2018) seeks to challenge such thinking by arguing for:

• The potential of critical reflexivity within commoning: recognising the political nature of technological development and the need for 'new' (digital) and 'old' (ecological) commoning to work together to counter a passive and uncritical approach to technology.

• The continuing fundamental role within commons-based peer-production of mutual coordination and contribution to community, over that of the price mechanism and/or top-down command and control processes.

Kostakis (2018) offers examples of digital commons as learning to resist co-option – including the growing body of platform cooperatives; the emergence of commoning platforms such as 'BeWelcome' and 'Fairbnb' that are structured to resist capitalist takeover; Wikipedia displacing corporately-organised Encyclopaedias Britannica and Microsoft Encarta; and Apache HTTP server outperforming Microsoft server software. Kostakis concludes that the digital commons, in becoming active within the economy alongside market and state institutions, can genuinely seek to change and displace them rather than settle for a 'commons-centric capitalism'.

In conclusion, it seems unlikely that these debates about the relationship between digital commoning and digital capitalism can be settled abstractly, but they illustrate the need to explore and challenge the development of the digital commons, and contemporary commoning more generally, through exploring and building understanding of the wider relations between communities, state and market (for instance, as per Polanyi, 2001 [1944]). This includes recognising and considering:

• The hybrid nature of digital commons – they are not simply digital, nor likely to be solely coordinated and controlled solely by one community of practice, but rather set in a wider context of community-market-state relations.

• How member and user communities of digital and other commons are making decisions about their development – e.g. what types of community practices and what types of top-down policymaking/ planning and market price-mechanisms are active and influential.

• How a particular commons or group of commons relate to the wider body of community, market and state activities and contexts that inevitably support and influence them.

- What types of political, social and economic visions, values and strategies are active in the thinking that underpins a commons and its networks (e.g. post-capitalist, communalist, libertarian and so on), recognising that there may be a number active in any community/network and context, and they may not be so easily reconciled.

3.2.3 Digital and urban commons as inseparable?

In exploring the development of digital commoning since the 1970s (Arvidsson, 2020; Niaros, Kostakis and Drechsler, 2017), it becomes apparent that digital commons are typically 'hybrid' rather than 'pure'. This is because they involve:

- both virtual and face-to-face social practices across their respective communities (Ossewaarde and Reijers, 2017);

- material infrastructures and systems such as hardware, cables and server parks (Reijers and Ossewaarde, 2018; Lynch, 2021);

- and relationships with other types of coordinating systems as the state and the market (Ossewaarde and Reijers, 2017; Birkinbine and Kidd, 2020).

The evolution of the digital commons is also tied to the increasing complexity and expansion of digital capitalism in urban contexts. Leontidou (2020: 264), for instance, reflects on the implications of these developments for contemporary urbanism:

Urban theory must be renewed … by putting communication technology studies centre stage. After Castells (1996) theorized the awakening of the 'informational' city with the concept of the 'space of flows', there have been a few references to the 'digital city' (Craglia et al. 2004); but in this essay, we would rather refer to hybrid urbanism, wherein urban public spaces are simultaneously local and international, offline and online, material and virtual: hence hybrid. The same holds for co-working spaces and shared mixed land uses, as well as for alternative grassroots hubs and occupied buildings.

Lynch (2021: 1872) makes a related point in highlighting the multi-dimensional nature of the Internet and therefore the complexities of its relations with commoning:

…the complex nature of the Internet as simultaneously territorialized and deterritorialized, material and immaterial, complicates the claims of both proponents and sceptics of Internet-based commons while highlighting the messy potential for practices of commoning.

Arvidsson (2020) discusses the complex urbanism that has driven the development of neoliberal globalisation and an increasingly digital capitalism over the last five decades. This included early digital technological developments from 1970s, the Internet as a reading platform from the 1990s (Web 1.0) and then social media as a publishing platform (Web 2.0). These material developments have been intertwined with capitalist trends such as the globalisation of consumerism and media culture, and the deregulation and outsourcing of key parts of the economy (e.g. labour markets).

This is not to say that all urban commoning is now synonymous with digital commoning – the level of integration will vary according to the types of activity involved and their positioning within the global economy. However, within the urban hybridity of which Leontidou (2020) speaks, there is interdependence and complexity in which both material and virtual elements must be understood together. In this review, trying to explore the current revival of the commons, digital commons and urban commons appear so entwined that it makes sense to examine them in tandem.

3.2.4 Environmental, natural and ecological commons

The initial brief for this literature review aimed to explore the revival of the commons across digital, urban and environmental dimensions. However, as noted in Chapter 2, methodological and practical constraints led to focus on the digital commons and related developments in urban commoning. Nevertheless, the review covers the environmental and ecological dimensions of digital and urban commoning that relate to three thematic areas:

- **Natural commons:** Here the focus is on coordinating the use, management, sustainability, and protection of natural resources such as water, ecosystems, and biodiversity, which are increasingly perceived as interconnected local-to-global or planetary ecological systems. Reijers and Ossewaarde (2018) refer to them as 'ecological commons'. These commons are governed by local communities (Van Laerhoven, Schoon, and Villamayor-Tomas, 2020), and are also recognised within broader political and cultural commons frameworks (Uymaz, 2019). Van Laerhoven, Schoon, and Villamayor-Tomas (2020) identify traditional areas of commoning, termed 'the Big Five', including pastures, fisheries, water management, forestry, and irrigation, while acknowledging the emergence of 'new commons' associated with biodiversity and climate change.

- **Knowledge-sharing, educational, and advocacy activities:** Commoning in this area underscores the interconnectedness of urban, rural, and remote environments with local-to-global or planetary ecological systems, advocating for social and policy change. Calvet-Mir et al. (2018), for example, discuss a participatory approach to establishing a digital commons aimed at preserving traditional agro-ecological knowledge. Such initiatives support ongoing agro-ecological transitions while safeguarding against the loss, enclosure, and commodification of collective knowledge (see also Bollier 2021, pp. 44-58).

- **Ecologically-driven societal and global transformation:** Commoning in this area aims to transition human civilisation at various scales (local-to-global) towards new forms of commons-based political economy and culture. These transformations, facilitated through practical activities, campaigning, and advocacy, seek to enable societies to coexist sustainably within the ecological limits of the planet while honouring the rights of other species. Moreover, they strive to foster more equitable societies that ensure a 'good life' for all current and future inhabitants.

A key issue here, relevant to the natural commons and environmental campaigning, pertains to conceptions of the relationship between humans and nature. Bauwens and Jandrić (2020) point out that even within Ostrom's thinking (the Bloomington School) nature remains as a resource for humans and our economy. Terms such as 'natural capital', 'natural assets' and 'ecosystem services' underline this emphasis, often focussing on economic value over other considerations.

Even the notion of nature as part of our cultural commons (Uymaz, 2019) positions 'it' at the service of humankind, albeit emphasising a more holistic concern for its wider value, including to future generations. Bauwens and Jandrić (2021) and Ganzert, Ochsner and Stock (2020), therefore, argue that there is a need to yet further rethink the relationship between human societies, digital and technological development, and wider nature and planetary ecological systems.

4. Research question 1: In what ways can a focus on the commons be said to be reviving?

This research question is considered from two perspectives:

*   the ongoing cycles of revival, impact and resulting change in relation to the commons from an historical perspective;

*   the revival since the Global Financial Crisis in 2008 where particular conditions have created new opportunities and challenges.

4.1 Ongoing cycles of revival, impact and change

Arvidsson (2020) argues that the increasing role of market exchange in Western Europe from the 16th and 17th centuries has had a complicated relationship with the commons. For instance, commons such as urban guilds and rural commons played key roles in creating the political economic transformation from feudalism to early industrial capitalism through their use and development of market exchange mechanisms and institutions:

*   The urban guilds' role entailed fixing prices, setting the rules of exchange, supporting legal regulations, linking with emerging universities and related religious institutions, and providing craft-based codes, identity and status.

*   The rural commons' role entailed supporting the rise of a rural middle class, free association and cooperation between villages.

Related to these developments was the increasing emergence of a more egalitarian commons-based market society – where market mechanisms, emerging secularism, civil society and community reciprocity were mutually supportive.

This cultural political economy and ethos supported discussions of justice and equality, and acts of resistance in relation to the enclosures of the commons (e.g. 'the Levellers' and 'the Diggers' in England). Ultimately though, Arvidsson (2020) argues, guilds and commons were increasingly undermined by this shift through:

*   the growing size of markets, their organisations/businesses and related class differentiation, e.g. masters of guilds, landed gentry;

*   enclosures, legal challenges and constraints;

*   and the emergence of mass-production.

Nonetheless, new varieties of commons emerged as capitalist societies developed. These continued to create change, for example as: 'capitalist commons' such as the elite communal management and shareholding 'community' of corporations and, the non-elite, working-class communities of practice and knowledge-sharing within workplaces.

Beyond these commons within capitalist institutions, Fritsch et al. (2021) recognise and discuss the emergence of urban commons and mutualism during the 18 and 19th centuries in Western Europe: highlighting alternative market-oriented commons like trading cooperatives, friendly societies, and mutuals within working-class communities. These initiatives, along with membership-based voluntary organizations, operated alongside the growth of trade unions and the labour movement. They provided employment, welfare, and leadership to challenge the status quo and played a significant role in catalysing the development and shaping of the welfare state and Keynesian economic policies by the mid-20th century in Europe and North America. However, over time, these social commons were gradually replaced as the state took on a more prominent role in stabilising capitalism and providing employment and welfare, particularly post-1945.

Despite their relative decline in the immediate post-war era in the developed world, the commons have continued to undergo waves of revival through community-based action, resistance, ownership and enterprise in the last five decades. For instance, Ganzert, Ochsner and Stock (2020) draw inspiration from the work on convivial communities of practice advocated by Ivan Illich in the 1970s (citing Illich, 1973). And, Niaros, Kostakis and Drechsler (2017) note the rise of makerspaces via early hacker sub-cultures from the 1960s and 1970s, themselves linked to 'the hippie culture' of the 1950s and 1960s.

In terms of intellectual revival, there is no shortage of influences and advocates in both research and practice. But, as noted before, recent literature flags the particular and critical influence of Elinor Ostrom in re-establishing within academic, research and policy circles the credibility of the commons as a community or social system to coordinate the use of common pool resources 'with some degree of success over a long period of time' (Arvidsson, 2020: 7).

Van Laerhoven, Schoon and Vallamayor-Tomas (2020) examine this intellectual revival through a literature search (1968-2020) focussed on peer-reviewed articles via the key terms of 'commons' and 'common pool resource(s)', which generated 3819 articles meeting their criteria in over 1900 journals. They observe an upward trend since the publication of Hardin's (1968) infamous article that accelerates from negligible numbers pre-1990 to 50 per year by the end of the 1990s, and with 74% of all of these articles published between 2007 and 2019. Whilst 'the Big Five' – pastures, fisheries, forests, irrigation systems, water management – continue to dominate both pre- and post-2007, they note the emergence of the 'new commons' in technology, biodiversity and the digital sphere. However, this focus on the terms 'commons' and 'common pool resources' might likely reveal only a portion of the literature relevant to commoning and its revival. Myriad other examples would likely be revealed through inclusion of terms such as 'community', 'makerspaces', 'community-based peer-production', etc.

Further, Arvidsson (2020), Dulong de Rosnay and Stalder (2020), and Ganzert, Ochsner and Stock (2020) point to the opportunities and spaces that digitalisation of knowledge and communications have created to expand commoning and increase its visibility since the 1970s; particularly with the rise of the Internet in the 1990s (Web 1.0) and increased interactivity in the 2000s (Web 2.0). Fritsch et al. (2021) argue that the last decade entails a further phase including distributed ledger technologies (DLT), such as blockchain, that support decentralised peer-to-peer transactions ('Web 3.0' perhaps). A DLT acts as a database that is synchronised across members of a decentralised network allowing for self-governance without a central authority or intermediary such as a financial institution or clearing house (Bauwens and Jandrić, 2021). Fritsch et al. (2021), however, offer a note of caution as to the role of DLTs, which are often part of wider

capitalist and speculative projects, such as crypto-currency, and libertarian commoning cultures that seek to support digital capitalist growth.

The revival of the commons since the 1960s and 1970s, through social and community economies, community development, local democratic control, intellectual advancements in commons theory and practice, convivial communities, community-based peer production, digitalisation, and knowledge sharing, demonstrates a continuous revival – or series of mini-revivals – in the exploration and development of commoning since that period. However, Arvidsson (2020) and Chatterton and Pusey (2020) argue that the wider context for this revival is the rise of neoliberal digital capitalism and the conditions it has generated:

- global deregulation and privatisation – including personal data and control of biological life (i.e. new enclosures);

- precarious employment and alienating work – reducing global working-class power;

- commodification and consumerism – including the marketisation of most aspects of everyday life;

- and corporate outsourcing of production and knowledge-creation – including via the digital knowledge commons and labour as a global open-access resource.

It is important therefore to recognise a complex picture around the revival of digital and urban commoning, and the commons ('new' and 'traditional') more generally. Revival over the last five decades is inextricable from the rise of neoliberal digital capitalism, either as a development within it or as a response to it, and so includes:

- incorporation as internalised 'capitalist commons'; outsourced and de-regulated global open-source labour markets and digital knowledge commons; and capitalist-supporting libertarian commons initiatives;

- marginalisation of much of the social and community economy to areas where the market is failing and the state is withdrawing – in particular as local social capital and subsidised, low-cost service provision.

Nevertheless, the digital and urban commons persist in challenging established norms through diverse forms of commoning at work across: social media engagement; community resource ownership; social enterprises like platform cooperativism; and activism addressing social and ecological issues. While some of these initiatives may have contributed to the growth of digital capitalism (Arvidsson, 2020), they can also serve as a means of resistance and opposition to it, and/or as spaces for the prefiguration of alternative futures.

4.2 The context of the current revival of the commons across the 2010s

Foster (2020, citing Selwyn 2018) emphasises the need for a more profound acknowledgment of the extensive transformations occurring in the digital age. New networks, platforms, data generation, algorithm development, automation, and computational analysis are exerting influence on a global scale, affecting various aspects of the economy, society, culture, human subjectivity, and politics – and thus opening up new pathways for research. Foster (citing Arvidsson, 2019; Jordan, 2020) outlines the complexity of the emerging social and economic context both in terms of:

- the changing nature of production and the rise of the 'industrious economy' of social-purpose start-ups, entrepreneurial online commons and digitalised networks and clusters, including in the Global South;

- the emergence of new economic and social practices, including value-capture activities, across the digital economy through social media, platforms, open-source software and gaming; generation of advertising and common goods; and, loss of intermediaries ('disintermediation') and their respective actors, producers and activities.

In this context, whilst not entirely 'new' – given the rise of digital and platform capitalism since the 1970s and 1990s (Niaros, Kostakis and Dreschler, 2017) – the digital economy/society, and the role of the commons within it, continues to expand in breadth and depth at remarkable pace.

Cardullo and Kitchin (2019) and Leontidou (2020) contribute to this evolving narrative by highlighting the emergence of the neoliberal smart city and urban hybridity. This includes urban challenges related to complex demographics, urban diversity encompassing aspects like class, ethnicity, sexuality, and disability, as well as generational alienation and polarisation. Furthermore, this relates to broader social divisions, crises in democratic governance within Western Liberal Democracies, and the growing trends of authoritarianism or resistance to authoritarianism in various regions around the world.

Analysis by Van Laerhoven, Schoon and Vallamayor-Tomas (2020) illustrates the parallel growth of peer-reviewed publications about 'the new commons' in key thematic areas (i.e. urban, digital, bio-diversity, climate change, intellectual property), as well as about the commons more generally since 2007.

