



Pop-Machina

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European framework conditions of circular collaborative production

Deliverable 2.4

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<http://www.pop-machina.eu>

Abstract

Pop-Machina H2020 D2.4 identified the legal, tax and governance framework conditions that, when favourable, provide fertile ground for circular makers to become grassroots communities. Main aim was to align the makers vision for knowledge sharing through online platforms with applicable or forthcoming European and national regulations on digital collaboration. The circular urban regeneration was approached, based on research and assessment of waste management policies in Europe, Belgium, Greece, Lithuania, Spain and Turkey. Further, socio-economic parameters were explored regarding urban upcycling ecosystems. Moreover, a qualitative analysis addressed the infrastructural, business, labour, safety and other market conditions that enable the growth of circular making chains. With the aid of shared makerspaces and blockchain platforms, new business models could flourish, if upcycling and open innovation are fairly and horizontally governed at EU level. The urban growth depends on regulated operational and tax incentives facilitating circularity and replicability of makerspaces (repair cafes and living labs with online city portals). Thus, regarding general drivers and barriers of circular collaborative production, D2.4 serves as an informative toolbox and roadmap during workshops and policy discussion beyond this project (as multiplier of the pilot cities' applied experience).

This report constitutes Deliverable 2.4, for Work Package 2 of the Pop-Machina project.

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Abbreviations

3D – Three-dimensional
3TG Conflict Minerals – Tin, Tungsten, Tantalum and Gold
AI – Artificial Intelligence
B2B – Business to Business
B2C – Business to Consumer
BaaS – Blockchain as a Service
CA – Consortium Agreement
CCCTB – Common Consolidated Corporate Tax Base
CCE – Circular Collaborative Economy
CCP – Circular Collaborative Production
CERTH – Centre for Research and Technology Hellas (Thessaloniki)
CE – Circular Economy
CMC – Circular Maker Community
CMCs – Circular Makers Communities
CNC – Computerised Numerical Control
CJEU – Court of Justice of the European Union
D2.4 – Deliverable 2.4 of Pop-Machina project
DoA – Description of Action
DoW – Description of Work
DIY – Do-it-yourself
DSI4EU – Digital Social Innovation for Europe
DST – Digital Services Tax
EC – European Commission
ECJ – European Court of Justice
e.g. – for example
EoL – End of Life
ERC20 – Ethers (Ethereum cryptocurrency)
EUDSII – European Union Digital Social Innovation Index
FoF – Factories of the Future
FTE – Full-Time Equivalent employment
GA – Grant Agreement
IAAC – Institute for Advanced Architecture of Catalonia, Barcelona, Spain
i.e. – that is (that means), namely
ICOs – Initial Coin Offerings
ILO – International Labour Organisation
IMM – Istanbul Metropolitan Municipality
IND 4.0 – Fourth Industrial Revolution
INTRA – Intrasoft International, Luxembourg
IPR – Intellectual Property Rights
ISM – ISM University of Management and Economics, Kaunas, Lithuania
ISTAC – ISTAC Waste Management Company in Turkey
KAUNAS – Kaunas City Municipal Administration

KoM – Kick-off Meeting
KPIs – Key Performance Indicators
KU – KOC University Turkey
LAW – CommonLawgic (Athens, Greece)
Leuven – City of Leuven
MPV – Minimum Viable Product
OSF – Open Science Framework
OSH – Occupational Safety and Health
OSS – Open Source Systems
P2P – Peer to Peer
PAYT – Pay As You Throw
PBA – perception-based analysis
PIR – Municipality of Piraeus
PLANET – Planet Turkey
PM – Project Manager
PRs – Producer Responsibility Schemes or Organisations (PROs)
QCA – Qualitative Comparative Analysis
Q-PLAN – Q-PLAN International
SDGs – Sustainable Development Goals
SDP – Significant digital presence
SCC – Santander City Council
SE – Social Economy
SGI – Sustainable Governance Indicators
T2.4 – Task 2.4 of Pop-Machina project
THESS – Municipality of Thessaloniki
TU Delft – Technische Universiteit van Delft
UC – University of Cambridge, UK
UNICAN – Universidad de Cantabria
YP – Yanna Pavlopoulou
UoM – University of Macedonia
VAT – Value Added Tax
VENLO – Municipality of Venlo
Vs – versus
WBCSD – World Business Council for Sustainable Development
WFD – Waste Framework Directive
WP – Work Package
WPL – Work Package Leader
WR – White Research

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Executive summary

This study provides an overview of the current European framework conditions of the Circular Collaborative Production (CCP). The purpose of deliverable D2.4 of the Pop-Machina H2020 project is to outline the European systemic institutional environment that currently affects the development of CCP and the creation of circular maker communities (CMCs). In every pilot municipality (Leuven, Santander, Kaunas, Istanbul, Thessaloniki, Piraeus, and Venlo), Pop-Machina demonstrates business-oriented collaborative production solutions, based on the needs and preferences of the local stakeholders. It is addressing several cutting-edge technologies in newly established makerspaces lodged in unused buildings, and development of skills for makers, especially for vulnerable groups such as women and immigrants, by providing a safe and healthy working environment and collaborative ecosystems. The European Commission adopted in 2015 the ‘Circular Economy Action Plan’, updated in 2020, that includes measures that help stimulate Europe’s transition towards a Circular Economy (CE), boost global competitiveness, foster sustainable economic growth and generate new jobs. The revised EC legislative framework on CE sets challenging, measurable targets that require a wide range of jobs, defined as ‘green’ jobs. The CE action plan will be truly sustainable if the municipalities and the EU Member states (as well as Turkey as a candidate member) offer related employment opportunities that provide safe, healthy, and decent working conditions, safeguarding diversity, digital accessibility and inclusion. This report describes what ecosystem factors support, attract and retain circular makers, such as the availability of standard and harmonised European and national tax incentives and regulations on infrastructure and workforce OSH in the pilot cities. Framework conditions depend on pertinent EU legislative policies and national legislation, business practices, and technical aspects (e.g. the adoption of blockchain tools).

For the construction of this report, CommonLawgic received input from municipal and national experts of the Pop-Machina project on CCP enablers and barriers from December 2019 to May 2020. The reports on the framework conditions of Belgium, Greece, Lithuania, Spain and Turkey, revealed significant national differences on the pilot cities’ readiness to foster CCP initiatives; such reports reflected the (CCP) conditions for consortium internal guidance. Under their light, the respective analyses compared the urban governance conditions that hinder circular activities in pop-up environments. Primary research methods supported the qualitative comparative analysis (QCA) and perception-based analysis (PBA) of municipal policy, legal, business, blockchain, and technical aspects, encountered in CCP. The responses’ valuation elaborated on the pilot cities’ capacity, maturity and readiness from the subjective standpoint of the municipal and national decision-makers, as well as of the consortium support researchers. Based on the above national frameworks’ comparison, this deliverable presents and analyses the drivers that foster and the barriers that hamper the circular production and the collaborative economy.

The first chapter introduces the scope and objectives of deliverable 2.4 relating its content to Work Package 2 of the Pop-Machina project on mapping the maker community ecosystem by identifying from a comparative perspective the currently applicable regulatory framework in the EU on CPP.

Chapter 2 outlines the research approach followed for the identification of the framework conditions and the process chosen for the selection of relevant legislative, governance and taxation sources; furthermore, it discusses the core principles of the circular economy as defined by the EU Circular Economy Action Plan. *Directive 2008/98/EC on Waste Framework (WFD)* underlined economic

instruments to be used by the Member states, providing incentives for the application of the waste hierarchy. It included, *inter alia*, the ‘Pay As You Throw’ (PAYT),¹ Extended Producer Responsibility (EPR) schemes, and incentives for municipalities to promote CE.

Chapter 3 clarifies the governance structure of the collaborative economy focusing on open innovation schemes as applied in a digitised environment considering the Sustainable Governance Indicators (SGIs) and sub-factors. This section builds upon the notions of the digital collaboration of makerspaces, industrial symbiosis and 3D printing.

Chapter 4 is a synthesis that comprehensively puts together the possible legal issues arising from the CPP practice including but not limited to: the available company legal reforms in place; crowd-funding potential; employment perspectives and labour law considerations such as Occupational Safety Health (OSH) conditions; legal challenges from the use of platform economies, particularly blockchain as a service, smart contracts, and tokenisation; intellectual property rights (copyrights) and patents; product certification and labelling.

Chapter 5 sets the regulatory context on waste management, developing the notions of critical materials, exploring the context of producer responsibility schemes (PRS) that collectively apply the Extended Producer Responsibility (EPR) principle and their interlinkage to competition and free-market disruptions.