The literature reviewed provides further insights into key drivers of this change in the last decade. Leontidou's (2020) discussion of the role of the digital and urban Social and Solidarity Economy in Greece helps identify some of the key issues in Mediterranean cities, which resonate across other parts of the world:

Austerity, mobilisation and the millennials: In the context of neoliberal fiscal austerity following the Global Financial Crisis (2008) and the European Sovereign Debt Crisis, there have been ongoing mobilisations and protests led by a struggling millennial generation in the Mediterranean region. This includes movements like the 'Arab Spring' starting in Tunisia, and mobilisations in Southern Europe – particularly Greece with 'the Movement of the Piazzas' and Spain with 'the Indignados' – as well as Turkey and Beirut (Lebanon). These protests have also resonated more widely, extending to regions like Latin America. Additionally, global phenomena such as the Occupy Movement and hacker activism in India further underscore the impact and reach of these movements (Chadha, 2019). This new generation of digitally literate, highly-educated citizens faces increasing levels of unemployment, work in the informal economy, and precarity in working conditions – they are often 'outcasts' (Arvidsson, 2020) and fill the ranks of the new 'precariat' class (Standing, 2011). In this context, they have continued to protest and to work towards an alternative Social and Solidarity Economy and related commons, using digital media and social networks.

Hybrid urbanism: This epoch of extraordinary cultural, political and economic change, Leontidou (2020: 264) argues, is within the context of an increasingly complex urbanism where public and social spaces 'are simultaneously local and international, offline and online, material and virtual: hence hybrid'. The author argues that the millennial generation may thus seek social change via mobilisations, creativity and the 'trans-locality' of the digital sphere – given widespread use of ICTs (information and communication technologies). The author points to the potential of the grassroots smart city as a counter-narrative to how the state and corporations pursue digital capitalism through the neoliberal smart city – a theme more widely

recognised within the literature reviewed (i.e. Arvidsson, 2020; Niaros, Kostakis, and Drechsler, 2017; Lynch, 2021) and related to emerging research on 'socially smart cities' (Durose et al., 2019).

Implicit within Leontidou's (2020) thinking, albeit less elaborated upon, are crucial factors that illustrate how neoliberal digital capitalism is fostering its own growth while undermining its own sustainability:

The age of the Anthropocene: Arvidsson (2020), Chatterton and Pusey (2020), and Dulong de Rosnay and Stalder (2020) each highlight the emergence of this new age of global environmental challenges, such as the climate emergency and loss of biodiversity, stemming from expansive human activities across the planet, primarily driven by capitalist centres. These activities are altering ecological systems, surpassing planetary boundaries, and exerting pressure on the global financial growth necessary to sustain capitalism's structures and dominance.

Risk-averse digital capitalism: This is shaped by the rise of monopolistic 'platform capitalism' and its utilization of algorithms, databases, and predictive analytics to mitigate investment risks. Arvidsson (2020) argues that this form of capitalism is progressively losing its adaptability and innovation capacity, hindering financial growth and investment in critical infrastructure such as education and technological development, which are essential for its sustained expansion. This pattern, Arvidsson suggests, echoes historical phases of capitalism over recent centuries and may have critical implications for its sustainability.

The scale of technological change: Arvidsson (2020) also acknowledges the emancipatory potential of digital and related technologies as they become more affordable and directly accessible to individuals beyond corporate capitalism. For instance, blockchain and other distributed ledger technologies (DLTs) offer avenues for cryptocurrencies and distributed autonomous organisations, supporting decentralised approaches relevant to commoning, small-scale producers and their networks. Arvidsson suggests that these technologies could potentially rival the complexity and reach of corporations and capitalist monopolies.[2]

The vulnerabilities of this variant of digital capitalism, and the associated neoliberal 'smart' state, thus seemingly provide spaces into which commoners can gain footholds as:

- communities of people and networks of organisations seeking to survive when market and state are failing them – as, for instance, the 'Jugaad economy' in India (Chadha, 2019)

- 'petty producers' concerned for interrelated community-based and market-oriented production – more decentralised, higher-quality goods and interesting, purposeful work, and reduced internal inequality within its own networks e.g. neo-rural farming in the developed world (Arvidsson, 2020).

- communities inspired to pursue alternative approaches and visions to the current political economic orthodoxies and capitalist interests – e.g. post-capitalism (Arvidsson, 2020; Dulong de Rosnay and Stalder, 2020; Chatterton and Pusey, 2020); the Collaborative Commons movement (Lynch, 2021); or the Social and Solidarity Economy (Leontidou, 2020).

- communities inspired to explore the cultural potential of new approaches to an 'autonomous, self-organising civil society' and for technologies that support convivial 'socio-technical entanglements' between humans, nature and media (Ganzert, Ochsner and Stock, 2020; citing Adloff, 2020)

[2]This discussion is also taken-up by Bollier and Helfrich (2019) in their treatment of the theory and practice of commoning and its associated aspirations and possibilities.

Chatterton and Pusey (2020) consider how a post-capitalist theory and practice centred on the commons might be developed in pursuit of political, economic and cultural change – a theme to which we return later. But is this level of transformation possible and desirable? Arvidsson's (2020) overview of the role of the commons and commoning in creating political economic transitions and change in Western Europe over the last millennium – across different phases of feudalisation and capitalism – illustrates the power of its various revivals and perhaps its potential pathways towards post-capitalism. Yet, Arvidsson also notes the rise of commoning in other parts of the globe as, for instance, state-facilitated localised petty-production in China (see also Niaros, Kostakis and Drechsler, 2017) and other petty-production in South-East Asia. Both historical and contemporary perspectives therefore also highlight the ambiguity and unpredictability of what emerges through these revivals, given mutual dependencies between commons, state and market.

5. Research question 2: What is the current scope and diversity of digital and urban commoning? What examples are emerging of developing practice across the globe?

To illustrate the variety of digital and urban commoning, this chapter is structured as follows:

- examples of the digital commons (5.1),

- examples of entwined digital and urban commoning (5.2), and

- examples of the commons in relation to state and market coordination (5.3)

These examples will show the close-binding between digital and urban commoning and the complex, interdependent yet often conflicted relations between actors and institutions within systems of market, state and commons – thus also setting the scene for discussions of theory and practice in Chapter 6.

5.1 Varieties of digital commons

Whilst acknowledging the hybrid nature of digital commons, as highlighted by Ossewaarde and Reijers (2017), it is useful to delineate the diverse manifestations of commons that have arisen through various applications of digital technology. These are categorised from 5.1.1 to 5.1.6 in the sub-sections below.

5.1.1 Digital open-source software

Perhaps the most widely-recognised form of digital commoning has been as digital, open-source software. As Dulong de Rosnay and Stalder (2020: 4) explain:

In 1984, the programmer Richard M. Stallman founded the free software movement to counter the rise of proprietary software and promote "four freedoms" (Stallman, 1996) related to code: 0) the freedom to run the software for any purpose; 1) the freedom to study and change the programme without restrictions; 2) the freedom to distribute copies of the programme; and 3) the freedom to distribute changes of the programme. As FLOSS (Free, Libre and Open Source Software) projects grew and proliferated, it established the practical example that complex, knowledge-intensive informational resources can be managed as commons in Ostrom's sense …

These authors emphasize the pivotal roles played by FLOSS in shaping the Internet's infrastructure, including critical components like the Domain Name System. Additionally, they underscore the importance of open-source web servers in facilitating the widespread dissemination and growth of the World Wide Web.

Kostakis (2018) notes a 'myriad of free and open-source (software and related) projects' that include Linux, Apache HTTP Server, Mozilla Firefox and Wordpress, as well as open design communities such as WikiHouse (building design), RepRap (technological design), and Farm Hack (farming equipment), that can share a mix of software, digitalised knowledge and related hardware.

One issue raised by Lynch (2021) is the extent to which there is a community of members and/or users who can take responsibility for the development, sustaining and protection of these digital resources. Are they a digital commons sustained by a community of practice or more akin to an open-access resource

that is accessible to 'all' but lacks a community to coordinate their use? He thus echoes Arvidsson's (2020) distinction between 'Commons 2' (community-based resource coordination) and 'Commons 1' (an open-access resource for 'all').

5.1.2 Digitalised knowledge and culture – and its hybridity

The largest and best-known example in this category is Wikipedia, which is available in over 150 languages. It is produced and managed through collaboration and sustained by donations from users (Dulong de Rosnay and Stalder, 2020). Of course, the Internet includes endless examples of knowledge and culture free-at-the point of access, but it is often unclear whether it is provided by a community of practice, a public service, a private body or a hybrid. For instance, Dulong de Rosnay and Stalder (2020) point to the role of Galleries, Libraries, Archives and Museums (GLAMs) in digitalising or making material accessible within the public domain: GLAMs may be part of the public sector, but also potentially private or third sector bodies (e.g. collections, some universities), and some community-based bodies. These authors note that whilst many of these are both legally and conceptually distinct from the commons, they can nevertheless be valuably supportive of commoning more generally. Whilst some institutions constrain the use of such material contractually, others release them without restriction and may indeed collaborate with sources in the commons (e.g. Wikipedia and the Wikimedia Commons repository). Similarly, they point to the increasing volumes of open access scientific and academic articles and data, while flagging that funders increasingly require research to be released in open access.

5.1.3 Digital media and communications

Digital media technology and related communications are highlighted as a key area of focus and development within digital commoning. Ganzert, Ochsner and Stock (2020; citing Adloff, 2020) note the potential for conviviality (Illich 1973) as an end in itself, articulated around principles and practices such as: non-violence and tolerance of difference, open social encounters, equality, and self-organisation. Such thinking can be supportive of an experimental and de-marketized approach to digital communications.

Birkinbine and Kidd (2020) cover a range of digital commons including varieties of media and telecommunications, indigenous communities and their cultures, artistic interventions, and political struggles. In a similar vein, Chadha (2019) and Leontidou (2020) illustrate how commons-oriented digital media and communications can shore up grassroots activities and campaigning, whether in their political work challenging hegemony and oppression, or supporting informal working and subsistence in challenging economic times and places.

5.1.4 Data commons

Dulong de Rosnay and Stalder (2020) describe the ever-growing potential of digitalisation to collect and analyse data:

- pooling data and data mining of large databases to generate new information and knowledge – and to make predictions that may shape policy (data analytics);

- the 'internet of things': interconnection via the internet of computing devices embedded in everyday objects, enabling them to send and receive data;

- varieties of automated and digitalised algorithmic decision-making – problem-solving through data using a set of rules for analysis – and the new roles of artificial intelligence.

Alongside other authors (Arvidsson, 2020; Cardullo and Kitchin, 2021; Leontidou, 2020; Lynch, 2021; Niaros, Kostakis and Drechsler, 2017) they highlight increasing concerns as to how these resources can be directed by a centralised state and used for surveillance and social control, for instance, in China (Arvidsson, 2020), or market-led and used to accelerate capitalist growth – for instance via 'smart cities' (Cardullo and Kitchin, 2019).

Dulong de Rosnay and Stalder (2020), therefore, see the development of digital data commons[3] as a counter to the centralisation, privatisation and commodification of these resources, given their potential to support both:

- open data resources which are available to all – so an open access resources in effect;

- segmented access to data: primarily for members of a data commons and also to others but with some constraints.

5.1.5 Platform cooperativism

Chatterton and Pusey (2020) describe the development of digital platforms via cooperative structures. The cooperatives movement brings into the digital economy long-standing commitments to community democracy, worker self-management, the role of unions, common ownership, the sharing of wealth, and concern for socially-useful products and outcomes. Thus, platform cooperatives seek to be more equitable and democratic than corporate-controlled collaborative sharing and digital platforms such as Uber, TaskRabbit and Deliveroo, which tend to turbocharge capitalist practices such as the commodification of work, the extraction of value, and the enclosure of knowledge.

These authors offer examples of platform cooperativism such as:

- Fairmondo: a cooperative alternative to ebay and Amazon;

- Loomio: open-source software for collective decision-making;

- Stocksy: artist-owned cooperative that sells stock photography and shares profits with workers and artists;

- CoLab: a global worker-owned data agency;

- Data Commons Cooperative: supports sharing data across cooperatives and the solidarity economy;

- FairCoop: an online platform for sharing tools and skills between cooperatives and organised around local nodes using the FairCoin cryptocurrency.

Chatterton and Pusey (2020) also highlight the potential of platform cooperativism to support broader ownership of digital infrastructure; advance the exchange of open-source software, data and information; and generate momentum towards 'post-work' futures.

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[3]For an interesting example of a growing data commons see Slum Dwellers International https://sdinet.org, a network of community-based organisations of the urban poor across Africa, Asia and Latin America

Kostakis (2018) notes over 200 platform cooperatives recorded globally and flags examples of hospitality exchange commons or cooperatives, such as BeWelcome and Fairbnb, which aim to avoid the fate of Couchsurfing, now run by a privately-owned company.

This is another area of the literature where digital and urban commons intertwine. Thompson (2020), in discussing new municipalism, focusses on the development of the democratic autonomy of the local state over that of the nation state, and notes the potential of commoning to create new 'spatial imaginaries' such as public-commons partnerships[4] and new approaches such as 'platform municipalism'. We return to such thinking later.

5.1.6 The mobile commons

Ganzert, Ochsner, and Stock (2020) explore the concept of the 'mobile commons', which encompasses a wide array of digital applications while on the move. This includes elements integrated into digital capitalism but also presents opportunities for digital commoning. Examples of the potential for using the term mobile commons include:

* mobile communications, such as mobile phones used as part of the platform economy to facilitate mobility;

* geographically mobile individuals and communities traversing the globe, including migrants and refugees, and their engagement with digital technology;

* media and cultural initiatives that are mobile, incorporating activities like film and video production.

The authors also highlight the concept of a 'mobile undercommons' (referencing Harney and Moten, 2013), which addresses issues of inequality within commoning practices. The mobile commons can be viewed as potential forms of resistance to prevailing structures and values, or conversely, they could represent elite/professionalised commoning or be co-opted by digital capitalism. Chadha's (2019) exploration of 'jugaad' in India, encompassing 'workarounds', digital commoning, hacking, and activities that may be illegal or defiant, also highlights the oppositional characteristics of commoning through mobile data technology and devices, and their role in reclaiming physical and virtual spaces.

Cardullo and Kitchen (2019) highlight the evolving uses of digital technologies by 'smart citizens,' who have transitioned from stationary desktop users to mobile consumers engaging in real-time interactions within cloud- and platform-based economies. This shift enables them to access digital information on the move, whether through corporate, state-provided, or commons-based platforms. While their focus is primarily on critiquing 'smart cities' and 'smart citizenship', they also underscore their potential for alternative approaches, emphasising the significance of mobility in this context.

5.2 Digital and urban commoning entwined

As highlighted above, the development of digital and urban commons is closely-entwined, with the digital commons seen as most often hybrid rather than 'pure' (Ossewaarde and Reijers, 2017). This hybridity in urban settings involves a blend of local and global elements, offline and online interactions, and material

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[4]For recent discussions of public-commons partnerships see Russell et al. (2023) and Pera and Bussu (2024).

and virtual dimensions, creating the concept of 'trans-locality' to highlight interconnectivity. Leontidou (2021) further argues that there is a fusion and fluidity that merges online and offline realms into a cohesive hybrid state rather than existing as separate entities and a duality. This hybridity extends to the relationships between commons, the state, and the market, with various organisations, institutions, and networks engaging in different modes of coordination. This complexity raises questions about which forces are dominant and the diverse forms of commoning, state intervention, and market coordination involved in these dynamics. The following sub-sections illustrate examples of this diversity at work.

5.2.1 Makerspaces and commons-based peer production

Makerspaces have become a prominent approach within the field of Commons-based Peer Production (CBPP), bringing together co-working and technological innovation. Niaros, Kostakis and Dreschler (2017: 1144) describe them as:

… community-led, open spaces where individuals share resources and meet on a regular basis to collaboratively engage in creative commons-oriented projects, usually utilizing open source software and hardware technologies. Through the intersection of digital technologies and urban life, several initiatives have emerged that attempt to circumvent the dependence on private firms or governments to provide solutions. Individuals of varying backgrounds and goals have access to prototyping tools in makerspaces, allowing them to collaborate in order to produce small-scale solutions for problems of daily life.

These co-working, makerspaces may go under a variety of other names, including: micro-factories, hackerspaces, fablabs, and media labs. Using makerspaces as an umbrella term, they introduce two basic criteria that qualify a space as a makerspace: firstly, exercising community-based forms of governance; secondly, utilising local manufacturing technologies. And they locate the beginning of these spaces in the hacker sub-culture of the 1960s and then in the 1970s via developments led by the MIT Artificial Intelligence Laboratory and other research institutes in USA.

Interestingly, there is arguably historical resonance here with Arvidsson's (2020: 11) discussion of petty producers from feudal times in Western Europe onwards and their roles in developing of knowledge commons:

Similar 'Smithian'[5] productive arrangements marked pre-capitalist Europe as well as China, India and the Islamic empire. In all these contexts, guilds or guild-like organizations served to insure against market insecurity, guarantee quality, regulate labour markets and, importantly, codify and protect knowledge commons in the form of shared standards for skills and craftsmanship.

In the last few decades, there has been a significant increase in the grassroots development of community-based physical spaces and digital technologies. Makerspaces have proliferated in parallel to the evolution of Internet-based interactivity and decentralising technologies, along with the global expansion of ICT networks and the decreasing costs of local manufacturing technology. Niaros, Kostakis and Dreschler (2017) map a wide-range of areas of development and focus:

• hi-techs such as 3D-printers, lasers and computerised numerical control routers;

• low-techs such as cutting tools;

• environmental data-gathering tech and bio-technologies;

• fab-labs to empower 'under-served' communities via grassroots digital technology;

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[5]'Smithian' as in Adam Smith's model and understanding of the effective working of markets and related networks via the actions of many local petty-producers.

- 'men's sheds' focussed on improving health and well-being of older men through practical activity;

- municipality-supported media labs that develop digital cultures (e.g. Madrid's Medialab Prado).

They consider these makerspaces as new types of 'third place' – urban settings beyond the home, work or formal education – that can build community ties, civic engagement and local democracy. Their growing numbers, well above a thousand, can largely be found in USA and Western Europe, including in many UK cities. Nevertheless, they are spreading across all continents and the authors note developments in urban China over a five year period from just 1 makerspace in 2010 to over 100 in 2015, with an average 100 members per makerspace.

They point to the potential of makerspaces to support:

- community-building: through diverse forms of governance and finance;

- effective learning environments: bringing together critical thinking, practical making, and social sharing;

- technical and social innovation: through synergies, cross-pollination, and participatory explorations via prototyping.

They note, however, that there are tensions across all three of these aspects, particularly relating to the degree of diversity and inclusion in makerspaces. Arvidsson (2020), likewise, observes complex relations between petty producers, corporations and the state – including in China where such spaces are supported by a centralised, autocratic surveillance state. Similarly, Dulong de Rosnay and Stalder (2020, citing Benkler, 2006) recognise the aspirations for the emerging digital knowledge industry in the 1990s and 2000s to seek to replace market-exchange/coordination by CBPP. They conclude, however, that the risk continues to be the appropriation of the digital commons – e.g. as per the development of the 'sharing economy' of Uber, AirBnB and so on.

5.2.2 Common infrastructure, urban participation and digital democracy

Dulong de Rosnay and Stalder (2020) emphasise the significance of the commons in fostering participation, political engagement, collaboration in education and learning through open educational resources, and community engagement via civic media. They highlight these approaches as alternatives to top-down, bureaucratic 'smart cities' strategies, promoting bottom-up, grassroots approaches.

Lynch's (2021) discussion of the digital and urban commons through the case study of Guifi.net, a community wireless network (CWN), makes clear in two ways how digital and non-digital urban development are entwined. Firstly, by flagging the extent to which digital communications are dependent on the material world as routers, fibre optic cables, servers, exchange points, undersea cables, satellites and so on:

Around the world, these infrastructures are still overwhelmingly controlled by corporate or government interests that determine access, monitor activity and collect personal data. (Lynch, 2021: 1868)

Therefore, digital and urban commoning may seek to provide alternatives to corporate digital and urban capitalism, but remains deeply engaged with it.

And, secondly, by noting that the development of CWNs is one way to extend digital and urban commoning through control of both the material and the virtual:

Based on ideals of sharing, open access and community control, CWNs offer a route toward commoning parts of the physical infrastructures on which the 'digital commons' of the Internet depend. Yet, these projects face myriad challenges to their long-term sustainability. In particular, the material and territorial nature of broadband infrastructures means that for CWNs to work the local community needs to possess the skills and knowledge necessary to maintain, repair and expand the infrastructure. (Lynch, 2021: 1868)

Guifi.net works across Catalonia, including Barcelona, and more widely in Spain through a community of people that maintain and develop this common material infrastructure as well as the digital infrastructure.

This demonstrates the complex nature of the Internet as simultaneously territorialized and deterritorialized, material and immaterial, that requires deeper reflection in theories and practices of digital commons. (Lynch, 2021: 1869)

The initiative works not only to sustain infrastructure and support digital commoning, but to build the knowledge of its members, support community learning on related issues and extend and develop services (e.g. smart electric meter), alongside other commoning partners including cooperatives and Barcelona City Council.

Cardullo and Kitchen (2019) recognise such developments in Barcelona as part of a growing commitment to digital democracy and urban participation, and as an alternative smart city approach; whilst Thomson (2020) understands the city's strategy as a form of platform municipalism. These wider developments between commoning and the local state in support of democratic development and autonomy are considered further below.

5.2.3 Digital commoning meets place-based approaches

The foci above on digital commoning and urban governance points to a wider body of place-based approaches that may prove fertile ground for both commoning and related public-commons or commons-public partnerships. Chatterton and Pusey (2020) flag two examples of the potential of place-based approaches to build locally-controlled cooperative infrastructure that could be integrated with platform cooperativism:

- **Community wealth-building:** 'The Cleveland Model' developed in neighbourhoods in Cleveland, Ohio (USA) is one illustration of the increasingly popular 'Community Wealth Building' approach that seeks to use the procurement budgets and assets of large public and quasi-public local institutions to invest in cooperative and community enterprise development in low-income communities.

- **Cooperative and commons-based networks:** The Catalan Integrated Cooperative (CIC) has over 2,500 members participating in various autonomous initiatives in housing, transport and healthcare as independent cooperatives. Members participate in education, a cooperative basic income platform, eco/collective stores, meetings and events, and it has developed a physical hub in Barcelona.

Community-wealth building in the US, Australia and UK (in Preston, see Hanley and Whyman, 2021; and in Scotland, EDAS and CLES, 2023) illustrates the potential for public-commons or commons-public partnerships, as well as aspirations towards 'digital community wealth-building' (Hanna, Lawrence and Peters, 2020). However, Thompson (2020), while considering recent developments of new municipalism in three forms – platform, autonomous, managed – positions community wealth building in Cleveland and Preston as tending towards top-down processes that are managed by the local state (or other institutions and funders), thus constituting a form of managed municipalism rather than commons-led initiatives.

Balaguer Rasillo (2021) showcases the Catalan Integrated Cooperative (CIC) and various activist organisations in Catalonia, such as Calafou, an 'eco-industrial post-capitalist colony' that was initially part of the CIC. They have been instrumental in creating a local digitally-based social currency and the crypto-currency FairCoin through FairCoop, a global decentralised network. The P2P Foundation's report on CIC (Dafermos, 2017) also highlights the crucial role of its IT committee within the organisation. However, as Balaguer Rasillo (2021) notes, although the CIC has grown to 3000 members and 300 cooperative workers, it ceased to exist as a formally structured entity since 2019[6]. Nevertheless, its network components and services have continued their operations.

5.2.4 The commons as varieties of resistance to neoliberal, digital capitalism

As previously mentioned, Arvidsson (2020), and as well, Bauwens and Jandrić (2021) highlight the intricate connections throughout Western history between commoning and the prevailing political and economic ideologies of feudalism and later capitalism. They demonstrate the interplay, conflicts, and the role of commons in driving transitions over time. These transitions have involved more egalitarian ideologies and developing new visions for the future.

This would seem apparent in recent decades too. Niaros, Kostakis and Dreschler (2017), for instance, highlight the role of anti-establishment hacker culture from the 1960s in the USA as a fore-runner of the makerspaces outlined above, and closely linked to the hippie culture. They stress that the negative mainstream connotations of hacking have been a misleading interpretation of this culture and its identity. They clarify their use of the following terms:

- the benevolent, white-hat hacker as an experimenter and collaborator;

- the malicious, black-hat hacker or 'cracker' who has criminal intent;

- and the grey-hat hacker who tends to hold a more morally ambiguous role.

Crucially, they point to a hacker culture built on solidarity and cooperation, freedom and autonomy, distrust of top-down authority and learning by doing. Other texts within this literature review make links to commoning as concerned for anti-establishment grassroots and collaborative approaches motivated by an alternative political economic and cooperative vision. Chatterton and Pusey (2020), for instance, write of three 'post-capitalist' approaches to challenging capitalist dominance – each offering a different perspective on how significant political economic change can be catalysed via different types of leadership; although also with the potential to be supportive of each other. These are described as:

- Community economies: including community ownership and land trusts working at a 'meso-level', alongside other types of meso-structures e.g. trade unions, civil society organisations, media, radicalised municipal leadership.

- 'Post-work' and 'accelerationist approaches': that seek to speed-up technological change in pursuit of strategies for satisfying lives, social justice and liberation from capitalism.

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[6]Similarly the P2P Foundation's Wiki provides an overview of the CIC but also indicates that it is no longer active as an integrated whole, although its sub-networks continue: https://wiki.p2pfoundation.net/Catalan_Integral_Cooperative

- Prefigurative, autonomous grassroots alternatives or micro-commons: e.g. community gardens, radical centres, temporary encampments and other disruptive interventions that, whilst often time-limited, provide spaces for innovation that can seed wider change.

Leontidou's (2020) discussion of forms of resistance through grassroots social and solidarity economies, in Greece and around the Mediterranean, illustrate a variety of oppositional approaches; for instance, the Movement of the Piazzas, mobilisations and flash-mobs, as facilitated by 'by trans-local instant communications' across networked societies through mobile digital communications (phones, tablets, lap-tops) and social media and internet infrastructures.Where necessary, they have found their ways around officially-controlled media and state censorship and barriers, e.g. internet blocking (Egypt, Turkey) and taxation of WhatsApp (Lebanon). In Greece, this grassroots 'smart city' was set within complex webs of 'creative alternative initiatives':

- economic commoning: cooperatives, alternative currencies and NGOs;

- technological, ecological and sustainable development innovations – as per the makerspaces noted above;

- community/citizen initiatives concerned for defending and reclaiming public spaces and alternative cultural empowerment.

Chadha (2019: 203; citing Raj, 2019) considers similarly oppositional spaces and practices in contemporary neoliberal urban India, termed 'jugaad', and notes that:

Jugaad is a common Hindi and Punjabi expression that in South Asia refers to the everyday practice of finding workarounds; the term encompasses many precarious practices of tweaking, tinkering, and hacking problems with whatever happens to be available.

Chadha (2019: 203) points here to hacking in the Indian context as likely outside of the law:

To be recognized as a hacking, people must operate under conditions of piracy, conditions that are outside of the purview of legality; jugaad by definition is disorganized, extralegal, and informal.

'Jugaad' knowledge and practice can be interpreted as forms of resilience and resistance, on the one hand, and yet on the other as potentially supportive of neoliberal urban economic growth:

Long understood as a subaltern method of coping with histories of capital dispossession and resource exploitation, jugaad has more recently been lauded by management executives as "frugal innovation," a type of business strategy that can yield quick and easy routes to surplus value creation and increased profit. In this way, jugaad knowledge and practices can at once be subaltern, democratic, queer, feminist, revolutionary acts of re/purposing available materials against histories, and memories of colonial domination and subjugation, as well as useful configurations of labour in a global framework of neoliberal capitalism. (Chadha, 2019: 203)

Nevertheless, Chadha (2019), highlights the potential of mobile digital technologies to hack urban spaces and create 'revolutionary micro-politics', for example: supporting Indian women to protest on the streets, and migrant Dalit workers to challenge Hinduvita[7] interests.

Commoning thus often has an element of challenging the political economic and cultural mainstream – as noted in the historical backdrop outlined earlier. However, the impacts of such challenges and oppositional activity are typically unpredictable.

[7]An ideology or movement seeking to establish the hegemony of Hindus and Hinduism in India.

They can be supportive of more egalitarian, welfare-concerned commons networks and cultural change (Arvidsson, 2020) as well as state economic and welfare systems (Bauwens and Jandrić, 2021). Yet, they can also be supportive of changes in capitalist political economy that lead to crucial adaptions within capitalist and state systems and institutions and the generation of capitalist commons (Arvidsson, 2020), hyper-capitalist crypto-currencies (Fritsch, 2021), and indeed state welfare systems that underwrite capitalism (Bauwens and Jandrić, 2021). As becomes particularly apparent through the example of piracy below, the tendency for 'hackers', 'commoners' and the like to push against the requirements of national and international law can create considerable technological and cultural change at global scales, and in morally-ambiguous or complex ways.

5.3: The complex linkages between the digital and urban commons, state and market

As noted earlier, literature within this review emphasises the need to explore commoning through its relations with the state, the market and dominant political economic and cultural structures and contexts (e.g. Arvidsson, 2020; Birkinbine and Kidd, 2020). Authors point to diverse linkages and overlaps that can be conflicted, interdependent, mutually-beneficial, subservient, creative, transformational and with long-term consequences that are hard to predict. Van Laerhoven, Schoon and Vallamayor-Tomas (2020), however, note a shift in commons scholarship in recent decades from discussions that highlight adversarial approaches to relations between commons and the state and market – at least in terms of natural resource management – to those oriented towards more collaborative approaches such as co-management and hybrid modes of governance.

A range of examples are therefore outlined below in relation to digital and urban commons that seek to illustrate this complexity and variety of relations and forms.

5.3.1 Commoning and digital capitalism – capitalist commons and market-orientated community-based commons

Arvidsson (2020) argues that commoning has played a crucial role in the development of capitalism since medieval times in Western Europe, and that this includes most recently digital capitalism. This author outlines some communities of practice that play crucial roles within capitalist organisations, namely:

- corporations – who are own and managed through communities and networks of shareholders and professionals;

- financial institutions, markets and networks – and the professionalised communities that support their control of surplus value (profit);

- the collective and now digital knowledge that communities create and hold internally within organisations through their workforce.

These 'capitalist commons' are further developing in the digital age through the actions of libertarian commoners and entrepreneurs who use commoning as a springboard for furthering digital capitalism and profit accumulation (Bauwens and Jandrić, 2021; Dulong de Rosnay and Stalder, 2020). Dulong de Rosnay and Stalder (2020) give the example of the 'sharing economy' which emerged through non-market exchange community platforms (e.g. couch-surfing) but has been captured and privatised such that 'sharing' now

means short-term rental (e.g. a room, a taxi-ride). Chatterton and Pusey (2020) observe similar development on the back of earlier platform commoning initiatives (e.g. hospitality exchanges).