Chapter 6 focuses on discrepancies between local and transboundary circular markets and highlights the significance of synergies between various stakeholders to overcome challenges (manufacturers, service providers, local makers). The chapter builds upon the terms of ‘waste passport’, ‘right to repair’, ‘ecodesign’ and ‘material waste flows.’

Chapter 7 examines the taxation challenges that CPP incurs, the fiscal and taxation policy target-setting around circularity and the European legislative instruments already in place or forthcoming. It considers tax and financial incentives for market users and concludes with useful, practical suggestions.

Chapter 8 elaborates and compares the above findings with a theoretical method, discussion, and results’ analysis of national framework conditions showcased by the pilot cities.

Chapter 9, based on the above results, analyses and compares the drivers and barriers of CCP. The sharing of legal, tax and governance practices among countries of different backgrounds helps to understand the baseline level of circular collaborative growth. The report ends with the authors explaining their limitations and providing initial policy recommendations in order to empower the prosumer and maker movement to overcome the challenges of the collaborative digital economy.

Finally, Chapter 10 explains this publication’s limitations. Chapter 11 recommends some policy amendments and suggests favourable framework conditions that can provide fertile ground for circular activities of grassroots makers. Chapter 12 briefly summarises the study’s general conclusions.

Overall, the D2.4 report critically analyses the legal, tax and governance drivers and barriers of the Circular Collaborative Economy (CCE), specifying a baseline status in order to benchmark later -as the project develops- the advancement of the research findings. The identified socioeconomic parameters that foster urban upcycling ecosystems can serve beyond the Pop-Machina project (to multiply the pilot cities’ applied experience).

¹ See <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098> [last accessed 15/10/2020].

1. Introduction

Urban regeneration and pop-up environments (temporary public workspaces) in vacant buildings (Bertino et al., 2019:11) help artisans to become more innovative, resilient, adaptive and cooperative against new challenges. Society's involvement and social entrepreneurship towards a circular economy are vital in order to confront the cohesion economic crisis within the EU.² Recent research (Ellen MacArthur Foundation, 2019) suggested that if a circular approach were applied in five sectors (steel, aluminium, cement, plastics, and food), the CO₂ savings till 2050 would equal the elimination of all transport emissions globally. The circular economy aims to 'design out' waste through optimisation of the high utility and value of products and materials with the help of innovative business models, and supportive policies (Parajuly, Fitzpatrick, Muldoon, Kuehr, 2020). The circular management principles mandate to prevent, reduce, reuse, share, repair, refurbish wasted articles, through the material recovery of End of Life (EoL) products and then recycle. At the same time, digitalisation, decentralised, and blockchain technologies facilitate the advancement of the collaborative economy and open innovation through online platforms. The disruption of COVID-19 pandemic accelerated further the digitalisation of teleworking, e-shopping and 'distant' collaboration practices.

Circular economy is defined as an economic system that aims to add value to products and supply chains while minimising the use of raw and virgin materials and the production of waste and pollution of all kinds in a sustainable way. The circular economy uses strategies such as redesign, repurposing, reuse, repair, refurbishment, remanufacturing, recycling, as a way to improve the productivity of resources all along the value chain to reduce resource extraction and consumption. It aims to keep and increase material value to derive more value and extend product life while decoupling the economy through a functional economy (Metta & Bachus, 2020, Pop-Machina D2.1, p. 23).

The Pop-Machina H2020 project timely explored the potential to merge the offline activities (in physical public makerspaces) with online communication practices, creating a collaborative community for circular production. Temporary use of empty buildings/spaces is a practice called in urbanism 'creation of pop-up environments' aiming to revitalise urban areas. Seven municipalities (Leuven, Santander, Kaunas, Istanbul, Thessaloniki, Piraeus, and Venlo) establish circular makerspaces as Pop-Machina pilot testbeds. 'Pop' addresses the accessible, inclusive and easily adaptable operation of living labs, and 'Machina' the blockchain machine-learning technologies (Harris, 2019). The transition to both those fastly emerging business models (of the collaborative and circular economy) can be a solution to global growth [a 'Deus ex Machina' (god from the machine) originally in Greek 'ἄπὸ μηχανῆς θεός'].

Currently, a new concept - the maker movement - reintroduces the making and repairing skills of consumers (under the new term prosumer) through the democratisation of new open-source technologies, shared tools and skills, within a community (Metta & Bachus 2020, Pop-Machina D2.1, p.21). Makerspaces, such as repair cafes, living labs and material helpdesks, facilitate peers to mingle, share knowledge and tools and collaborate in manufacturing processes. Prosumers are customers who prefer to have control over the specifications of products that meet their exact needs. Some European governments offer subsidies for maker movement initiatives, increasing the number of makerspaces in Europe (Metta & Bachus, D2.1, p.18).

² **General Secretariat of the Council.** (2015). *The promotion of the social economy as a critical driver of economic and social development in Europe* (13766/15 SOC 643 EMPL 423). Retrieved <https://data.consilium.europa.eu/doc/document/ST-15071-2015-NIT/en/pdf> last accessed 27/10/20.

Nevertheless, there are multiple legal, operational, fiscal and tax governance challenges for the circularity growth, such as incentives to makers and operational licencing standards of physical maker-spaces and virtual collaboration platforms. Maker champions (lead users and mentors) help ‘to monitor the urban and peri-urban circularity’ navigating towards a shift of ‘social behavioural, economic, environmental performance’ (Von Hippel, 1986: 791–806). Therefore, this study elaborated, based on a sample of expert opinions, on ways to tackle the advancement of the circular maker movement navigating enablers and constraints. D2.4 identified the framework enablers and barriers of pop-up environments, according to pre-existing perceptions and background knowledge of ‘leaders’ (municipal and national experts) over legal principles and infrastructural factors of upcycling and digital social innovation (DSI).

The expected impact was to understand from the start of the Pop-Machina project, the knowledge background, maturity readiness and infrastructural capacity of the seven pilot cities. Such knowledge-based feedback -through interviews with open-ended questions- provides the baseline to qualitatively benchmark against progress and provide primary recommendations per country at the policy discussion phase. T.2.4 identified, compared and assessed through a Qualitative Comparative Analysis (QCA) the baseline findings in each of the seven pilot cities (Istanbul, Kaunas, Leuven, Piraeus, Santander, Thessaloniki, Venlo). KPI 10 addressed the socioeconomic contexts of the urban maker communities, based on a literature review. Through a (PBA) perception-based analysis, the background knowledge also tested major concepts of legal, tax and blockchain circular collaborative conditions (KPI 12). Pop-Machina partners performed supportive studies on their national framework conditions (CREVIS/ETAM for Belgium, the University of Cantabria (UNICAN) for Spain, PLANET for Turkey, ISM for Lithuania and CommonLawgic (LAW) for Greece. D2.4 study compared the applicable European framework conditions to the above national ones. Based on this task’s findings, Pop-Machina could kick-start a series of co-creation workshops and events to discuss openly the governance, tax and legal barriers that hamper collaborative production, and advance well-grounded policymaking.

1.1 Pop-Machina WP2 general objectives and vision

Work Package 2 (WP2) of Pop-Machina, aims to map the maker community ecosystems; analyse the methods and tools for the creation of maker communities; and, identify the relevant local value chains, as well as the legislative, governance, and taxation procedures of collaborative production in the pilot locations. All the above objectives serve the vision of Pop-Machina to create ‘Circular Maker Communities’ (CMCs) and a specialised inventory/tool-box of circular collaborative production solutions; as a new business model. Pop-Machina aims to fill in the gap of Circular economy (in short, CE) actions by testing in the pilot cities the promotion of makerspaces development for a more redistributed, decentralised and local manufacturing. The broader envisioned impact of Pop-Machina is to demonstrate the potential to reduce the consumption of primary materials through the development of new circular products at a local scale, triggering a pro-sustainability mentality shift and a transition from consumer to maker-prosumer. Pop-Machina also explores the potential of the maker movement, to overcome scaling issues, if based on cutting-edge technologies (blockchain and Factories-of-the-Future) exchanging tokens, instead of monetary rewards, through Blockchain as a Service (BaaS) and gamification. Trainers and makers share ideas, mainly focusing on the skill development of women and vulnerable groups, empowered to partake actively in collaborative production opportunities.

1.2 Scope and objectives of deliverable D2.4

Task 2.4 (T2.4) of WP2 began in June 2019 and ended in October 2020. It was decided to start at the early stages by mapping the stakeholders and the potential value chains of pilot cities in order to

identify the baseline framework conditions. Namely, the D2.4 aimed to clarify the legal, governance and tax drivers and hurdles, affecting CE³ value chains and collaborative production⁴ in urban environments. There were overlaps with other tasks, so the consortium partners involved decided that stakeholders and value chains analysis would be performed and elaborated in-depth at D5.1 and D5.2. Therefore, the scope of deliverable 2.4 (D2.4) focused on potential collaborative production opportunities in local ecosystems according to the European regulations in force.