Besides these capitalist commons and libertarian commoners are a mix of those engaged in commoning as community-based peer production and/or those who pursue market-orientated commoning due to economic necessity. Dulong de Rosnay and Stalder (2020, citing Benkler 2006) note the rise of this type of digital commons at the core of the digital knowledge industry –for example, in the field of software development organised through social relationships and self-organising rather than by top-down management or price mechanisms.

Likewise, Niaros, Kostakis, and Dreschler (2017) recognise different types of makerspaces, some combining community-based and market-focused dimensions, while others operate with a distinct focus. Arvidsson (2020) acknowledges one key group of value-driven commoners but also highlights a larger population of outsourced, unregulated digital knowledge workers globally, often receiving low wages. These workers serve as a low-cost open-access resource for digital capitalism, relying on community-based support for survival. This phenomenon is evident in urban areas across Europe, North Africa, the Middle East (Leontidou, 2020), and in the vast urban landscapes of India (Chadha, 2019).

These types of commoning are thus integral to, interdependent with, and dependent on market-orientated production and the larger monopolies, oligopolies, and institutions of corporate digital capitalism.

5.3.2 The pirate economy and the commons

The informality of many commoning networks, and the survival issues that these commoners live with, point to the potential crossover into 'grey', 'shadow' and 'black' market economic activities – as per Niaros, Kostakis and Dreschler's (2017) discussion of different types of hacking above. Similarly, Chadha's (2019) exploration of 'jugaad' shows the potential for some market and state institutions to benefit from and tolerate such informal, illegal and/or criminal activities. For instance, Arvidsson (2020: 6) notes the role of Chinese digital technology in providing affordable technology across the globe that spreads both digital capitalism in the longer-term as well as the mobile commons:

This new commons-based economy might provide an alternative to a capitalist economy in what seems to be accelerating decline. This is already the case for popular consumers. (In the last decade, it was Chinese shanzhai or 'pirate' phones, not Nokia or Apple, that provided access to the internet to consumers in India and Africa.) In the future it might provide new forms of resilience in the face of a growing ecological crisis.

Extensive examination of the ambiguous and multi-faceted realm of digital and urban commoning, its interactions with market forces, state institutions, and neoliberal digital capitalism – along with the intricate ethical landscape it navigates – falls outside the purview of this literature review. However, such an investigation appears highly relevant in times marked by socio-ecological crises and escalating urban hybridity and complexity.

5.3.3 Smart cities, smart citizens and alternative or grassroots smart visions

Cardullo and Kitchen (2019) explore one of most striking recent developments of digital capitalism, namely 'smart cities', via a neoliberal urbanism concerned for marketisation and growth through speculation without concern for social need, collective provision and inequalities.

Smart cities, then, have emerged as the latest, tech-led phase of the entrepreneurial city through which private interests seek to capture public assets and services by offering technological solutions to urban problems (e.g. congestion, emergency response, utility and service delivery). (Cardullo and Kitchen, 2019:816)

Niaros, Kostakis and Dreschler (2017: 1143) write in similar vein pointing to concerns about central control via technology:

The 'smart city' idea has crystallized into an image of a technology-led urban utopia permeated with centrally controlled technological infrastructures, with the aim to improve the urban environment in terms of efficiency, security and sustainability.

Cardullo and Kitchen (2019) consider therefore the roles and participation of 'smart citizens' within smart cities, whether as entrepreneurs, investors, consumers, or workers. They argue, drawing from their study of developments in Dublin, that these are mostly to be understood as 'tokenism' or even 'non-participation' – as per Arnstein's (1969) 'Ladder of Participation'. Citizen participation and citizen roles become focused on supporting market provision, whether as:

• consumer or user – selecting services within the marketplace of providers;

• resident – particularly those who can afford access to exclusive smart districts;

• data product – creating data with smart technology.

Fundamental to Cardullo and Kitchen's (2019: 818) critique is the de-politicisation of smart development, which is far-removed from Lefebvre's (1996) 'Right to the City' and its concern for citizens to shape urban spaces to meet community needs through active citizenship:

Even when smart city projects herald more effective forms of active citizenship and citizen empowerment – e.g. Living Labs, citizen-science and open source software – they often do so by co-opting citizen contribution into the wider economic landscape of efficiency, optimization, and a business-driven city. In other words, rather than fostering subversive ideals of experimentation, smart innovation appears more an exercise of replication via short-term and financially risk-averse projects.

Nonetheless, Cardullo and Kitchen (2019) and others see opportunities through digital and urban commoning to challenge dominant digital capitalist institutions through aspirations for alternative smart city approaches. Niaros, Kostakis and Dreschler (2017) present makerspaces as hubs for citizen-driven transformation that can support a 'more inclusive, participatory and commons-orientated vision of the smart city.' Leontidou (2020) presents grassroots creativity, in the context of the informational city and urban hybridity, as offering an alternative 'grassroots smart city'. And Lynch's (2021) discussion of Guifi.Net in Catalonia likewise recognises its challenge to mainstream, hegemonic thinking on the smart city. These alternative approaches help to build counter-narratives towards 'socially smart cities' (Durose et al. 2019).

Cardullo and Kitchen (2019) and other scholars, such as Thompson (2020) discussing platform municipalism, find inspiration in Barcelona's concept of a 'right to a smart city'. Following the transition from a right-wing council to a new activist-led administration prioritising housing and equality, coupled with the advocacy of grassroots political movements, the city has transitioned from a neoliberal approach to embracing an alternative concept of smart city:

much more citizen-centric and participatory, adopting the concept of 'technological sovereignty' as a new form of citizenship, and appointing a new commissioner of Technology and Digital Innovation. Technological sovereignty is the notion that technology should be orientated to and serve local residents, and be owned as a commons, rather than applying a universal, market-orientated, proprietary technology. (Cardullo and Kitchin, 2019: 825)

In practice, Cardullo and Kitchin (2019) note the following strategies used to generate both a digital and democratic 'revolution':

- using open source technologies;

- retaining ownership and control of data infrastructure – and guaranteeing access for citizens;

- piloting open data, control of personal data, civic apps, and crowdsourced sensors – thus connecting citizens (with varying degrees of success) to technology without limiting rights and entitlements;

- a FairBnB pilot that creates an online map of vacant properties – alongside rent controls – to improve supply of affordable housing.

A key part of this alternative approach in Barcelona is development of the platform Decidim[8], a public-commons partnership[9] that offers digital infrastructure to support participatory democracy – financed by the local state but developed and managed by an open community.

5.3.4 New municipalism and the commons

Thompson (2020) explores the emerging 'new municipalism' movement in the context of a devolution of power, and search for democratic autonomy, 'down' from nation-states to municipalities – the latter understood broadly from ultra-local town councils to large city-regions. In part, this is in the context of neoliberal austerity policies and the need to generate new forms of co-production and shift from regulatory to partnering roles by the state. The Fearless City Conference in Barcelona, for instance, drew participation from 180 cities in 40 countries.

Thompson argues that the commons revival is closely-allied to this movement and provides a new 'spatial imaginary' of public commons including public-commons partnerships (citing Russell and Milburn, 2018). Re-municipalisation of assets and widening democratisation are central to this emerging set of practices. Cardullo and Kitchen (2019), in their discussion of Barcelona, observe municipalisation of service provision (electricity, water) and experiments in basic income, as well aspirations to re-politicise the smart city and move away from marketisation and state control by deepening democratic control via citizens, communities, social/civic movements and social innovation.

Thompson (2020) points to the diversity of this new municipalism by outlining three distinctive approaches:

- Platform municipalism: illustrated by developments in Barcelona (Catalonia/Spain) and Berlin (Germany), this is part of a wider 'platform urbanism' that seeks to work within, against and beyond the state and platform capitalism by mobilising civil society beyond traditional party-political boundaries.

- Managed municipalism: as illustrated by developments in Cleveland (Ohio) and Preston (UK) via community-wealth building, and oriented towards using the economic resources of the local state and public sector to democratise and restructure existing urban economies.

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[8]See https://decidim.org [Accessed on 04/03/24].

[9]Recent discussions of public-commons partnerships in the context of the new municipalism movement can be found in Russell et al. (2023) and Pera and Bussu (2024).

- Autonomist municipalism: which seeks to move beyond state-based administrative structures and political community to confederations of cooperatives, communes and assemblies – and related themes of bio-regionalism and cultural self-determination. Examples of this include Cooperation Jackson (in Mississippi) and the Rojava self-organising communes in the autonomous Kurdish region in Syria.

Each offers a distinctive model or speculative ideal-type, argues Thompson (2020), and raises questions as to where the commons and digital commons fit within their aspirations. However, these apparent divergences can also be viewed in light of contextual factors: varying perceptions and expectations regarding opportunities; established practices shaped by historical experiences like mutualism and solidarity; cultural and national identities and tensions; and localised urban dynamics linked to local resources, public anchor institutions, poverty, precariousness, migration, social class and other demographics. While Autonomist and Managed approaches may signify distinctive aspirations and approaches, they could also discover common ground in practical opportunities and a readiness to collaborate under suitable conditions.[10]

Thompson (2020) flags other key emerging issues generated by these different new municipalist approaches that are valuable to consider including:

- relationship to the global economy – potential to exploit the global south and/or focus on protecting local interests that creates a race-to-the-bottom;

- relationship to democracy – and the roles of top-down versus bottom-up/horizontal approaches: successful cooperative development in Quebec, Mondragon, and Emilia-Romagna have developed via federated structures first, then policy breakthrough;

- the local state as cultivator, catalyzer and/or enabler (Sutton 2019).

5.3.5 State-civil society partnerships for change: institutionalising the commons?

A further recurring theme in this literature is the need for wider political-economic visions (e.g. post-capitalism) as well as state leadership to support a step-change in the development of digital and urban commons and the wider social change generated. Chatterton and Pusey (2020: 22), for instance, write of the role of progressive states:

What needs more exploration is the potential to mobilise the digital common as a vehicle to erode and ultimate replace, rather than simply co-exist alongside, daily life under capitalism. Important issues of ownership and control remain unresolved, which stretches across small groupings of member-owned cooperatives, the interests of highly motivated social entrepreneurs and macro interest from progressive national governments tapping into the power of a larger scale cooperative common.

Dulong de Rosnay and Stalder (2020:17) argue for the digital commons as a challenge to surveillance capitalism as part of a vision of a 'participatory, democratic and ecological society'. For them, this requires transformation in business, infrastructure, governance and societal/cultural norms – i.e. 'a green new deal' – as well as a rebalancing of individual and collective rights foregrounded in a new understanding of the singular and the collective (citing Harraway, 2016: 'entities-in-assemblage'). Here the digital commons can support new commons-based institutions to develop, but cannot achieve such change by themselves – i.e.

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[10]For example, Cooperation Jackson would seem to be linked to the Community Wealth Building movement in the USA too as per those involved in Managed Municipalism: https://community-wealth.org/content/community-wealth-building-jackson-mississippi-strategic-considerations and: https://cooperationjackson.org/principles

without being part of broader movements for social and political transformation.

In a similar vein, Uymaz (2018) discusses the revival of the commons as political vision and catalyst for change in Italy since the early 2000s, where a second wave of state privatisations was then under way. Commons as shared natural or social resources such as rivers, lakes, forests, mountains, coasts, seashores, as well as cultural, archaeological, and environmental resources have emerged as focal points within both public governance and civil society campaigning. The 2008 Rodotà Commission, established to consider state privatisation legislation, provided a technical definition of commons, recognising them 'as a form of property that required special protection at a constitutional level and a legal category, different from both private and public ownership' (Uymaz, 2018: 85).

Further, a national referendum in 2011 seeking to block water privatisation easily surpassed the necessary 50% quorum of the electorate, and 27 million voted to revoke the legislation and resist the enclosure of this vital shared resource. However, the government subsequently blocked this, resulting in social struggle with the state via the language of the commons and a commons movement.[11] Uymaz (2018: 85) notes the impact of this on civil society more generally:

The unexpected success of the referendum, which proclaimed water as a common, allowed to find a ground for collaboration of a rather heterogeneous group of civil society actors such as scholars, famous jurists, social movements, activists, ordinary citizens and local communities.

Various commons in the form of collective resources have thus become a focus for challenging a neoliberal agenda of privatisation and welfare reduction, including in relation to:

• knowledge commons, digital freedom and 'journalism as a commons';

• fiscal commons and state fiscal management (budgets and borrowing) as a commonly-held resource which different interest groups seek to use;

• social commons – services, housing, welfare and employment;

• and cultural commons – heritage, art, history, archaeology, music, etc.

Here the language of the commons is used to indicate a focus on shared, social or collective ownership or provision of a multitude of material, social and political resources in which the state, civil society and citizens have active roles in coordinating – a political vision of a public commons or social commons perhaps.[12] One in which a movement of citizens, communities, digital communities, and wider civil society – including trade unions – have had a fundamental role in catalysing and sustaining change. Thus Uymaz (2018: 91) notes the crucial role of public protests and internet campaigning by civic collectives.[13] An occupation of a theatre in Rome became a focus for opposition and a forum for developing commoning practices:

During the occupation, the loose-knit collective of performers, directors, technicians and citizens transformed the space into one of Europe's most ground-breaking cultural venues reinvigorating cultural life in the heart of Rome. The group focuses on keeping the Teatro Valle open to all by using non-hierarchical decision making to involve greater democratic participation.

[11]Ugo Mattei (2014) gives an account of this period and its complex political struggles: https://commonsblog.files.wordpress.com/2007/10/mattei-italian-commons-chapter-short.pdf

[12]For example, as the political visions of the Commons and Social Commons illustrated in writings by Mestrum (2016), Coote (2017) and Standing (2019).

[13]For instance, through the role of the website 'Patrimoniosos' which was founded in 2002 by a group of people opposing the role of a state-owned company in selling cultural heritage.

The developments sketched in this section are thus suggestive of a wider sense of possibilities in advancing change through new forms of interaction between state, wider civil society, and the community organising of digital and urban commoning. This extends beyond specific public-commons partnerships, presenting a political-economic vision that offers counter-narratives and alternative imaginaries to those of neoliberal digital capitalism.

5.3.6 The commons and wider civil society: hybrid bodies

Dulong de Rosnay and Stalder (2020: 12) note the complexities for commoners of asserting themselves within the modern state given a legal system constructed to meet the needs of private ownership, corporate institutions and state and public structures and systems, and in support of evolving forms of capitalism:

But communities, even when they have explicit boundaries, are not legal entities. Surprisingly, in Ostromian institutional analysis, this plays almost no role. Yet, to overcome this limitation many digital commons have created their own foundations as 'boundary organisations' capable of performing legal, financial, technological and governance services that the community itself cannot provide.

They suggest that broader civil society and third-sector entities, encompassing larger voluntary organisations, philanthropic bodies, cooperatives, and social enterprises with legal status and professional staff teams, offer avenues to cultivate and safeguard digital commons within existing political, economic, and legal frameworks. This raises further questions, namely:

• How to avoid that well-resourced staff teams within civil society bodies become dominant over the membership in the digital commons it has been set up to support – in line with challenges also documented for third and community sector membership bodies more generally (Henderson, Escobar and Revell, 2020).

• Should the commons as a way of thinking and organising inevitably aspire to work outside of any conceivable state or 'state-like' system – and their legal and professional structures – or might it seek to re-imagine 'the state' via federated systems or hybrid federations/state systems?

• How does the conviviality of commoning, and the associated de-professionalisation and valuing of community life imagined, for instance by Illich (1973), seek to engage with civil society structures that are often embedded within and/or accountable to current state-market institutions, systems and values?

These questions further illustrate the challenges of developing commoning as a political-economic vision that seeks to transform current systems through an alternative worldview of how the world does and should work.[14] They provide an intriguing contrast to discussions in the previous section, where political efforts in Italy sought to institutionalise the commons within existing, albeit reformed, state systems and associated legal frameworks.

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[14]Bollier and Helfrich (2019), for instance, in their conceptualisation of the commons as a worldview (the Commonsverse), illustrate the depth of thought needed for and the challenges generated by such a vision.

6. Research question 3: What are the key current issues for theory, policy and practice relating to digital and urban commoning?

The issues raised for theory, policy and practice through this literature review are developed across the following broad themes:

- Working in challenging cultural, economic and legal contexts – 6.1

- Governing the digital and urban commons – 6.2

- Digital and urban commons in an ecological context – 6.3

- Coordinating the complex practices of digital and urban commoning – 6.4

- Digital and urban commons and rebuilding democratic governance – 6.5

- Digital and urban commons and social transformation – 6.6

6.1 Working in challenging cultural, economic and legal contexts

Dulong de Rosnay and Stalder (2020) provide an overview of the tensions for digital commoners in working in environments that are often, at best, unsupportive and, at worst, hostile. They offer a helpful framework of emerging and inter-relating concerns, namely: legal and economic concerns; authorship and shared creativity; data ownership; and defending the commons.

6.1.1 Legal and economic concerns – resisting appropriation and enclosure

Dulong de Rosnay and Stalder (2020) flag the tension between:

- legal systems in Western Liberal Democracies designed to sustain private ownership – including authorship and related copyrighting of knowledge and cultural materials – on the one hand;

- and on the other, the aspirations of digital commoning – and commoning more generally – which relies on a community to develop, sustain and share these resources within its own boundaries and potentially more widely as it sees fit.

They give the example of advanced knowledge industries, such as software development, where commoning or commons-based peer production (citing Benkler, 2006) has often proven more successful than top-down or market-coordinated approaches in cultivating significant innovations. Commercial organisations may both contribute to and draw from these digital commons – and even incorporate them within their internal development, investment and funding strategies (Ossewaarde and Reijers, 2017). Therefore, strong legal protections for such commoning would be require to block appropriation in the longer-term by those commercial interests. They give the particular example of the development of the 'sharing economy' as such an appropriation or enclosing as discussed earlier (see Ossewaarde and Reijers, 2017; Kostakis, 2018; Reijers and Ossewaarde, 2018).

Consequently, these authors note the role of free and open licensing in countering the exclusive copyrighting of the mainstream corporate economy – as initially developed in relation to open-source digital software

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created by digital commoners. Some free and open licences are unconditional, others conditional – reserving rights for commercial use or requiring all derived material to commit to accessibility, support creativity and prevent enclosures. The latter, known as 'copyleft licences', include General Public Licensing (GPL) created to support free and open software. Creative Commons licenses (CC) for writing, music, visual images etc. allow non-commercial sharing, but tend not to be copyleft.

Dulong de Rosney and Stalder (2020) note, however, that there are legal complexities and dilemmas created by diverse types of commons-type licensing and by different legal frameworks in different nation-states – particularly in the context of legal systems concerned primarily for private property rights. Given the diversity of context and practice, different digital commons may not be legally compatible and there are, therefore, risks of copyright infringement. Further, they flag ethical concerns regarding the appropriation of contributions from commons that have evolved prior to and/or outside of modern legal systems, including those from non-Western and industrial cultures and societies e.g. tribal peoples, first peoples and so on.

As outlined earlier, Uymaz (2018) points to the work of the 2008 Rodotà Commission in Italy in identifying the commons as different from both private and public forms of ownership and therefore requiring constitutional protection and a distinctive legal category to be defined as collective rights by a political community. Uymaz notes two key challenges in generating and implementing legal protection:

• how to articulate suitable and effective legal recognition by central and local state of these collective commons institutions, given their aspirations for autonomy from the state;

• how to measure the current extent (quantitatively) of the commons and its related economic and social roles – in other words, how to assess the existing and potential scale of this way of coordinating resources.

6.1.2 Authorship, creativity and the 'nested-I'

Dulong de Rosney and Stalder (2020) highlight that at the heart of Western legal systems and cultural narratives and justifications is the notion of individual creativity and authorship – a form of private ownership. However, they note too that this is increasingly challenged by Western thinking itself: for instance, postmodernist literary theory that points to the collective dimensions of creative processes. Digital commoning and the development of the free software movement, they argue, has continued to challenge such individualist thinking through processes of collective sharing and learning that support collective progress across sectors and society. Thus, they point to the need to understand the individual in their social networks and context via a 'networked individualism' in which the person and their social relations are understood as mutually-supportive and evolving (citing Rainie and Wellman, 2012). This would seem to make connections to a broader body of commons-related theory, policy and practice concerned for the interrelated well-being across individuals, communities and wider living systems – for instance, through terminology such as 'the nested-I', 'Ubuntu rationality' and 'buen vivir'.[15]

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[15]For instance, Mestrum's (2016) political vision for the social commons draws on the notion of 'Buen Vivir' – and individuals in the context of the wider well-being of communities and environments. In turn, Bollier and Helfrich (2019) draw on African philosophy to write of the 'Nested-I' – and related 'Ubuntu rationality' – as focussed on the deeply-entwined interdependence that sustains humanity. Here the aspiration is to work for the wellbeing of individuals, communities and wider living systems simultaneously.

6.1.3 Data ownership, control and surveillance

Dulong de Rosney and Stalder (2020) highlight the issue of the control of data as an 'increasingly central techno-political issue'. The challenge for digital commoning is, therefore, how to arrange data governance as a commons, rather through centralisation and surveillance via the state and/or corporations. They argue that existing tensions around personal data sovereignty – privacy, open access, ownership – can be resolved through the values of digital commoning. They give as an example the Data Commons Manifesto generated by the Decidim's 'Decode' socialised data project in Barcelona, which uses blockchain technology to build common data infrastructure where individual citizens can establish control and boundaries.[16]

Cardullo and Kitchin (2019) in their discussions of the work of Decidim draw on the concept of 'technological sovereignty' and present it as an alternative to the 'technological solutionism' of smart cities – and position the former as supporting 'the Right to the City'. This approach can include commons-based citizen platforms, cooperative platforms and open science citizen projects, and their control and coordination of data in order to serve, protect and empower (digital) citizens. Dulong de Rosnay and Stalder (2020) also pursue this notion of technological sovereignty and, in a similar vein, describe it as concerned for 'the collective city' and a 'community of citizens' who control this shared digital infrastructure and related communications and data – and are supported by legal structures in protecting the interests of municipalities and citizens.

Finally, Dulong de Rosnay and Stalder (2020) also outline a related discussion about open-access to data collected by public institutions and government. Some, they say, particularly from the libertarian wing of the open-data movement, may argue for licenses that do not restrict downstream uses, including by commercial organisations: with the rationale of facilitating innovation and growth and where market-led businesses and corporations may develop apps that are not necessarily released under open license. Others, from more socially-orientated models, including knowledge commons, will argue for retention of some rights for the public – via copyleft licensing and related policies to avoid appropriation and commodification. This latter approach may result in either not releasing data into the public domain (e.g. public transport usage data to support internal public transport planning rather than commercial aims) or generating a public procurement app (for public transport development based on sharing knowledge publicly) as open-source software.

6.1.4 Defending the commons

Chadha (2021) and Lynch (2021) recognise that digital activists and hackers may adopt oppositional and extra-legal strategies to protect the digital commons from data exploitation and capture, and related surveillance, media and communications. Leontidou (2020) and Chatterton and Pusey (2020) point to this as occurring both in the digital sphere e.g. circumventing mainstream media sources and state regulations; as well as more generally in the urban sphere e.g. reclaiming public spaces or unused housing. Each of the above are, then, suggesting that defence of the resources of the digital and urban commons and the rights of commoners and citizens will likely, on occasion at least, require civil disobedience as well as more orthodox legal strategies and tools. Otherwise these commons may not survive the attention of corporate commercial interests and/or the neglect or even hostility of the local and central state. Dulong de Rosnay and Stalder

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[16]See, for instance, Nesta's report (Bass and Old, 2020) on the Decode initiative in Barcelona.

(2020) point to the potential of utilising existing legal structures and instruments which can provide sufficient defence even if not designed to meet the particular needs of commoning, e.g. using an existing civil society organisational form that does have legal status.

Overview: The literature reviewed in the sections above illustrates the challenges for digital and urban commoners in working to defend their coordination and sharing of material, social and digital commons, particularly over the longer-term. Existing or reformed legal structures will likely not yet be suitable to achieve the necessary defence of commoning interests, so commoners need to be strategic and tactical in their approaches – and 'box cleverly' in order to punch-above-their-weight, so to speak. Further, it seems likely that where pursuing a different vision and ethos to mainstream political economy (neoliberal digital capitalism), they will continue to run into significant obstacles as their approaches contradict and challenge the priorities of different elements of the corporate capitalist world and aligned parts of the state. This is a complex, dynamic, and crucial, area of theory and practice for commoners to continue to grapple with as it continues to unfold.

6.2 Governing the digital and urban commons – developing democratic practices

Arvidsson (2020) highlights a historical pattern: that of the commons, particularly in rural and urban commoning in Western Europe, being mobilised to generate more egalitarian, cooperative ways of working and as a rallying-call for a 'better world' – possibly reflecting a nostalgic longing for a perceived fairer past. Although the author also observes that diverse forms of commoning – as communities of practice and interest – are already at play in many spheres within and across corporate capitalism.

There might then be an assumption that commoning and commoners will tend to be more democratic in their approaches to governance and co-production. However, this literature offers a more complex picture: recognising firstly that commoners may begin with a certain advantage due to the requirement to navigate shared social practices together – and where therefore issues of power and its dynamics more likely become explicit and revealed; yet secondly that the types of participants who become involved – or who are unable to become involved – and the political, economic, and social environments in which they live and work, remain complex and require ongoing attention and effort to address.[17]

In considering makerspaces and hackerspaces, Niaros, Kostakis and Drechsler (2017) argue that governance of such spaces tends to be hybrid and that they should not be seen as pursuing pure forms of commoning, but are rather dynamic, evolving and diverse. Their governance, autonomy and independence often depends on the types of resources and funding these commons use to sustain themselves. The authors identify the following broad patterns:

- Self-identified hackerspaces put an emphasis on 'do-ocracy' and voluntarism.
- UK makerspaces tend to rely on both informal and paid roles, some employing technicians – which potentially relates to some spaces as emerging from informal groups while others from existing companies or organisations.
- Chinese makerspaces are mixed, with some funded by a parent company, some receiving state support, and some having no income and working through volunteers.

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[17]For discussion of some of these challenges in other types of commons see Henderson, Escobar and Revell (2018) and Durose et al. (2021).

They argue, therefore, that it is better to understand makerspace governance on a case-by-case basis, particularly given that there is no precise definition of a makerspace. They also point to the interconnectivity of this type of commons, with many linking more widely to:

- national and international networks of makerspaces and commons-orientated open-source projects;

- local networks that can support socialising and learning, while building social capital.

This suggests, therefore, that the governance of makerspaces, and related online CBPP, is likely to have a strong relational and networking element that goes beyond the individual organisation and/or space and into wider collaborations.

However, these same authors point to evidence that makerspaces and hackerspaces are not necessarily leading beacons of inclusive practice or outcomes. They note that whilst some makerspaces have been developed in ethnically- and spatially- diverse places, there is often a lack of racial and gender diversity more generally, and evidence of a lack of engagement with issues of access and inequality that limit participation – for instance:

- in China, UK and the USA, membership is predominantly male (about 4 out of 5);

- affluent males tend to be dominant in the makerspace and hackerspace movement(s);

- in UK and USA, the majority of 'makers' are well-educated and technologically-confident, so less inclusive by class than might be aspired to or imagined.

Niaros, Kostakis and Drechsler (2017) note that there are examples of feminist or 'people of colour'-led spaces; although some have challenged these as being against the principle of openness within commoning. They argue, more generally, for the potential of makerspaces to be more inclusive, if and where they can provide suitably-resourced skilled organisers who can support diversity and build communities for creativity, learning and social innovation. Accordingly, they remain optimistic as to the potential for makerspaces to provide opportunities for entrepreneurs and communities to come together to create new forms of organisation that:

- go beyond corporate structures and profit-maximising;

- co-create through new and diverse combinations of norms, knowledge, infrastructure design, and making;

- and open society in pluralist ways that support diversity and inclusion, and challenge current social norms.

Lynch's (2021) discussion of the development of Guifi.net in Catalonia and Spain similarly points towards relational working as crucial to sharing the technical knowledge needed to sustain this community-based wireless network (CWN) and its digital, physical and social infrastructures; and in the process building effective governance. Users of the service are guided in establishing their own internet infrastructure and connection, and the CWN creates opportunities for communal learning to extend members' knowledge of how the system works and to experiment with its development. This, Lynch argues, supports sharing of ownership and responsibility, and the ongoing elaboration of multiple forms of collective knowledge – digital and social. One of the CWN's project aims, for instance, is to give:

… people greater knowledge about the smart devices increasingly spreading into new domains of everyday life. It also sought to provide opportunities for collective reflection and experimentation exploring the possibilities for those technologies to be incorporated into commons-based models of community development. (Lynch, 2021: 1874)

Lynch acknowledges that many CWNs have failed to expand and/or have failed to sustain themselves longer-term because they have remained focused on the leadership of small knowledgeable groups ('geeks'). However, he argues that Guifi's success is through its relational and territorialised approaches. Further, he points to its focus on and commitment to a wider social agenda: low-cost approaches to technological development; sharing of costs across membership; tackling technological inequalities (access and support); and, seeking to reduce energy poverty via a joint project with a cooperative energy company.

Dulong de Rosnay and Stalder (2020) take-up related themes, presenting their discussion of the governance of the digital commons in the context of Elinor Ostrom's influential eight design principles drawn from her empirical studies around the world – see Box 4.

Box 4. Ostrom's eight design principles

Ostrom identified the following eight principles for stable arrangements for sustainable common pool resource management (source: Laerhoven, Schoon and Vallamayor, 2020; citing Ostrom, 1990; Ostrom 2005; Cox et al. 2010):

1. Boundaries: Clearly defined boundaries (i.e. of the resource and of the group of users).

2. Rules: Congruence between appropriation and provision rules and local conditions.

3. Participation: Most individuals affected by the operational rules can participate in modifying the operational rules.

4. Monitoring: Effective monitoring by monitors who are part of or accountable to the resource users.

5. Sanctioning: Graduated sanctions – appropriators who violate operational rules are likely to be given graduated sanctions.

6. Conflict resolution: Resource users and their officials have rapid access to low-cost local arenas to resolve conflicts among users or between users and officials.

7. Autonomy: The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.

8. Nested enterprises: Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organised in multiple layers of nested enterprises.

Dulong de Rosnay and Stalder (2020) propose that digital commoners need to define a community's boundaries not only in relation to the producers, members, and coordinators of a commons but also its potential broader group of users. The main challenge lies not in competition for limited resources among potential users, as digital commons often offer non-rivalrous (inexhaustible) resources accessible to all if desired. Instead, the key concerns revolve around preventing the enclosure and privatisation of these resources by private or state entities and safeguarding them from harm, such as disinformation, inadequate information, and infrastructure maintenance. To address these issues, they suggest the establishment of entities like a Foundation (within civil society or the third sector) to provide essential legal support and structures within the current political-economic landscape.

However, they also note the complexities of participatory governance in digital commoning communities, raising several issues:

- Members perceived as contributing more to a shared resource may be 'awarded' or attract more power in relation to that commons e.g. as per 'founders syndrome' – although they suggest that in relation to digital resources where access is open this will have a limited impact.