This deliverable contains a comprehensive analysis of the legal, governmental and taxation requirements of the applicable European Regulation, comparing the national framework conditions that are respectively perceived to apply in each pilot city. The European regulatory framework of the circular collaborative economy is time-framed at the starting stages of the project, based on perception-based input from municipal experts and national policymakers on local circular procedures. By obtaining a tangible and structured sense of applicable rules, pilot cities can further their research on relative framework conditions, assigning -in the future- their legal and technical experts to conduct specific inquiries or municipal policy amendments.

To that end, the authors shared with the consortium partners separate reports of the national frameworks of Belgium, Greece, Lithuania, Spain, Turkey (since June 2020) and several discussion drafts on the European framework conditions (since February 2020). All the above were used to support and enhance the maker champions regulatory knowledge during workshops and facilitate the policy discussion at the end of the project. To be noted that Turkey generally abides with most of the EU Regulations, as an EU candidate member state (cand. MS) to the EU-, according to the EC 2019 Report⁵ on the EU Accession Progress of Turkey.

This deliverable's main objective was to identify the current baseline framework conditions and regulatory enablers, according to comparable perception and knowledge-based empirical evidence, time-limited from January to May 2020. Therefore, it was crucial to identify which national and EU laws affect and drive the circular business potential of the pilot communities and their collaborative ecosystem. Core pillars of the EU legislation and policies relevant to the envisioned by Pop-Machina social metabolism, governance, legal and tax challenges, are the following four (pillars):

1. circular economy (hereafter named as 'CE');
2. governance of open innovation;
3. collaborative production in competitive environments;
4. makers (their legal, labour and entrepreneurship status).

Therefore, an analysis of the current legislative framework was performed in advance, bringing out the tax, labour, contract, business law, and other policy-related issues that could favour or hamper the maker movement and CCP projects.

3 **European Commission.** (2015). Closing the loop- *An EU action plan for the Circular Economy (COM (2015) 614)*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52015DC0614> [last accessed 15/10/2020]

4 **European Commission.** (2016). *A European Agenda on the Collaborative Economy (COM 2016) 356*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52016DC0356&from=EN> [last accessed 15/10/2020]

5 **European Commission.** (2019). *Commission Staff Working Document Turkey 2019 Report (COM 2019/220)*. Retrieved from <https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/20190529-turkey-report.pdf> [last accessed 15/10/2020]. Turkey aligns with the EU common commercial policy despite the EU-Turkey Customs Union, since it still applies additional duties to a large number of imported products (pp.9893). National legislation is aligned with the EU *acquis* on consumer protection in non-safety related issues. However, enforcement, consumer awareness, coordination and cooperation with sectoral stakeholders remain insufficient(pp.95).

2. Identification of the framework conditions

2.1 Approach

This report includes the general framework of European legal challenges in the creation of a circular maker community (CMC) in the era of the collaborative economy.⁶ A set of principles, as evaluation criteria, determine the legal, governance and tax requirements of the circular production.

Because of this scope, the following principles apply:

- the framework conditions addressed are generic, in the sense that they must be of interest to any CMC, not identifying industry-specific national requirements;
- the international, national or regional legislative framework primarily ascertained a European perspective; thus, a literature review of mainly EU legal sources defined the applicable principles and requirements;
- the identified legislative framework focused on mandatory legal documents used as the basis of definitions and legal requirements. For this reason, voluntary initiatives, policy statements or other non-legally binding documents, are cited, if of value to Pop-Machina;
- the legal assessment framework must be conclusive and reproducible, possible to apply and integrate to any CMC, as a means to evaluate the perceived impact of compliance;
- practically, the legal assessment of generic EU-level regulations, principles and requirements, will be related to specific target values, under the condition to be traced to at least one legal source. However, multiple sources of law may apply to the same administrative need.

2.2 Sources, selection process and relevance to Pop-Machina

To achieve T2.4 task goals and to compile the necessary data, resources used emanated from available international, European and national accounts and regulations; global statistical reports; and information available from different functional areas. T2.4 sources included both hard (academic journals, EU and UN legislation, Eurostat, OECD), as well as innovatively sourced soft data (online news, web blogs). As mentioned, the legal evaluation of the referenced legislation was content-limited and time-restricted to selected EU sources of law that were current and most relevant to the Pop-Machina project. Such selection considered the following functional areas:

- EU and UN policy reports on business, cooperative and social entrepreneurship regulations, considering diversity, inclusion, Occupational Safety and Health (OSH) of makers;
- literature and blogs regarding the digital accessibility to collaborative platforms, taxation policies of digital transactions, of smart contacts and the Blockchain as a service (BaaS);
- secondary feedback emerging from prior Pop-Machina deliverables, although timewise concurrent.

D2.4 had to validate its first-stage research, with primary data compiled from different functional areas, needed for qualitative comparative analysis. To this goal, additional perception-based sources (multidisciplinary interviews and background reports on national framework conditions).

As mentioned, the municipal experts provided the primarily needed feedback from December 2019-April 2020, via perception-based and knowledge-based questionnaires, that tested their pro-

⁶ **European Commission.** (COM (2016) 356) *A European Agenda on the Collaborative Economy*. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2016%3A356%3AFIN> [last accessed 15/10/2020].

existing experience on the local development of circular collaborative actions or makerspaces (cited at Section 8.4 below). For example, interviewees answered whether a national legal framework on blockchain and social enterprises exists in their country that could serve to upscale circular production through makerspaces (both living labs or virtual online platforms).

Pop-Machina T.2.4 tested and measured such background knowledge of municipal representatives and local expert practitioners, as a way to explore the public awareness and infrastructural status of each pilot city on the circular and digital collaborative economy. Further, based on a stakeholders mapping, T2.4 comparative qualitative research identified the baseline for the value chains and framework conditions of pilot cities in their respective countries. Furthermore, by May 2020, together with interview feedback from national decision-makers (as detailed at Appendix 2sect. 5), detailed reports on the applicable national and municipal legislation of five participant countries (Belgium, Greece, Lithuania, Spain and Turkey) were collected for consortium use with the assistance of their support partners ETAM, CommonLawgic, ISM, UNICAN and PLANET TURKEY, respectively. According to such feedback, leading national enablers and barriers emerged through grounded hypothesis and qualitative comparative analysis, as analysed in Section 8.5 below.

2.3 Key Performance Indicators (KPIs) addressed in D2.4

According to the KPIs management plan (Appendix 1 herein) and the Grant Agreement (Pop-Machina GA, 2019), D2.4 mainly addresses KPIs 10 and 12, through a baseline perception-based analysis (PBA), and qualitative comparative analysis (QCA). The target values are as follows:

Box 1 KPIs 10 and 12

KPI-10. Socioeconomic contexts analysed and optimised based on project outcomes: 7 (in the seven pilot cities)

KPI-12. Legislative, governance and taxation contexts analysed and optimised based on the project outcomes: 7 (in the seven pilot cities)

Assigned KPIs 10 and 12 examine qualitative factors relying on opinions and perceptions of municipal expert practitioners at the early stages of Pop-Machina. This kind of QCA analysis was selected to evaluate ways of achieving desired positive behavioural change (advancement of maker movement) overcoming legal and practical barriers.

The perception-based analysis (PBA) (Saangeta et al., 2019) is used as an acknowledged methodology at the European Digital Social Innovation Indexes (EDSII). EDSII ranks cities, according to their Digital Social Innovation (DSI) maturity level as perceived by expert business executives. At this report, PBA identified, tested and assessed the degree of background knowledge of municipal expert practitioners that relate to KPI 12 impact factors, on the legal, tax and blockchain concepts of circular collaboration. Through interview surveys in each of the pilot cities, this report provides a knowledge baseline of framework conditions, time-limited to October 2020. Further details on the KPIs Management Plan, the limitations and optimisation recommendations are found in detail in Appendix 1, at the end of this report.

Task 2.4 proposes the future quantitative assessment of Pop-Machina's baseline impact with KPIs, key Themes, and sub-factors, based on the said stakeholders' mapping of the framework conditions of the pilot cities. Other Pop-Machina's consortium partners also address the requirements of KPI 10, with the progressive metabolic transformation of abandoned and decaying buildings into innovative pop-up makerspaces. T2.4 partially defined the related socioeconomic contexts (KPI 10), and legal, tax, governance factors (KPI 12) under a qualitative hypothesis of descriptive characteristics and not as accurately measured quantitative traits.