- The consequences of insufficiently-inclusive commoning cultures can put digital commons at risk because their lack of demographic and discursive diversity makes it difficult for them to learn, adapt and/or develop in complex evolving contexts.

- The potential inefficiency and time-consuming nature of some types of large-scale participatory democratic practices.

Dulong de Rosnay and Stalder (2020) advocate for an approach to cultivate a robust and appropriately 'efficient' democratic culture within a digital commons through collective engagement in formulating the rules governing its operations and governance. This process fosters comprehension of and adherence to these rules, aiding members in navigating practical constraints and resource limitations. By engaging in this collaborative rule-making, essential values can be established. For instance, the authors highlight the importance of determining the level of openness of digital resources and generating pragmatic strategies and outcomes in intricate, evolving contexts. This approach also addresses the tensions between libertarian and socially-oriented perspectives within commoning, particularly concerning access to data held by a commons.

Overview: The broad learning from this literature is that whilst digital and urban commons – as communities of practice, place, interest and/or identity – provide potential spaces for developing inclusive, collaborative and deliberative democratic governance, this cannot be taken for granted. Instead, it must be worked at intentionally, actively and strategically, and will require creative and pragmatic approaches that can work with existing resources whilst seeking to respond to rapidly changing contexts and dynamics.

Many types of digital and urban commons are likely to attract a membership that may be limited in terms of diversity and possibly skewed towards privileged powerful classes and groups; others may lack the resources and level of commitment to intentionally address and change these dynamics. However, other commons will and do deliberately seek to focus on marginalised, less powerful groups and classes – often through communities of place and/or identity – and seek to empower their membership: see Slum Dwellers International for a notable example.[18]

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[18]See https://sdinet.org/ [Accessed 04/03/24].

The networking potential across and between commons offers a way to build and deepen shared understandings of their democratic potential and generate a networked governance – or even federated and/or heterarchical structures[19] – that seeks greater diversity, credibility and flexibility of approach through building deliberative capacity and collective dialogue that can engage with the opportunities, challenges and risks.

How digital and urban commons generate income, source funding and use the resources of their members is another governance issue that is little explored in the literature reviewed. The extent to which state funding, policymaking and political support, or resourcing from other external sources (e.g. philanthropic funders, research institutions, private sector), are crucial to the long-term survival of a commons will inevitably impact on the internal governance of commoning initiatives and related community bodies – thus foregrounding the significance of transparency and accountability in their governance (Henderson, Escobar and Revell, 2020).

6.3 The potential of digital and urban commoning in ecologically-challenging times

Van Laerhoven, Schoon and Vallamayor-Tomas (2020) note that much of the research on the commons in the last fifty years has focused on 'the Big Five' – pastures, forests, irrigation, fisheries, water management – and is thus generally linked to ecological issues and by extension the sustainable stewardship of ecological systems. Further, they argue that the 'new commons' field likewise has strong links to ecological or related biological developments e.g. biodiverse, genetic and microbial commoning.

Much of the literature on digital and urban commoning covered in this review – across practice, policy and research – also highlights connections to ecological dimensions in one or more of the following ways:

- coordinating the use, protection and sustainability of natural resources as part of local-to-global ecological systems (**stewarding**);

- learning and education regarding the interconnection between urban environments, rural and remote environments, and ecological systems (**learning**);

- campaigning and advocacy to seek changes based on the interdependence between diverse environments and ecological systems (**advocacy**);

- practices to advance an ecologically-sustainable political economy, increasingly guided by principles of 'post-capitalism' oriented towards social transformation (**prefiguration**).

We will return to post-capitalist thinking later, but here we outline examples relevant to the three other themes above.

Calvet-Mir et al. (2018: 1) explain their participatory approach to the development of a digital commons in Spain through the Connect-e platform. It supports transitions to, and scaling-up of, agroecological farming through the protection of traditional agroecological knowledge, understood as:

the cumulative and evolving body of knowledge, practices, beliefs, institutions, and worldviews about the relationships between a society or cultural group and their agroecosystems. These knowledge systems contribute to maintaining environmental and

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[19]A heterarchy is broadly understood as a system of organising where the elements of the organisation or network are unranked and so non-hierarchical; or where they possess the potential to be ranked in a number of different ways which can change over time and according to circumstance and context (and so remain flexible, dynamic and fluid).

culturally sensitive food systems and have been considered very relevant for agroecological transitions, or the processes of scaling-up and -out agroecology.

In turn, Niaros, Kostakis and Drechsler (2017) outline a number of makerspaces with a strong environmental focus that mix practical uses, knowledge-sharing and advocacy:

- **Public Lab:** Born out of the Deepwater Horizon oil-spillage and ecological disaster in the Gulf of Mexico, this initiative is exploring and addressing environmental issues with 'underserved communities'. Virtual (wiki) coordination and in-person working has led to a range of low-cost, open-source environmental monitoring technologies and related data collection and analysis e.g. air and water quality.

- **Open Source Beehives** is a citizen-led beehive network that has produced a 'sense-able' beehive via local manufacturing technologies and kits for urban farming, and seeks to build understanding of Colony Collapse Disorder.

Niaros, Kostakis and Drechsler (2017) also note two makerspace bio-technology projects which may prove of value for understanding ecological systems and their coordination. Their potential will depend on how they are used, by whom and for what purposes in the shorter- and longer-terms:

- **KiloBaser:** This project is described as a 'Nespresso machine of DNA synthesis' reduced to the bare essentials. It emerged from an Austrian-based makerspace and is now produced by a start-up company.

- **Backyard Brains:** This initiative from a USA-based makerspace seeks to innovate by providing open-source educational and scientific equipment in creative ways, e.g. turning a mobile phone into a microscope.

Chatterton and Pusey (2020) point to the role of commoning generally, and platform cooperatives in particular, in the development of a de-growth economy and social solidarity economy (SSE). They flag areas where they are already active in sustainable development activities which have significant impacts on ecological systems; namely: community-led energy generation, urban agriculture, circular economies, environmentally-low impact housing, and restorative design practices that bring together built and natural environments to improve social well-being.

This range of examples illustrate the potential for the stewarding, learning and advocacy roles of digital and urban commons in relation to local-to-global ecological systems. However, they provide limited information as to the complexities of 'doing' this type of commoning – the theory and practice. What, for instance, are the trade-offs between seeking environmental sustainability whilst also running a project that must be seen as successful by funders, the state and others seeking to invest in new technologies? What are the range of environmental impacts that may arise from how new bio-technologies may spawn various uses and spin-off technologies in wide-ranging fields?

A more focused literature review in relation to ecological *and* urban *and* digital commoning is needed to engage with these emerging debates for theory and practice. As Arvidsson (2020) has illustrated historically, although this cannot be assumed to apply to all future scenarios, commoning may again find itself being channelled to support the revitalisation of less idealistic and more commercially-driven forms of political economy – whether or not commoners aspire to do so in the first place. Is the role of commoning to be as a testing ground for innovative ideas, technologies, and methodologies that have the potential to reshape and/or rejuvenate neoliberal digital capitalism … or do commoners have other options? We return to this topic later.

6.4 Coordinating the complex networks of digital and urban commoning

The discussions in previous sections are illustrative of the complex coordination involved in the range of activities within any particular example of digital and urban commoning. For instance, Lynch's (2021) case-study of Guifi.net illustrates that this is no single-function commons or commoning network:

- it owns, provides and manages the material infrastructure to sustain its digital activities;

- it supports its members (users) in learning about using that infrastructure and how it works – while deepening their knowledge about broader issues that will impact on the development of its services and organising as a commons;

- it provides and develops a range of related services and activities, e.g. developing open source home-sensing systems via smart devices;

- and it undertakes partnership-working and sharing knowledge digitally to support development in collaboration with other bodies, e.g. a renewable energy cooperative, the city council.

Guifi.net must therefore undertake and coordinate a wide range of practices and activities through its members and staff and in partnership with others. Consequently, Lynch (2021) argues that it is the collective working of the membership that builds the organisation, its infrastructure and its effective governance: multiple knowledges and capacities are needed and must be shared. In one neighbourhood where this organisation was encouraged to work by the council, but where community had been weakened by tourism, it proved too difficult to effectively extend their network and services.

Niaros, Kostakis and Dreschler (2017) similarly illustrate the complexity of makerspaces, given their capacities for community-building, development, knowledge-sharing, and interdisciplinary innovation within their community and across wider networks of hackers, researchers, engineers and entrepreneurs.

Similarly, Dulong de Rosnay and Stalder (2020) note that in all types of commoning there are a range of activities needed to sustain organising and community:

- caring and community-building – online and offline;

- communication and governance;

- monitoring of rules and practice (quality-control, accountability, moderation);

- linking with other commons and other forms of organising;

- and advocacy for the interests of the commons, commoning and relevant social change.

It is important, then, to recognise and understand that commoning requires diverse skills, knowledges and practices – technical, social, political, organisational. This often creates the need to mobilise collective capacity through cross-sector as well as cross-network collaborations. For example, Van Laerhoven, Schoon and Vallamayor-Tomas (2020) observe a shift within the natural or environmental commons away from adversarial approaches to the state and the market, and towards collaborative approaches to co-management, hybrid modes of governance and coordination across public, private and community sectors.

6.4.1 Varieties of alternative currency-coordination

A particular approach to coordination across networks covered in this literature focusses on alternative commons-based currencies. Balaguer Rasillo (2021) provides an account of the work within the Catalan Integrated Cooperatives (CIC) to build alternative digital currencies in two forms:

• Eco-networks or Ecoxarxes: local digitally-based social currencies;

• Faircoin: a global digital crypto-currency developed by FairCoop.

In Catalonia there are about 12 local independent, autonomous social currencies operating to support the exchange of goods, services and knowledge – and with the intention of building a system of exchange outside of capitalist logic. The Community Exchange System International based in South Africa supports this electronic exchange and a worldwide network that includes Community Exchange System Australia and Community Exchange System Asia (based in Taiwan), which is now linking with other systems concerned for time-banking globally to establish the Community Exchange Alliance.

Catalonian commoners have now developed their own online electronic exchange system, IntegralCES, that links to this wider community exchange system. Purchases and sales within the system include small items e.g. organic produce, jewellery, therapies, and larger items e.g. vehicles, solar panels.

Further, Catalonian commoners have also led on the development of FairCoop and its cryptocurrency FairCoin. Whilst based on blockchain technology, FairCoin uses the 'proof-for-cooperation' algorithm, which avoids high-energy usage via mining or minting of the currency, but is nevertheless encrypted, resilient and supports fast transactions. Its peer-to-peer networks, as 50 territorialised nodes each with a monthly online assembly, can support economic activity and governance across the globe without the control of state or financial institutions, thus generating a decentred institution potentially relevant to a postcapitalist world.

Balaguer Rasillo (2021) recognises that currently these approaches, even in Catalonia, are used largely by activists rather than a wider body of less-committed 'users'. Nevertheless, they illustrate the potential of alternative currencies, rather than complementary ones that work alongside existing fiat and capitalist currencies and systems of credit/debit[20]. For instance, the author argues that they can meet North's (2010) criteria for challenging capitalist systems by supporting: democratic control; alternatives to capitalist credit; production for social need rather than profit; and local production rather than cheap production.

The experiences of activists in Catalonia and their wider global connections illustrate how federated structures could use digitally-based commoning to support a wider range of urban and ecological commons. However, Dallyn and Frenzel (2021: 863), whilst supportive of the work of FairCoop and FairCoin, note some fundamental challenges that have resulted in both the network and its currency becoming partially 'dormant':

Currently best described as being in a state of stasis, many participants and communities have exited the project … however, the FairCoin blockchain can still process transactions, and there are a small group of developers who continue to contribute to its development.

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[20]However, there is a necessary relationship with fiat currency and with profit-generating investments through crypto-currencies that were needed to maintain FairCoin as a working alternative currency that can be used more generally by traders.

They note three challenges:

1. The 'filtering membrane' (De Angelis, 2017) refers to the relationship between FairCoin and the fiat currency (the Euro) into which FairCoin could be converted and exchanged. This relationship proved insufficient to insulate it from capitalist currencies and institutions. The value of FairCoin on crypto-currency exchanges – through which it sought to sustain its strength in relation to the Euro – fell. Therefore, its commitment to pay merchants in Euros at a fixed rate proved problematic. Its relationship with wider capitalist systems was thus unstable and so unworkable over time as users could change into Euros rather than stay with FairCoin when this suited them. The commons could agree prices internally but to no avail if traders were now choosing to change back to trading in Euros instead.

2. Insufficient strong boundaries around the commons: membership of FairCoop was too open and its value base and practice was insufficiently defined and supported by its membership.

3. Relationship with state regulations: albeit not an immediate cause of the problems, it is certainly a challenging dimension because engaging with any state-regulated currency or crypto-currency system requires acceptance of its regulatory bodies and regulations: thus a potential conflict with its own governance system.

Fritsch et al. (2021) further discuss the potential of distributive ledger technologies (DLTs) such as blockchain to support decentralised approaches to alternative digital currencies that can coordinate resource-use and use-value at scale through federated commoning systems. They flag an important distinction between those advocating and developing crypto-currencies across two different camps:

• 'Crypto-libertarians' and digital currencies that seek to accumulate exchange-value alongside resource-coordination – and thus potentially support a 'hyper-capitalism' such as via Bitcoin. These can be considered 'pro-capitalist' commons, likely to sustain inequalities.

• 'Crypto-commonists' and currency systems that use exchange value to support effective production of use-values: decentralised socio-economic markets focussed on meeting the needs of individuals, societies and eco-systems, and who can be considered 'anti-capitalist'.

Fritsch et al. (2021) are very aware of the challenges for 'crypto-commoning'. For instance, building on Ostrom, they outline six areas of challenges for the global coordination of commoning: scaling-up; cultural diversity; interlinked common pool resources; accelerating rates of change; coherence across states; and planetary ecological boundaries. However, they argue optimistically for the role of DLTs:

With novel technological means to communicate heterogeneous values, purposes and intentions, commons-oriented DLT projects have in front of them the laudable task of merging patience, care, and inclusion with leading-edge technological capacity to unlock new potential in human collaboration. Nothing short will suffice as a foundation for the fractal, interoperable, and scalable global commons that could offer massive new opportunities in dealing with pressing global challenges. (Fritsch et al., 2021: 14)

This literature thus reflects the multifaceted challenges of sustaining a workable commoning crypto-currency over the longer-term. A central one is the need to develop a large network of members and users that see this financial tool/system as 'preferable', a better practical option for instance, to mainstream state currencies and crypto-currencies. Nevertheless, the development of blockchain and DLTs seems to provide opportunities and encouragement for further exploration.

6.5 Digital and urban commons for rebuilding democratic governance

As noted earlier, Dulong de Rosnay and Stalder (2020) recognise the current crises of the Western model of liberal democracy and fears of slipping into 'post-democratic frameworks.' They see a potential role for the commons in countering this through a range of digital, participatory and deliberative approaches that support citizens in increasing their informed civic participation and self-governance. They highlight two examples: the commons-orientated platform in Barcelona (Decidim) as an alternative approach to smart cities; and, crowdfunding approaches to policy development by the state in Iceland and Taiwan.

In a similar vein, Cardullo and Kitchen (2019) discuss Barcelona's partnership between the local municipal state and grassroots citizens' initiatives as a democratic alternative to the neoliberal smart city. In terms of democratic renewal, key current issues for theory and practice they highlight include:

*   the nature of the working relationship between the local state and grassroots organisations – framed as a public-commons partnership (citing Russell and Milburn, 2018; see also Russell et al., 2023);

*   and 'technological sovereignty' as a new dimension for democratic citizenship – one in which technological innovation seeks to serve local residents, is owned as a commons, and includes citizen access to data commons.

They also highlight the role of Decidim, which supports participatory democracy via digital infrastructure, and is a public-commons project thus far mostly financed by the state but coordinated by an open community. It develops action plans, policy and legislation through:

*   access to relevant knowledge and data online;

*   opportunities for participation via the digital platform;

*   opportunities for in-person participation;

*   and digitalisation of the results of both processes for transparency.

Research into other digital and urban commons also emphasise related dimensions. For example, Niaros, Kostakis and Drechsler (2017) see makerspaces and hackerspaces as playing a role in rebuilding civil society and social capital. They draw from Robert Putnam's (2000) Bowling Alone research and narrative about the loss of social connection and civic engagement in the USA, and note the potential of the commons as an antidote.

Each of the above present their vision as a more democratic, citizen-driven alternative to the neoliberal smart city approach. Similarly, Leontidou (2020) highlights grassroots creativity in Greece and more widely in the context of the emerging informational city and urban hybridity as offering an alternative model of the 'grassroots smart city'. Whilst Lynch's (2021) discussion of Guifi.Net in Catalonia likewise recognises its challenge to mainstream, hegemonic thinking on the smart city.

Overview: The papers reviewed in this section largely draw from a few cases, although Thompson (2020) points to a wider range of city-led initiatives globally that can inform commoning theory and practice. Some of the key areas for learning and development that emerge across this literature are:

*   bringing together both the (local and/or central) state and grassroots community organisations/ commons to work together – which requires considering how to share leadership and resources, and the respective balances of power and responsibility between these two loci of leadership.

- using digital technology to extend and deepen democratic participation and meet the needs of citizens (technology sovereignty) – rather than using it to develop new forms of extraction and exploitation through corporate smart city technology and related state and/or corporate surveillance.

- using digital technology to improve the credibility of the democratic process through its potential to increase transparency and reflexivity e.g. public records, access to evidence, and supporting critical deliberation.

An enduring challenge in democratic participation lies in maintaining a sustainable, vibrant, and impactful approach where citizens continue to recognise their involvement as meaningful and productive. It is crucial to avoid engagement fatigue and cynicism that can arise when people feel their contributions do not result in tangible changes. This is a potential risk in the partnerships that the commons may forge with traditional institutions that are not designed for participatory forms of governance. Consequently, Manley and Whyman's (2021) depiction of a social-economic democratic model, exemplified by community-wealth building, underscores the importance of advancing democratisation not only within the local state but also across broader economic, political, and community governance structures spanning from local to global levels.

6.6 Digital and urban commons and transformation

Much of this literature is concerned either directly or indirectly with considering the role of the digital and urban commons in generating change or transformation. Two overarching questions underpin the key themes in this final section:

- What sorts of social and/or political economic vision are elucidated by the commons?

- What sorts of strategy might commoners develop in pursuing these vision(s)?

6.6.1 Varieties of social and political economic perspectives and visions relevant to the commons

Six broad perspectives, if not fully-fledged visions, emerge from this literature and are outlined below:

Libertarian digital commoning and digital capitalism: Dulong de Rosnay and Stalder (2020) and Fritsch et al. (2021) recognise an entrepreneurial and libertarian approach to commoning, e.g. in relation to crypto-currencies, digital software development and digital technology more generally. Arvidsson (2020), likewise, notes the symbiotic relationship – both historically and currently – between the commons and capitalism. Ganzert, Ochsner and Stock (2020) also observe the close connection between digital commoning and digital capitalism in their analysis of digital media. This theme thus underscores how the digital and urban commons generate opportunities not only for their own development but also for the growth of an entrepreneurial digital capitalism.

Pragmatic public, private and commons partnership-working and development: Van Laerhoven, Schoon and Vallamayor-Tomas (2020) observe a shift in recent decades away from more agonistic relations between commons, state and markets, at least in terms of commons scholarship and the study of natural resource management. They suggest this as a potential trend and pattern across the development of commoning development more generally: initially challenging the status quo, later incorporated within an evolving system and sharing its resources, thus supportive of certain types of social change. Whilst such change may

be considered as a form of step-by-step incrementalism, it is not entirely clear if there is one overarching vision for broader transformation to be identified here or a dynamic plurality of visions.

Social and political resistance and egalitarian aspirations: An example is provided by Chadha's (2019) exploration of jugaad in the Indian context, highlighting its potential to generate revolutionary, socially-challenging and perhaps transformational acts: for instance, in relation to promoting feminist, queer, subaltern and democratic initiatives. However, it is important to acknowledge that – as it facilitates learning, flexibility, and adaptation to capitalist challenges – jugaad can inadvertently bolster neoliberal economic norms by aiding individuals in navigating and surviving within this orthodoxy, rather than challenging and fundamentally changing it. This literature review provides many other examples of such social and political economic tensions at various scales – e.g. Ganzert, Ochsner and Stock (2020) regarding digital media; and discussions of the illusion of the digital commons (Kostakis, 2018; Ossewaarde and Reijers, 2017; Reijers and Ossewaarde, 2018).

Nevertheless, it appears that the informality and absence of enduring institutions can serve as both a strength, offering fluidity and adaptability, and a weakness, as it fluctuates based on social circumstances, motivation levels, political opportunities, and the availability of appropriate resources. Moreover, these social movements do make valuable contributions to discussions about the political economy of an ecological post-capitalist vision, as is explored further below.

In Uymaz's (2018) examination of political struggles in Italy over the past two decades, the tensions between the central state and grassroots citizens' movements and civil society have centred around the commons as a focal point for resisting state-led privatisation programmes. This dynamic reflects a societal process where conflicts arise among the state, corporations, and citizens, necessitating the establishment of a new consensus regarding the interplay between the state, market, and commons. Similarly, Leontidou's (2021) analysis of social and political economic conflicts and the evolution of digital and urban commoning across the Mediterranean region over the past decade, highlights the potential for broader political movements to emerge from grassroots initiatives. Examples include movements in Spain and Greece that have demonstrated the power of grassroots activism in reshaping political landscapes.

The rise of a 'new' industrious but precarious socio-economic class? Arvidsson's (2020) analysis of the commons' impact on political-economic change in Western Europe over the past millennium, with a focus on the last five decades amidst the ascent of global digital capitalism, highlights the frequent presence of egalitarian principles within commoning practices.

Foster (2019; citing Arvidsson, 2019) encapsulates Arvidsson's perspective as centred on the concept of the 'industrious economy' – a labour-rich, capital-poor, and decentralised model that holds potential for being a driving force of change. Nonetheless, this model presents a nuanced dynamic, being susceptible to value appropriation by digital corporate entities while also potentially serving as a transformative class, diverging from traditional Marxist views centred on organised working-class labour. Foster highlights the intricate complexities within this framework, where open-source software offers avenues for learning and creativity but is vulnerable to exploitation by corporate tech giants. Foster underscores the opportunity to glean insights from diverse digital economic practices concerning aspects like value, ownership, profit, activity, and monetisation. However, he notes that this approach may not explicitly address power dynamics and the barriers to change as comprehensively as Marxist perspectives do in terms of societal and political economic transformation and challenges.

Arvidsson (2020) presents a global spectrum of this emerging class, encompassing hackers, peer-to-peer producers, social enterprises, and participants in the digital economy. Additionally, he highlights instances of small-scale industrial innovation in Italy and China, the shanzai (piracy) economy, and individuals in the West and Asia facing precarious employment, along with those in the Global South affected by new enclosures and climate challenges. In the Anthropocene era, Arvidsson argues, this diverse group of marginalised 'outcasts' and contemporary petty producers has the potential to instigate social and economic transformations akin to the role played by petty-producers in feudalism and 19th/20th-century capitalism – given their potential:

- for innovation – relative to more risk-averse corporate cultures – for instance, as decentralised autonomous organisations (DAOs) via blockchain technology and DLTs that support (digital) transparency and control by its members, and the development of crypto-currencies and new forms of digital community finance;

- to develop guild-like organisations that support revenue-sharing and collective-welfare e.g. 'global nomads' and related co-working spaces in Chiang Mai (Thailand) and Bali (Indonesia); and musicians guild in Brazil that supports communal housing and revenue-sharing.

In support of authoritarian surveillance and digital state capitalism? There is limited material in this literature review as to the relationship between the Chinese state and the workings of petty-producers and commons-based innovation there, but it is recognised as an important developing context (Niaros, Kostakis and Drechsler, 2017; Arvidsson, 2021). Little can be concluded from this review, but given the role of China globally, such a political economic reality – top-down, surveillance, state-led digital capitalism – and its relationship to commoning needs to be considered to grasp the range of this evolving landscape globally.

An ecological, democratic and decentred post-capitalism: Arvidsson (2020) argues that there is potential in the age of the Anthropocene for more than corporate and/or state-dominated models of digital capitalism. The limitations on economic growth that must be addressed to build a sustainable future may provide spaces for development of small-scale production committed to quality and craftsperson-ship: akin, the author suggests, to Adam Smith's (18th century) vision of markets supported by many local producers, for instance as in the emerging worldwide food economy of 'neo-rural farmers' and the Via Campesina movement of the Global South.

This feeds into a broader and recurrent vision across several of the texts: the development of progressive and complex networks of commons, makerspaces and cooperatives with the potential to work productively with the local and central state, in a diversity of ways and across digital, economic, social, political and ecological dimensions, to build towards a post-capitalist future:

- the role of cooperatives and platform cooperatives (Chatterton and Pusey, 2019);

- digital commoning and local democracy (Dulong de Rosnay and Stalder, 2020; Lynch, 2021)

- the Social and Solidarity Economy (Leontidou, 2021)

- new municipalism and relations between local state and commoners (Thompson, 2020)

- networked individualism (Dulong de Rosnay and Stalder, 2020) – and related concepts of the Nested-I, Ubuntu rationality and Buen Vivir (Bollier and Helfrich, 2019; Mestrum 2016).

It should be recognised, however, that there are diverse schools of thought at play in these visions – for example, some draw on Marxist or left-leaning thinking (Chatterton and Pusey, 2019; Thompson, 2020), while others find inspiration through ecological, democratic and social economic thinking.

6.6.2 Strategies for pursuing social and political economic visions

Less developed within this particular literature are discussions of strategies to pursue these broader visions. Indeed, some practitioners concerned for libertarian commoning, social resistance and a new industrial class might reject that such strategies need to developed – arguing instead for more organic processes that pursue particular activities, seek localised change and adapt to circumstances, contexts and needs.

However, those concerned for an ecological post-capitalism do seem concerned for reflecting on and developing suitable strategies for change. For instance, Kostakis (2018) and Reijers and Ossewaarde (2018) argue for a more critically-reflexive commoning movement that is looking to subvert over time capitalist structures, institutions and culture in the search of an emancipatory, post-capitalist cultural political economy. In turn, Dulong de Rosnay and Stalder (2020: 15) argue for the digital commons to build alliances with wider social movements to create wider and complex societal and global transformation:

Moving forward in a world faced with climate emergency, extreme right-wing politics, systemic inequalities, and a pandemic, we are convinced that the digital commons needs to intersect with larger power imbalances and social movements, such as the green new deal, crossing environmental and technology battles, to develop more sustainable alternatives to capitalism.

Chatterton and Pusey (2020: 19) provide the most in-depth consideration of tools and frameworks for strategy-building for an ecological post-capitalist alternative:

As the terrains of capitalist enclosure, commodification and alienation combine and expand along with the socio-environmental crises of the Anthropocene, or perhaps more accurately the capitalocene, so do those of postcapitalism.

They seek to provide a rich framework to support the development of post-capitalist theory and practice – Box 5 illustrates some of the key questions they raise in relation to focus for strategies, types of action and types of change.

However, they also recognise that these complex, multi-layered spatial political strategies are unlikely to become a clear blueprint for social and political economic transformation. Rather they will involve discrete and localised clusters of activity that include horizontal networks, both online and offline. They are also cautious about the role of the state, which they suggest may prove as much a powerful barrier to such change as a strong and crucial ally in leading and creating it. In terms of the types of strategy pursued, they offer the following menu of examples:

- A platform cooperativism that erodes and then replaces, rather than coexists with, digital capitalism – through micro-, meso- and macro-levels of organising.

- Development of democratic governance and ownership across virtual networks of digital workers and place-based initiatives such as the community economy and community-wealth building, with a focus on tackling poverty, dereliction and capital extraction.

- Bringing together varieties of activity and services – e.g. as the Catalan Integrated Cooperative (housing, transport, healthcare) – and related activities for education, basic income and eco/collective stores as part of new post-capitalist institutions.

- Developing forms of finance and economic activity to support non-commodified, socially-useful production – e.g. re-skilling, open data platforms, knowledge sharing – in order to reduce the role of markets and corporations and increase worker or community control.

- Developing forms of work, via new digital technologies, that are more fulfilling and less precarious.

Box 5. Key issues for post-capitalist strategies for change (source: Chatterton & Pusey, 2019)

(1) The need to engage with the following three 'terrains of transformation' in order to count as 'post-capitalist' approach:

- developing commons that resist enclosure and experiment with alternatives;

- seeking socially-useful production that counters commodification;

- generating socially useful work as an alternative to alienated toil and precarious work.

(2) To be alive to the power, but also limitations, of the following types of organising:

- micro-level: as autonomous radical social actions;

- meso-level: as community economies;

- macro-level: as interventions by the state and other large scale socioeconomic actors.

Given the complexities of walking these transformative paths (citing Wright, 2010), they point to the need to simultaneously:

- advance efforts towards structural/systems change;

- make progress within existing institutional arrangements;

- work on the gaps of current systems that make visible opportunities for change (prefigurative strategies).

Overview: This has been a limited introduction to a complex field of visions and associated strategies for change. It is only within the context of ecological post-capitalism that some early reflections emerge from this literature that consider 'the how' of substantial transformation through the development of commons theory and practice. However, in merely scratching the surface, it at least becomes evident that advancing such theory and practice entails navigating a landscape rife with numerous visions, considerations, options, tensions and obstacles that must be carefully assessed in relation to many diverse contexts.

7. Concluding reflections and priorities for further research

The previous chapters addressed the research questions that animated this literature review about the contemporary revival of the commons; namely:

* RQ1: In what ways can a focus on the commons be said to be reviving?

* RQ2: What is the current scope and diversity of digital and urban commoning? What examples are emerging of developing practice across the globe?

* RQ3: What are the key current issues for theory, policy and practice relating to digital and urban commoning?

The review has covered considerable ground due to:

* The multifaceted landscape and language that contemporary commoning now inhabits across diverse contexts and communities of practice; and spanning political economic, social, ecological and democratic visions as much as localised practices (Chapter 3).

* The multiple ways and contexts in which the commons can be said to be reviving – particularly in digital and urban commoning as part of ongoing cycles of challenge and revival in recent history and into the last decade (RQ1, Chapter 4).

* The increasing multitude of examples and possibilities illustrated by digital, urban and ecological commoning, and their complex relations with state, market and wider civil society (RQ2, Chapter 5).

* The complexity of evolving theory and practice for digital and urban commoning in relation to: the legal, political, economic and cultural matters that impact on the knowledge commons; the challenges of/for democratic governance within these communities of practice; their overlap with ecological commoning; the potential for coordination within and across commoning and wider networks; the capacities of digital commons to support democratic renewal with the state; and, the varied social and political economic visions and social change that commoners can aspire to (RQ3, Chapter 6).

Having offered some mapping of key themes and debates, but mindful of the limitations of this small-scale review (see Chapter 2), we conclude with some pointers for further research to support the development of theory and practice:

* firstly, drawing from two particular articles within the literature reviewed here;

* secondly, from the learning derived from our review process.