2.3.1 KPI 10 on socio-economic metabolism

D2.4 provides a holistic view of socioeconomic conditions (KPI 10), across both the pilot cities and Europe, based on a literature review on impact assessment (Girard, Nocca, Gravagnuolo, 2019; Fabbriatti and Biancamano, 2019; De Medici, Riganti, Viola, 2018).

Task 2.4 addresses KPI 10 on socioeconomic metabolism, following the commitments in the Urban Agenda for the EU – Action Plan,⁷ which supports the development of legislation for waste, issuing a Circular City Funding Guide. Urban resource centres are proposed for waste prevention, reuse, and recycling, addressing regulatory obstacles and drivers of urban circularity. Moreover, the Urban Agenda forms a Roadmap on Circular Resource Management and a collaborative economy Knowledge Pack for cities, on reuse and spatial management of buildings under the CE -core principles of ‘Pay-as-you-throw’- coaching toolkit. The long-term EU budget 2021-2027, provides a Commission-delegated modernisation of cohesion policy focusing on investment priorities for a Smarter Europe in terms of innovation, digitisation, and SMEs’ support; a Connected Europe, in terms of digital networks; a Social Europe, in terms of protecting quality employment, education, skills, social inclusion, access to healthcare with locally-led urban development towards sustainability across the EU.⁸

CE is a multifaceted topic in which the cooperation among multi-level administrations, businesses, public procurement, consumption, and resource management, all have to be balanced out. European cities jointly address urban metabolism and promote economic development, social inclusion and environmental protection with strong partnerships between society, business and government. Further, in the relevant literature, the ways material flows are transformed and returned to the environment by the city are essential factors to address questions of the sustainability effect of human behaviour on the metabolism of the city (Villarreal Walker et al., 2014). KPI 10 on socioeconomic criteria is, therefore, indirectly evaluated in D2.4 based on Pop-Machina pilot cities feedback and applied experiences.

A shift from mass to decentralised production enables local and small-scale making, local employment opportunities, along with a reduction of logistics and environmental impact of the current supply chain (Metta & Bachus, 2020, Pop-Machina D2.1, p. 24). However, cities must cope with KPI 10 multi-level governance challenges, under increasingly regressing conditions: fragmentation of the value ecosystem, reduced budgets, social and health issues (e.g. social distancing inequality, social exclusion) and over-urbanisation. Additionally, most of the consumers are not inclined to alter their behaviour. The bottom-up grassroots approach of the maker movement could accelerate citizen acceptance for the transition of cities towards a long-lasting CE model, incentivising consumers towards: a) production with shared prototypes, faster and cheaper, b) better material flow and sharing of resources through DSI and circularity certification strategies, and, c) global knowledge for solutions adapted to the local context of CE in production.

2.3.2 KPI 12 on legislative, governance and taxation contexts

KPI 12 target values derived from the QCA analysis of the EU and the national legal frameworks of Belgium, Greece, Lithuania, Spain and Turkey. These reports analysed how state actors cooperate through a ‘national strategy on the circular economy’, in order to achieve the national transition to a circular DSI model. Finding features of those reports are categorised as enablers or barriers in Section 9 of this study. Main legal challenges and sub-factors related to DSI in urban ecosystems are digital labour standards, consumer (prosumer) protection and accessibility rights, taxation incentives, and user safety in makerspaces. To that end, T2.4 identified and qualitatively compared various legal, policy, economic, social/cultural, and technological factors in each pilot city. Further legal challenges

7 **European Commission.** (2019). *Urban Agenda for the EU: Multi-level governance in action*. pp. 64-79. Retrieved from https://ec.europa.eu/regional_policy/sources/docgener/brochure/urban_agenda_eu_en.pdf [last accessed 15/10/2020].

8 12 idem.

involve the quality, liability and commercialisation of circular products, considering the Extended Producer's Responsibility (EPR) principle, as well as industrial symbiosis, reverse engineering and logistics schemes, competitive practices and Intellectual Property Rights (IPRs) in digital collaborative production.

Accordingly, Pop-Machina is seeking to transform the above provisions to user applications of CCP. The main target of T2.4 is to create pilot collaborative production solutions through open innovation, engaging the CMCs in a shared circular vision. Pop-Machina governance structure requires trained makers of circular products that join makerspaces to proceed in exchanging tokens and sharing know-how and IPRs with smart transactions through online platforms. EU taxation and digital services tax are complementary regulations that proactively regulate the emerging circular market at a governance level since the EU regulations are deemed to apply in every Pop-Machina participant country.

Another critical legislative target value is the business and company model that fits CE. CE initiatives are preferred by marginalised social groups or excluded from traditional lines of production. For that reason, CE is usually combined with the social economy. The EU vastly applies the enterprise term to any entity that meets the minimum criterion of being engaged in a social activity. There is still a lack of a uniform European legal model for Social Enterprises. However, aiming to upscale the cooperation of social enterprises at a European level, the EU Directive on the European Cooperative Society⁹ has come into force. Common area between CE and Social Economy is the rise of a new type of jobs, the so-called 'green jobs' related to sustainable development. The typical attendants of a makerspace consist of freelancers (self-employed), spin-offs or start-ups, that would be interested in being informed on the European and national company or social economy laws in force. As further explained in Section 4.1, the EU created regulatory provisions for a friendly business environment for small-medium enterprises (SMEs) and Social Enterprises in terms of funding opportunities. All the above buzzwords and key themes relate to KPI 12 value targets and are explained in detail in the following chapters.

2.3.3 Theoretical framework of KPIs selection

The theoretical framework for T2.4 KPIs was perception-based on interviews feedback from municipal expert practitioners and national policymakers of the seven pilot cities. Further, the KPIs and sub-indicators are based on additional feedback provided from 5.1 workshops, on the findings of other Pop-Machina deliverables and finally on a review of other existing DSI indices models. The Pop-Machina project gradually develops a functional crowdsourcing platform allowing the consortium partners to submit more target values, according to incoming data sources.

Combined with the review of academic literature and existing policy reports, this primary research distilled experts' perceptions to give a clear understanding of circular collaborative readiness, maturity or receptiveness at a city level. T2.4 aimed to address some novel metrics that provided interesting indicators, themes and subsidiary variables of circular collaborative innovation. KPIs 10, and 12, dealt in T2.4 have a generic and time-limited weighted significance. The practical implementation of the law, governance, taxation and technology factors evidence policymakers and citizens' supportive involvement into the local circular and social economy schemes.

There are similarities and differences between proposed indices from other social innovation models in the European and global context of digital urban metabolism – such as European Digital Social Innovation Indexes (EDSID).¹⁰ The experimental European Digital Social Innovation Index (EDSII) aims to measure and compare the capacity of cities to support DSI through composite

9 See **Council Regulation (EC) No 1435/2003**, on the Statute for a European Cooperative Society (SCE). (2003). OJ L 207. Available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32003R1435> [last accessed 15/10/2020].

10 **Digital Social Innovation**. What is DSI? Retrieved from <https://digitalsocial.eu/what-is-dsi> [last accessed 15/10/2020].

indicators, measuring the ecosystems of 60 cities in Europe over digital social innovation (DSI).¹¹ DSI4EU methodology could be applied voluntarily, given that Pop-Machina pilot cities are not included in the existing DSI mapping of 60 EU cities. It could be useful if Pop-Machina addresses the EDSII¹² methodology, based on steps detailed in the JRC/OECD Handbook on the construction of composite indicators (CI).¹³ The 32 open-access, multidisciplinary EDSI indexes are grouped alongside other related indicators into six themes: (1) skills, (2) infrastructure, (3) funding, (4) diversity and inclusion, (5) collaboration, and (6) civil society. The EDSII ranks the cities capacity to support the growth of digital social innovation, determining weighted indicators and themes through a perception-based (PBA) survey among 114 DSI practitioners, public sector employees, researchers, intermediaries, funders and policymakers.¹⁴

Based on the mentioned EDSII methodology, the D2.4 questionnaires were structured to address some thematic indicators adjusted to KPI 12 target values on the circular collaborative economy, such as skills (company law, tax and OHS incentives, digital and technical skills of the workforce) and governance (executive accountability, open government, civic participatory capacity, adaptability) for the seven pilot cities. D2.4 served as the baseline of the updated vision of the pilot cities, during the first year of the project. Therefore, it could address but not measure (timewise) quantitative data, on the legal, tax and governance indicators or metrics of the circular economy, social collaboration, workforce health and safety, business environment of pilot cities.

Besides, KPIs 10 and 12 will be projected at the later Pop-Machina tasks through simplified reporting and qualitative comparative analysis (QCA) with dashboards and data visualisation tools. Yet, the drivers and barriers that relate to KPI 12 are visualised in the diagrams of Chapter 8, based on the primary data collected. This method of descriptive statistics for reflected key-aspects of policies, including such of digital transition and governance interest, were indicatively prioritised, enabling recommendations before the policy discussion phase of Pop-Machina project.

Given that all answers from Pop-Machina interviewed experts contained verbal responses, there was a need for numerical codification and quantitative evaluation of such feedback. Specifically, the transfer from narrative data to a computational dataset was achieved, by transforming each verbal statement/response (even of the void ones) into a numerical form. Based on the positive or negative tone of the respondent responses were distinguished into two main categories. Responses that were deemed ‘positive or optimistic’ for prosperous success were categorised as ‘drivers’, thus, characterised with ‘scale of achievement {1}’. ‘Negative or pessimistic’ responses were considered as ‘barriers’, therefore, described with the ‘scale of constraint {0}’. Void, null or invalid responses were regarded as seemingly belonging in the area of ‘barriers’. Subsequently, in conducting the numerical codification of the collected verbal responses, each verbal statement/response was associated with the {driver, barrier} duality, counted with the numerical index {1, 0}, respectively. This statistical approach enabled the attribution of a counted valuation ‘0’ or ‘1’ to account for every response.

Pop-Machina T.2.4 KPIs are discussed, in conjunction with other related KPIs of indirect influence, especially to the KPI 4 (focusing on plastics, food waste,¹⁵ critical raw materials, construction, and demolition products), KPI 25, 26, 27, that act as project targets limitations over secondary raw materials, workforce balance, social inclusion of vulnerable groups, diversity and gender parity, waste management, the market for secondary raw materials, innovation in production and consumption.

11 **Nesta and Digital Social Innovation.** (2019). European Digital Social Innovation Index (EDSII) Construction Methodology. Retrieved from <https://digitalsocial.eu/images/upload/87-EDSII-Construction-Methodology.pdf> [last accessed 25/10/2020].

12 The European Digital Social Innovation Index. DSI Data Visualisation. Retrieved from <https://digitalsocial.eu/viz/#/map?l=0&e=0&x=-132.391&y=441&k=1> [last accessed 25/10/2020].

13 See JRC/OECD & European Commission. (2008). Handbook on Constructing Composite Indicators: Methodology & User Guide. Retrieved from <https://www.oecd.org/sdd/42495745.pdf> [last accessed 15/10/2020].

14 **Nesta & Digital Social Innovation.** (2019 June). European Digital Social Innovation Index (EDSII) Construction Methodology. Retrieved from <https://digitalsocial.eu/images/upload/87-EDSII-Construction-Methodology.pdf> [last accessed 25/10/2020].

15 **European Commission.** EU actions against food waste. Europa. Retrieved from https://ec.europa.eu/food/safety/food_waste/eu_actions_en#:~:text=The%20Commission%20has%20implemented%20all,waste%2C%20food%20and%20feed%20and [last accessed 23/10/2020].

According to the updated vision of the pilot cities, Pop-Machina pilot partners seem to focus on plastics, food waste, critical raw materials, construction and demolition products. Assigned KPIs also align with other reporting frameworks, such as SGI¹⁶ (thoroughly discussed in Section 3 below) and the European Digital City Index (EDCi)¹⁷ and the Digital Economy and Society Index (DESI).¹⁸ Other useful sources of indexes can be found at Fab City Dashboard¹⁹ and OECD Better Life indexes.²⁰

2.4 Core principles on circular economy

The European Union has developed an extensive legislative framework in order to promote the extension of a product's life cycle, the prevention of waste generation, and the promotion of recycling. All these legislative tools promote the Circular Economy Action Plan and impose commitments and obligations to various stakeholders. The EU adopted a *New Action Plan on Circular Economy*²¹ (March 11th, 2020) as the main block to the *New Green Deal*²² (11.12.2019) and created informative²³ implementation channels.²⁴ The starting point of this research is the European Action Plan for the Circular Economy²⁵ (as lately updated) that sets the strategic guidelines for initiatives in the EU Member states and Turkey as an EU candidate Member State.

From a literature viewpoint, circular economy (CE) is classified as a) CE of products and b) CE of processes, having distinct routes of implementation, abiding legislation, and strategic developmental planning. Besides, CE processes depend on different rounds of materials and cycling flows of a three-level deployment: inter-enterprise circulation, regional circulation, and social circulation (Kyriakopoulos et al., 2019). CE of products is primarily determined as promoting circular innovation in the handling of products like plastics, food waste, critical raw materials, construction/demolition, biomass, and biobased products. At both CE-based schemes, the EU seeks to create structures adaptable to the linear model of production, in order to replace them with circular gradually. However, this transition unavoidably necessitates the supplementary co-existence of linear and circular products or services or processes. Central pillars to the promotion and implementation of CE are the municipalities since they customise engagement strategies (small-scale), aligned with the specific characteristics of their communities, the relevant value chains and the material flows (both inflows and outflows).

The new Circular Economy Action Plan suggests measures to make sustainable products the norm in the EU; empower consumers and public buyers; focus on sectors of high circularity potential such as electronics and ICT; packaging; plastics; textiles; construction and buildings and food. The vision behind this is to 'turn the Union into a digitally circular, resource-efficient, green and competitive low-carbon economy'.

16 **SGI Sustainable Governance Indicators** & Bertelsmann Stiftung. (2018). Policy Performance and Governance Capacities in the OECD and EU. Retrieved from https://www.sgi-network.org/docs/2018/basics/SGI2018_Overview.pdf [last accessed 15/10/2020].

17 **European Digital City Index 2016**. EDCi. Retrieved from <https://digitalcityindex.eu/> [last accessed 15/10/2020].

18 **European Commission**. (2020). The Digital Economy and Society Index (DESI). Europa. Retrieved from <https://ec.europa.eu/digital-single-market/en/desi> [last accessed 15/10/2020].

19 **Fab City Dashboard**. vo. 15. Retrieved from <http://dashboard.fab.city/> [last accessed 15/10/2020].

20 **OECD Better Life Index**. How's life? Retrieved from <http://www.oecdbetterlifeindex.org/#/21121111111> [last accessed 15/10/2020].

21 **European Commission**. (2020). EU Circular Economy Action Plan. Retrieved from https://ec.europa.eu/environment/circular-economy/index_en.htm [last accessed 15/10/2020].

22 **European Commission** COM(2019) 640. The European Green Deal. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN> [last accessed 25/10/2020].

23 **European Commission**. (2020). EU Circular Economy Action Plan. Retrieved from https://ec.europa.eu/environment/circular-economy/index_en.htm [last accessed 15/10/2020].

24 **European Commission**. (2019). First Circular Economy Action Plan. Retrieved from https://ec.europa.eu/environment/circular-economy/first_circular_economy_action_plan.html [last accessed 15/10/2020].

25 **European Commission**. (2020). EU Circular Economy Action Plan. Retrieved from https://ec.europa.eu/environment/circular-economy/index_en.htm [last accessed 15/10/2020].

At the core of such strategy lies the European legislation on Waste management, cited at in detail at Appendices 3 and 4, and briefly referenced below:

- a) The Waste Framework Directive (WFD) 2008/98/EC²⁶ that was recently amended by Directive (EU) 2018/851;²⁷
- b) The Commission Decision 2014/955/EU on the list of wastes²⁸ and;
- c) The Directive 2018/852²⁹ amending Directive 94/62/EC on packaging and packaging waste.

In particular, WFD has, since 2008, introduced the following principles:

- a) ‘the **polluter – pays**’ principle, as described in article 14 (1) of WFD, ensures that the price of goods endorses the costs of preventing, controlling, and cleaning up pollution;
- b) ‘the **proximity**’ principle, in article 16 (3) of WFD, promotes the local waste management;
- c) ‘the **preventive and precautionary**’ principle introduced by the waste hierarchy in article 4 (1) of the WFD form of the priority tier between a material and a waste, upon examination preventing disposal. Following preferable actions, according to the waste hierarchy would be preparing for reuse, recycling, (energy) recovery, and the least preferred is the disposal;
- d) ‘the **self-sufficiency**’ principle established in article 16(2) of WFD encourages each Member State to promote recovery actions to become self-sufficient in waste disposal and recovery.