Foster (2020) and Van Laerhoven, Schoon and Vallamayor-Tomas (2020) provide useful insights for developing such a research agenda on the digital and wider commons, highlighting three areas of focus:

(i) Social justice and emancipatory research. Foster (2020) notes that whilst some commons-focused researchers and theorists are more concerned about exploitation, precarity, fragmentation and the outsourcing of risk, others are more optimistic as to the benefits of technology and the opportunities for

emancipatory approaches in this emerging context. Van Laerhoven, Schoon and Vallamayor-Tomas (2020) outline some of these research opportunities:

- supporting a more diverse research base, going beyond authors from narrow demographics and based in European and North American institutions, and towards those working and researching in other regions of the world;

- and looking to extend current key areas of commons research through a focus on gender, equality and environmental justice, and the emerging 'new commons' more generally.

(ii) Interdisciplinary working on practice-focused research. Van Laerhoven, Schoon and Vallamayor-Tomas (2020) argue for the potential of cross-pollination and collaborations with other fields, disciplines, geographies and a wider range of stakeholders (e.g. practitioners, policymakers). They advocate for bringing commoning insights into these diverse arenas to support new ideas and challenges, and to avoid reliance on certain key publications and the 'ideologisation' of commons research and publishing. Foster (2020) argues for interdisciplinary approaches but offers a note of caution given that the range of existing theories may be neither suitably coherent nor particular helpful in the face of changing and emerging social realities. Consequently, Foster points towards practice as a better starting point for a research agenda seeking to understand new contexts, challenges and aspirations.

(iii) Beyond institutional analysis and into deeper understanding of context. Van Laerhoven, Schoon and Vallamayor-Tomas (2020) argue for deepening empirical research into Ostrom's (1990) eight design principles, particularly by considering the relations between the principles as well as with their application in diverse contexts. However, they propose to extend such a research agenda beyond the traditional focus on institutional analysis of local commons and the management of natural resources to advance a wider exploration of commoning and its practices. Further, Foster (2020) notes the importance of investigating more critically the detail of 'big picture' macro-economic accounts of the rise of the digital economy. These have often been loose in language and selective of evidence, and broad-brush working assumptions need to be interrogated further.

Drawing on these three themes, as well as the discussions in the preceding chapters, we highlight seven areas of opportunity for further literature review and practice-related research:

(1) Learning from diverse historical and wider contemporary contexts. The value of understanding current contexts and the previous histories of commoning has been emphasised in Chapters 3-4. However, as noted in Chapter 2, this literature review is skewed towards Western European and North American contexts and scholarship. For instance, whilst Arvidsson (2020) acknowledges both historically and currently the importance of wider contexts – e.g. in both cases China is highlighted – most material is learning from Western contexts over the last millennium and particularly in the digital age over the last 50 years. Similarly, Leontidou (2020) acknowledges wider contemporary contexts – i.e. Latin America, North Africa and the Middle East – but the author's core material is from the Southern European Mediterranean region, namely Greece and to some extent Spain.

It is crucial to deepen understanding of existing research from across the globe, particularly from researchers and practitioners from the Global South. The increasing accessibility of AI language translation may provide the opportunity to generate a more diverse knowledge commons about the commons. It is also crucial to

learn from a more diverse cohort of researchers and practitioners in terms of class, gender, ethnicity, and perspectives from first peoples and indigenous communities – and such learning may come in a range of forms beyond narrowly codified scholarly knowledge.

Arvidsson's (2020) exploration of the historical evolution of the commons in Western Europe, including the emergence of language and supportive institutions, offers valuable insights into the opportunities, challenges, and complexities surrounding contemporary commoning and its ongoing development. This is a history that has been given considerable attention by key scholars of the field (e.g. Linebaugh, 2008, 2014; De Moor, 2008, 2011). However, a broader historical perspective on commoning might be gleaned by considering Polanyi's (2001 [1944]) concept of 'reciprocity' within human communities as a foundational framework for investigating commoning as social practice since 'the dawn of everything' (Graeber and Wengrow, 2021).

(2) Digital and urban commoning as challenging of western cultural norms, thinking and values. The commons have a focus on shared collective resources and are underpinned by an understanding of our individual selves as inextricably nested within relationships, networks and contexts. This provides a very different perspective to the individualism that continues to be dominant in Western liberal democracies and culture, and their broadly-speaking neoliberal, digital capitalist political economies. Two key areas of theory and practice were highlighted in the review, but there is much more to learn about both:

• The 'Nested-I' as an alternative ontology to western norms and thinking –inspired by the practical philosophies of networked individualism, Ubuntu rationality and Buen Vivir.

• Resistance through legal, extra-legal, advocacy and cultural means to the ongoing contemporary enclosures of the commons –which continue apace across domains of life, from the sea (Standing, 2022) to biodiversity and biological life itself (Shiva, 2020).

(3) Deepening inclusive and democratic governance of the commons. Whilst the commons provide obvious opportunities for exploring inclusive and democratic practice through their own self-governance, the literature reviewed (Dulong de Rosnay and Stalder, 2020; Niaros, Kostakis and Drechsler, 2017) illustrates the challenges given the often-dominant roles of professional, highly-educated classes and males in particular. Exploring the literature further for counter-examples in relation to class, gender, ethnicity, age, sexuality, disability, neurodiversity, culture and belief – and in particular from the Global South – would provide valuable insights for supporting the development of contemporary commoning practices. Likewise, there is scope for a better understanding of approaches to democratic governance across the field – an area sometimes taken for granted but that requires investigation (see Durose et al. 2021; Henderson, Revell and Escobar, 2018: 89-94).

(4) Ecological commoning meets digital and urban commoning. This has been only tangentially covered in this review, but the literature on contemporary ecological commoning, spanning traditional ('old') and new commons, is of considerable scope and thus its overlap with digital and urban commoning is likely a productive area for further study (Van Laerhoven, Schoon and Vallamayor-Tomas, 2020).

(5) Coordination across and between commons: alternative currencies and wider self-governance. The material reviewed in this area has been limited, but it suggests considerable challenges for commoners and their primary concern for coordination via social practice and values – rather than state policy and/ or market-driven price-mechanisms – in surviving in the context of the neoliberal digital capitalist political

economy (Balaguer Rasillo, 2021; Dallyn and Frenzel, 2021; Fritsch et al., 2021). A more focussed literature review would help to further unpack the opportunities, challenges and dilemmas currently faced by commoners across the globe and broaden the examples of emerging practice globally.

(6) Working with the state on democratic governance. This was a key focus for this review and from the various perspectives of digital commoning (Dulong de Rosnay and Stalder, 2020), digital and urban commoning (Lynch, 2021), platform cooperatives (Chatterton and Pusey, 2019), platform municipalism (Thompson, 2020), and alternative smart cities (Cardullo and Kitchen, 2019; Leontidou, 2020). Yet much of the material accessed here draws from a certain number of key examples and cases. There are myriad further examples to inform case study research and comparative analysis, as per the examples in Thompson's (2020) exploration of new municipalism globally – which draws on several key cases but points more widely; Leontidou's (2020) study of Athens' social and solidarity economy and wider hybrid digital urbanism in Southern Europe; and, Niaros, Kostakis and Drechsler's (2017) overview of makerspaces globally. A more focused literature review should explore these examples, particularly prioritising those from the Global South.

(7) Varieties of social, political economic and ecological visions in digital and urban commoning. Whilst six useful perspectives were highlighted – libertarian and entrepreneurial commoning; collaborative-working between commons, state and market; egalitarian commoning and social resistance; the commons as a new 'industrious class'; the autocratic digital surveillance state and the commons; and ecological post-capitalism – only the latter was explored to any depth in terms of vision and strategy. There is clearly scope for more extensive literature review across all of these themes – and doubtless more. It also seems important to reiterate Foster's (2020) concern regarding the implicit use of broad-brush working assumptions within macro-economic accounts that lack sufficient detail, and the risk of conflicting and incoherent use of divergent theories via interdisciplinary collaboration. More generally, this suggests that we – researchers of the commons – need to be more explicit, transparent and accountable about the theories, values, assumptions and visions at play in our work and across the field.

Coda

In conclusion, the commons are currently undergoing the latest wave of revival in their millenary history. They now represent a lively field across various domains of practice, research, politics and policy – propelled by the confluence of social, economic, political and environmental crises, and the aspiration to build more desirable futures. As such, this is a field that can elicit both hype and hope. Hype in the hope that the commons can claim a more prominent space in contemporary societies. And hope that the hype lives up to the expectations of people seeking alternative paths for our troubled worlds.

We started this review with a historically-informed but very basic definition of the concept: the commons are material or social resources that are managed (and sometimes own) by a community of place, practice, identity, or interest. However, as this review illustrates, the commons are much more. They encompass

- a complex paradigm that accommodates a range of social, political and economic practices and imaginaries (collective visions)

- that strive to organise shared worlds according to values such as equality, fairness, autonomy, interdependence, democratic governance, solidarity and so on;

- and oriented towards goals such as economic wellbeing, technological sovereignty, the Right to the City, cooperative culture, ecological sustainability, and environmental justice.

Approaches in the commons tend to be diverse, idiosyncratic and contextual – as they are reflective of the communities that sustains them. In this sense, although there are certainly 'patterns of commoning' (Bollier and Helfrich, 2019), the complexity of this field of study seems to militate against a simplified or unified theory of change. This suggests an important contrast to the simplified grand narratives about the market and the state that have come to dominate contemporary forms of socioeconomic and political organisation. Arguably, a key struggle for the future of commoning will be to claim its place in the public imagination at large.

Can the commons act as a form of multi-sited 'social acupuncture'[21] applied across multiple relationships, spaces, contexts and scales? Can this ultimately lead to the systemic changes needed in the century ahead? And can this realm of 'real utopias' (Wright, 2010) face up to the challenges of political economies dominated by the capitalist state-market alliance? These are some of the questions we are left pondering as we continue to engage with the latest revival of the commons – somewhere between the perils of hype and the urgency of hope.

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[21]The 'social acupuncture' metaphor was developed, in a different context, by playwright and artist Darren O'Donnell to explore the dynamics of emerging social interactions and the power of civic engagement.

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Appendix 1: Searches summary table

Database: DiscoverEd

Search end date: February 2022

Search	Inclusion criteria	Search terms ('any', 'contains', 'all items', 'English' … before adding filters)	Results
A	1. Time frame: 2007- (04.02.)2022 2. Geography/Language: English 3. Types of sources: All 4. Relevant fields: Interdisciplinary 5. Relevance: Assessed according to the definitions and research questions	Commons Digital Commons Environmental Commons Ecological Commons Natural Commons Urban Commons	19,102,095 Results 2,489,416 Results 4,938,303 Results 1,029,711 Results 6,317,798 Results 1,733,823 Results
B	1. Time frame: 2007- (04.02.)2022 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: Social sciences 5. Relevance: Assessed according to the definitions and research questions	The Commons Digital or Environmental or Ecological or Natural or Urban	8,919,275 Results 3,058,775 Results
C	1. Time frame: 2007- (04.02) 2022 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: Social sciences 5. Relevance: Assessed according to the definitions and research questions	The Commons Digital or Environmental or Ecological or Natural or Urban	937,997 Results 172,451 Results
D	1. Time frame: 2015-2022 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: Social sciences 5. Relevance: Assessed according to the definitions and research questions	Digital or Environmental or Ecological or Natural or Urban	125,395 Results

E	1. Time frame: 2017-2022 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: Social sciences 5. Relevance: Assessed according to the definitions and research questions	Digital or natural or urban commons	100,842 Results 85,148 Results (2018-2022) 68705 (2019-22) 50,016 (2020-22)
F	1. Time frame: 2017-2022 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: Social sciences 5. Relevance: Assessed according to the definitions and research questions	Digital Commons Natural Commons Environmental Commons Urban Commons	61,350 30,590 (2020-22) 160,685 137906 94327
G	1. Time frame: 2019-2022 (09.02.22) 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: Social Science 5. Relevance: Assessed according to the definitions and research questions	Digital Commons AND Environmental Commons AND Urban Commons	5,116 Results 3,772 Results (2020-2022)
H	1. Time frame: various, see right column (09.02.22) 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: interdisciplinary 5. Relevance: Assessed according to the definitions and research questions	Digital Commons AND Environmental Commons AND Urban Commons AND Revival	549 (2020-22) 754 (2019-22) 929 (2018-22) 1054 (2017-22)

I	1. Time frame: various, see right column (10.02.22) 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: interdisciplinary 5. Relevance: Assessed according to the definitions and research questions	Commons AND Digital AND Environmental AND Urban AND Revival	930 (2018-22) 1055 (2017-22) Note: 1942 (2017-22) without peer review criteria.
J	1. Time frame: 2017-22022 (10.02.22) 2. Geography/Language: English 3. Types of sources: Peer-reviewed 4. Relevant fields: Interdisciplinary 5. Relevance: Assessed according to the definitions and research questions	Public Commons Partnerships only Public Commons Partnership AND Digital Public Commons Partnership AND Digital AND Environmental AND Urban	144,000+ 34,146 (or 7821 if 'social sciences' only is the Relevant Fields) 8484 (1731 if 'social sciences' only is the Relevant field; or if 'Revival' is added then 247 is total)
K	1. Time frame: 2017-2022 (10.02.22) 2. Geography/Language: English 3. Types of sources: Peer-reviewed (+ 'All') 4. Relevant fields: Interdisciplinary 5. Relevance: Assessed according to the definitions and research questions	Commoning Commoning AND Digital AND Environmental AND Urban Commoning AND Digital Commoning AND Environmental Commoning AND Urban	1819 (or 2246 'All') **162 ('P-R'), and good mix of disciplines, (or 250 'All')** **349 ('P-R') or (599 'All')** 700 ('P-R') or (1111 'All') 750 ('P-R') (or 1245 'All')

Appendix 2: Key themes and words

Broad themes	Related key words
(1) History and definitions of the commons and related political economy	Re-emergence of the commons History of commons History of digital commons Definitions of the commons Hybridity – real and virtual Digital capitalism Neo-liberal capitalism Sharing economy Extraction Enclosure Commodification
(2) Diversity of digital, urban and other commons	Peer-2-Peer Makerspaces Digital commons Illusion of the digital commons Convivial tools Market-orientated commons Digital and participatory design Digital platforms for participation Digital toolkits Digital currencies Crypto-currency Local community currencies Digital media Community media Communications communities New media Community radio Cultural commons Intellectual commons Knowledge commons Data commons Urban commons Urban community hubs Parks and greenspaces Cultural and digital art Workplaces Platform cooperatives Faith-based commons

(3) Digital developments	Digital platforms Open-source software FLOSS Ethics and digital Data management E-waste Post-digital Open-ness and risk 3-D printing AI Algorithms Extended reality or XR Robotics
(4) Urban development: capitalism, state and commons	Urban planning Smart cities Surveillance Peer surveillance Digital democracy Smart cities – participation Smart cities – alternatives Sharing city Urban citizenship and right-to-the-city State and commons partnerships Health and well-being
(5) The state and wider commoning	New municipalism Public services and co-production Education and commoning Welfare commons Financial Commons
(6) Social transformation, political economic change and commoning	Equalities LGBTIQ+ Anti-rascist Post-colonial Urban social transformation Urban movements Post-capitalism Anthropocene Equalities, social justice Resistance Hacking Strategies for resistance De-schooling Critical digital pedagogy

	Social and solidarity economy Community economy Resilience Self-help Covid Pandemic
(7) Environmental, urban and digital commoning	Urban nature Environmental commons Natural commons Seed banks Urban farming Rural and peri-urban Ecological commons Transport and urban sustainability

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Reviving the commons?
A scoping review of urban and digital commoning

**James Henderson and
Oliver Escobar**
August 2024