Additional for the development of the circular economy are:

- e) the **end-of-waste criteria** (article 6 of WFD), to determine when specific waste ceases to be waste and obtains the status of a product (as secondary raw material). The objective of end-of-waste criteria is to remove the administrative burdens of waste legislation for safe and high-quality waste materials and recyclables, product standardisation and quality assurance; improving harmonisation and legal certainty in the recyclable material markets;
- f) the **by-products**, as defined at the WFD, are the substances or objects from a production process. However, the primary aim is not the production of that item, regarded as not being wasteful. By-products from a wide range of industries have different environmental effects. Moreover, false identification of a by-product may cause environmental damage or unnecessary costs for business; therefore, manufacturers have to consider the by-products disposal cautiously.

In alignment to this D2.4 publication the European Policy Center (EPC) recently issued a roadmap for a digital circular economy and initiated several policy dialogues³⁰ on how blockchain and digitally-enabled solutions can disrupt current linear practices and boost synergies for the transition to circularity (Hedberg, Sipka & Bjerkem, 2019).

²⁶ **Waste Framework Directive (WFD)** 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Text with EEA relevance), (2008). OJ L 312, Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN> [last accessed 27/10/2020].

²⁷ **Directive (EU) 2018/851** of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste (Text with EEA relevance) PE/11/2018/REV/2. (2018). OJ L 150. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.150.01.0109.01.ENG [last accessed 15/10/2020].

²⁸ **European Commission** Decision 2014/955/EU of December 18th, 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament and of the Council Text with EEA relevance. (2014). OJ L 370. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32014D0955> [last accessed 15/10/2020].

²⁹ **Directive (EU) 2018/852** of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste (Text with EEA relevance) PE/12/2018/REV/2. (2018). OJ L 150, Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32018L0852> [last accessed 15/10/2020].

³⁰ **European Policy Centre (March 2020)** The Circular Economy: Going Digital. Retrieved from <https://circulareconomy.europa.eu/platform/en/knowledge/circular-economy-going-digital> [last accessed 27/10/2020].

3. Governance

Governance is defined as citizens-centric collaboration, participation and engagement in informal shared practices. The term governance comprises the organised decision-making processes of governing collectively with social actors. Further, the term governance means processes in government led by the interaction and collaboration between different stakeholders (Alonso & Lippez-De Castro, 2016). Smart and Data-based Governance in cities lately advances through online platforms, blockchain and Factories of the Future (FoF) technologies using digital tokenisation, as an alternative paying method among collaborative (peer) communities.

Pop-Machina framework conditions relate to open innovation governance, as defined by Chesbrough in 2006 as 'knowledge inflows and outflows to accelerate internal innovation and expand the markets for external use of innovation' (Pedersen, 2020). Chesbrough initiated the theory on 'Open Innovation strategy for creating and profiting from technology'. Open innovation advances with a transactional approach of knowledge, packaged into intellectual Property (IP) commodities acquired and sold, or qualified and controlled, through contractual agreements (Pedersen, 2020). The 'digital circular city' provides an opportunity to work with enthusiastic city managers towards a legitimately sustainable concept (Prendeville et al., 2018). A wide range of institutional action plans and formal declarations are required to put forward positive measures on upcycling. Besides, policies from design and shaping to implementation, monitoring, reporting, and evaluation are perceived the shared responsibility between different tiers of government (Kanuri et al., 2020; European Commission Subgroup, 2020; Levarlet et al., 2020). Examples of open innovation governance are Lego's, NIKE's and Procter and Gamble (P&G) collaborative strategy to increase competitiveness, growth and extroversion through decentralised innovation (Livescaut, 2019). With knowledge sharing, large manufacturers lower innovation costs and link to the best technologists anywhere in the world, bringing new product and service development closer to customers. Makers create shared value, with the productive symbiosis of secondary raw resources (Björn Remneland & Styhre, 2019), mutual learning from stakeholders and, by opening up new revenue streams through otherwise protected, IP routes. However, well-rounded European legislation on these innovative issues is not yet in force. To adopt open innovation, makers need to translate in practice the digital making into a circular vision and engage, under symbiotic ties, with significant stakeholders (municipalities and large manufacturers).

Box 2 The Pop-Machina governance structure

Therefore, the Pop-Machina Governance structure advances online project collaboration with the sharing of data, knowledge and intellectual property rights (IPRs) among engaged makers in a Circular Maker Community (CMC), with the use of smart contracts and digital tokens. The Pop-Machina open innovation Quintuple Helix governance structure (among municipalities, academia, industry, citizens and CE) allows the makers (participants in Pop-Machina platform and maker-spaces) boost circular production through partnerships with spin-offs, social enterprises and SMEs. The engagement challenge of the makers’ movement is how to motivate users to join collaborative networks of circular makers; co-create shared value, contributing and sharing their know-how and IPRs, for the mutual benefit of a circular ecosystem. Pop-Machina needs to create its ecosystem with a shared symbiotic vision and culture for a transition to Circular Maker Communities (CMCs).

T2.4 examines Governance emerging legal challenges in the context of Pop-Machina with regards to the steering and reforming capacity, maturity and readiness for a digital transition to the circularity of the key administrative actors (government and municipalities). Therefore, the Executive Capacity for knowledge spillover and adaptability was tested through knowledge-based and perception-based questionnaires to each countries’ expert practitioners. Sustainable Governance depends on leaders facilitating long-term public mechanisms for the interest of future generations. Therefore, institutional learning, background knowledge, and the capability for implementation of innovative actions are regarded as Executive Accountability. To that goal, we considered the globally implemented methodology for the construction of the **Sustainable Governance Indicators³¹ (SGI)** on policy performance and governance capacities of 41 EU and OECD countries. The SGIs match and tailor well with the governance issues addressed by KPI 12 target values. The SGI pillars evaluate how a country’s institutions advance the executive capacity and adaptability, as well as how and to what extent citizens and NGOs exercise their participatory competence to set their government accountable for its actions or omissions. Policymakers can stimulate pop-up environments for urban sustainability, as well as business, citizens, and communities into bottom-up grassroots activities (Prendeville et al., 2018). The following SGIs (related to governance KPI 12 sub-factors) analyse the interaction with the participatory social actors.

Figure 1 Snip-part was taken from Sustainable Governance Indicators (SGI) 2018 pp. 70/2³²

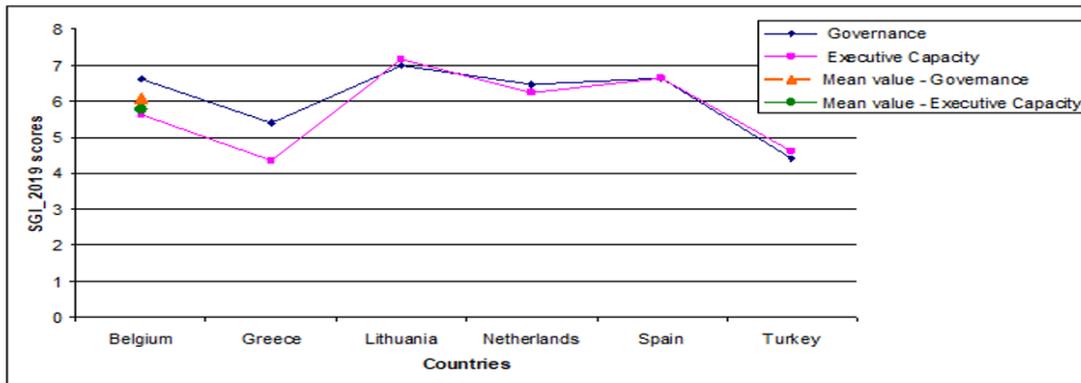


Therefore, governance and executive capacity of the six Pop-Machina countries and the seven pilot cities were examined based on the countries’ SGI scores, publicly uploaded online. They are visualised on a diagram based on SGI scores 2019 (Figure 2) below:

31 **SGI Sustainable Governance Indicators & Bertelsmann Stiftung.** (2018). *Policy Performance and Governance Capacities in the OECD and EU*. Retrieved from https://www.sgi-network.org/docs/2018/basics/SGI2018_Overview.pdf. pp.70-74/232 < [last accessed 15/10/2020].

32 Idem.

Figure 2 SGI Scores on Governance and Executive adaptability of Pop-Machina countries (2019)



In general, the SGI’s governance methodology evolves from country reports on sound empirical - annually updated- data, and builds upon qualitative assessments of three country reviewing experts. Therefore, D2.4 framework findings are similarly built upon municipal and national decision-makers’ perceptions, as extensively analysed in Chapters 2.3.3 and 8. At a state level, four more SGI factors (Open government, Adaptability, Citizens participatory competence and Executive accountability) were deemed essential pillars of governance for the grassroots needs of the Pop-Machina project. National 2020 SGI downloads³³ provided the authors with the needed scores to visualise governance framework conditions (on adaptability, executive accountability, civic participation, open government). Scores of those four SGI factors of the six countries of interest (Belgium,³⁴ Greece,³⁵ Lithuania,³⁶ Netherlands,³⁷ Spain,³⁸ Turkey)³⁹ updated in 2020, are cited in Figure 3.

33 Downloads SGI 2020. Sustainable Governance Indicators. Retrieved from <https://www.sgi-network.org/2020/Downloads> [last accessed 15/10/2020].

34 Castanheira, M., & Rihoux, B., & Bandelow, N. (2020). SGI Belgium Report. Retrieved from <https://www.sgi-network.org/2020/Belgium> [last accessed 27/10/2020].

35 Sofropoulos, D., & Huliaras, A., & Karadag, R. (2020). Greece Report. Retrieved from <https://www.sgi-network.org/2020/Greece> [last accessed 27/10/2020].

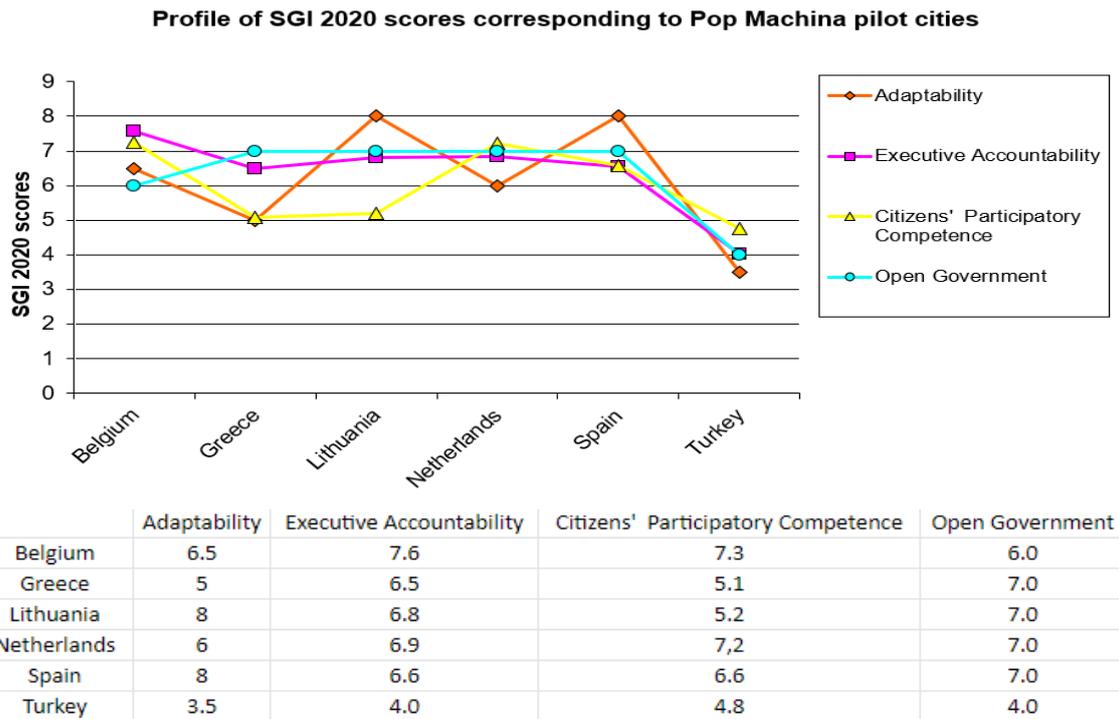
36 Nakrosis, V., Vilpisauskas, R., & Jahn, D. (2020). Lithuania Report. Retrieved from <https://www.sgi-network.org/2020/Lithuania> [last accessed 27/10/2020].

37 Hoppe, R., & Krouwel, A., & Bandelow, N., (2020). Netherlands Report. Retrieved from https://www.sgi-network.org/2020/The_Netherlands [last accessed 27/10/2020].

38 Kölling, M., & Molina, I., & Colino, S., (2020). Spain Report. Retrieved from <https://www.sgi-network.org/2020/Spain> [last accessed 27/10/2020].

39 Genckaya Ö., & Togan, S., & Schulz, L., & Karadag, R. (2020). Turkey Report. Retrieved from <https://www.sgi-network.org/2020/Turkey> [last accessed 27/10/2020].

Figure 3 SGI Scores 2020 of Belgium, Greece, Lithuania, Netherlands, Spain, Turkey



The participatory open governance of the collaborative economy crucially depends on the integration of innovative policies through offline (in makerspaces), and online actions (on digital platforms) and each country presents a different digital social innovation capacity. To that end, D2.4 research methods were structured, based on national reports and interviews to experts on the municipalities' capacity maturity and readiness. It was evident that in order for the makers' movement to upscale, all the above factors regarding civic adaptability and governmental steering conditions are of crucial importance.

3.1 Governance of the collaborative economy

Collaborative Economy from a peer-to-peer socioeconomic approach aims at creating a higher collective value. The collaborative economy is based on new forms of trade and work organisation. The services and goods are pooled to allow higher utilisation rates. Actors of the collaborative economy gather in communities (networks) and often use digital platforms (mainly numerical) as a means to exchange resources (tangible and intangible) (Metta & Bachus, 2020, Pop-Machina D2.1, p. 68). However, given that collaborative economy is a relatively new phenomenon and mostly unregulated, the European Commission (EC) issued in 2016, the *COM (2016) 356* 'European agenda on the collaborative economy'.⁴⁰ EC clarified the legal challenges of this new economic model in a broad terminology for the collaborative economy.

40 European Commission. (2016). A European Agenda on the Collaborative Economy. COM (2016) 356. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52016DC0356&from=EN> [last accessed 15/10/2020].

Box 3 Terminology for the collaborative economy

'Collaborative economy' refers to business models where activities are facilitated by collaborative platforms that create an open marketplace for the temporary usage of goods or services. The collaborative economy engages three categories of actors:

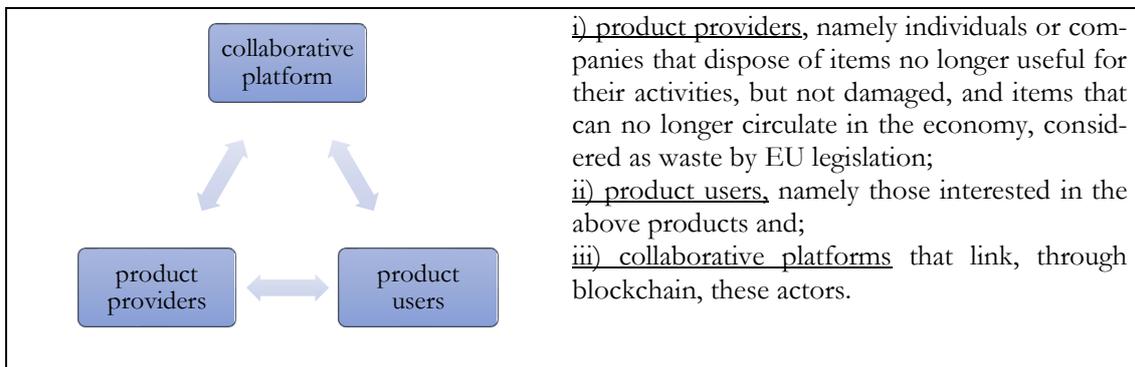
- (i) service providers who share assets, resources, time and skills - offering services on an occasional basis ("peers") or acting in their professional capacity ("professional services providers");
- (ii) users of these services, and;
- (iii) intermediaries that connect - via an online platform - providers with users, facilitating transactions between them ("collaborative platforms").

Collaborative economy transactions do not always mean a change of ownership and can occur for-profit or not-for-profit.

Within the scope of the collaborative economy's definition by the EC, collaborative platforms facilitate access to goods and services -instead of ownership transfer- and conclude transactions between parties, which are peers (Hatzopoulos, 2018). In the core of the notion of the collaborative economy is the culture of sharing. In the context of the Pop-Machina initiative, the collaborative economy is examined as a new way of trade and work. This conceptual framework requires some kind of material ownership transfer when engaging in circular activities.

A collaborative makerspace can either engage in repairing activities or in upcycling activities (creative reuse), the latter calling for the makerspace to have somehow ownership of its products. Therefore, Pop M collaborative pilot platform resembles more to the concept of a trade broker (although a non-profit one as an EU funded pilot project). Seeking to link a collaborative economy with circular economy and maker economy presents further challenges to an already complex regulatory framework. The aim of Pop-Machina, according to the 'European agenda on the collaborative economy',⁴¹ is to engage the community users in collaborative circular activities using makerspaces and digital platforms. This collaborative economy model creates triangular relations among the following actors, illustrated in Table 1:

Table 1 Collaborative economy triangular scheme



There are European and national by-laws applicable that impede the determination of the rights and obligations of the parties involved. European Commission suggests that in order to determine the suitable set of rules, each case should be assessed *ad hoc* [COM (2016) 356]. This legal ambiguity is further reinforced by the fact that the relevant national legislation, when existing, is not harmonised; thus, there is a different legal status on collaborative economy per country.

41 Idem.

For Pop-Machina, the physical makerspace consists of an informal platform to share skills, knowledge, tools and workspace. The digital collaborative platform links users and service providers to share raw materials, designs and products. Users could produce remanufactured products, accompanied by a circularity certification, a QR code as a warrant of secondary raw sources, from recycling or energy recovery processes. Digital technologies, like 3D printing, may improve the manufacturing of many urgently needed spare parts. Data sharing via online platforms could help to identify and recover spares or equipment that can be remanufactured, instead of having an appliance recycled or repurposed at a lower value.⁴² Collaborative consumption and production consist of disruptive innovation options for consumers and prosumers to shift from the present linear model to CE. Further shared ownership among multiple consumers sharing the right to use, by paying a charge, consist of new collaborative models (e.g. sharing, lending, trading, renting, gifting) (Ghisselini, 2015). In circular waste management, collaborative policies could accelerate with the positive and inclusive impacts of digital technologies.⁴³

The fourth industrial revolution (IND 4.0) creates the necessity of a revolution in governance at all levels: international cooperation, national, regional, municipal, and corporate. However, the digital platforms require upskilling or re-skilling of the workforce in digitalisation⁴⁴ and the deployment of connectivity at European or global scale, e.g. through the expansion of 5G networks, and a harmonised legal and licencing environment. This transition requires a digital technology evolution to allow safe online transactions; there is a new role for the private sector, academia and public officials to provide expertise in developing digital technologies. The collaborative economy is closely related to economic, cultural, and societal challenges; meeting supply and demand with a high concentration of population in urban areas; creating new employment opportunities and new channels of communication; strengthening social inclusion (Hatzopoulos & Roma, 2017). Digitalisation technologies, like Artificial Intelligence (AI) and Blockchain, present the ways to fight inequality by advanced transparent data analysis.⁴⁵ However, the digital and blockchain technologies have severe negative externalities, due to the energy consumption and of the electronic devices and data centres involved. They have considerable e-waste footprint; thus, environmental concerns should not be underestimated. Lately, the European Commission has set the Collaborative Economy⁴⁶ Agenda (as approved by the European Parliament),⁴⁷ recognising the untapped growth potential of the collaborative production schemes.

42 See <https://circulareconomy.europa.eu/platform/sites/default/files/pub_9285_drce.pdf> [last accessed 10/2/2020]

43 See ISWA pp. 13/90 [last accessed 15/10/2020].

44 See **Digital Europe**, A stronger digital industrial Europe - Digital Transformation as its FOCUS. Retrieved from <https://www.digitaleurope.org/policies/a-stronger-digital-industrial-europe-digital-transformation-as-its-focus/> [last accessed 27/10/2020].

45 **European Commission. Digital Economy and Skills**. Retrieved from <https://ec.europa.eu/digital-single-market/en/content/digital-economy-and-skills-unit-f4> [last accessed 15/10/2020].

46 See '**A European agenda for the collaborative economy**'. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2016%3A356%3AFIN> [last accessed 15/10/2020].

47 Idem. Retrieved also from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0356&from=EN> [last accessed 15/10/2020].

Box 4 Governance structures of the circular collaborative economy

COM 2020/98 that outlines the New EU Circular Economy Action Plan (11.3.2020)⁴⁸ defined the governance structures needed to upscale the circular collaborative production: Digital technologies may track the journeys of products, components and materials with securely accessible data. Smart circular applications provide the governance system to drive services, such as product passports, resource mapping and consumer information.

Moreover, a Resolution on the Product Safety in the Single Market (particularly on those products sold online embedded with AI) calls for a revision of the current product safety legislation (the General Product Safety Directive and the Machinery Directive).⁴⁹ More on the ‘waste and product passport’ and ‘right to repair’ can be found in Chapter 6.3 herein.

Therefore, the recent *European Regulation on platform-to-business relations (P2B Regulation) (June 20th, 2019)*⁵⁰ provides a harmonised framework in place for minimum transparency and remedy rights for business users of online intermediation services. As well the *Digital Single Market Strategy for Europe*⁵¹ is significant since each of the seven pilot municipalities form a local marketplace in the European Single Market. In line with the EC, Pop-Machina creates an online platform to facilitate communication, information on resource mapping and product passports, and transactions among engaged stakeholders.

3.2 Collaborative makerspaces

Living Labs, Fab Labs, Hackerspaces, and Makerspaces are the physical workspaces of the maker movement that provide communities, businesses, and entrepreneurs, the infrastructure and manufacturing equipment indispensable to turn their ideas and concepts into reality (Rosa et al., 2017). Collective grassroots, bottom-up maker movements in cities, ‘Do-it-yourself’ (DIY) or ‘Do it Together’ (DIT) communities of people with various skill sets, different backgrounds disrupt the context of traditional linear models.

A makerspace is defined as a community place which can host a workshop, is open to the public and where tools are present for share use. Maker spaces usually combine manufacturing tools, community and educational means to enable community members to design, prototype and create manufactured objects that would not be possible for someone working alone (Metta & Bachus, 2020, Pop-Machina D2.1, p. 69).

48 **COM (2020) 98** final. A new Circular Economy Action Plan for a cleaner and more competitive Europe. (11.3.2020). Retrieved from https://ec.europa.eu/environment/circular-economy/pdf/new_circular_economy_action_plan_annex.pdf [last accessed 27/10/2020].

49 **EU Parliament News**. (26/10/2020) EU consumers should enjoy a ‘right to repair’ and enhanced product safety <https://www.europarl.europa.eu/news/en/press-room/20201024IPR90101/> [last accessed 27/10/2020].

50 See **Regulation (EU) 2019/1150** of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32019R1150> [last accessed 15/10/2020].

51 **European Commission**. COM(2015) 192 final: A Digital Single Market Strategy for Europe. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0192&from=EN> [last accessed 15/10/2020].

Box 5 Pop-Machina collaborative makerspaces

Pop-Machina explores the potential of digital collaboration (online activities) in physical makerspaces⁵² (with offline activities) in the sense of sharing knowledge, prototypes, ideas, equipment tools and workspace by users who wish in upscaling their and commercialising their circular production. Within the context of Pop-Machina, a makerspace acts as the urban spatial linkage of the creative and innovative spirit of local makers' communities and the sustainability aspect of circular production. Further, as an indirect result of the transition to the 4th Industrial Revolution,⁵³ makers in makerspaces can take advantage of digitally open-access tools, such as software and online platforms, 3D printers, CNC and laser cutters (Van Holm, 2017, Wolf-Powers, 2017). Pop-Machina project also showcases the operation of a collaborative marketplace for makers under the form of an integrated social collaboration platform (SCP), Open Knowledge tool (OKT) and Data Collection and Analysis tool (DCAT).

Additional comparable evidence on the Pop-Machina social collaboration platform (SCP) evolved from the elicitation process of Pop-Machina D2.5 (Dimitriou, 2020), which elaborated on the user and business requirements of the pilot cities. The requirement-gathering proved that each business requirement produces one or more user requirements. Pilot cities have to consider early the business requirements to align with the scope of Pop-Machina collaboration platform. D2.5 delivered a precise mapping of requirements as specific platform components, in order to guide the technical partners, transform these requirements into functional and non-functional system requirements (Dimitriou, D2.5, p.18).

The system builds an SCP as a news channel for letting the community be informed about events, findings and outcomes of the work of the project, to address relevant and applicable policies and legislation of the maker movement. (Dimitriou, 2020, D2.5, p.16). The SCP also functions as a marketplace, enabling transactions among the stakeholders, validating material and equipment usage, circular economy processes and all transactions between pairs of users of the makerspace system. The open knowledge tool (OKT) complements the social collaboration component supporting Pop-Machina users to share knowledge, consisting of a learning management system (LMS) that hosts skills and machinery training resources, best practices, webinars and workshops for disseminating knowledge. Matchmaking algorithms propose collaboration among stakeholders whose offer and demand are complementary. Blockchain technology sustains the ledger of material used in the production line of the products, which is the outcome of the making procedures and records relevant certificates. The value of labour for making, of materials, is certified for circularity through a QR, correspond to tokens. The tokenisation of services and materials, along with the smart contracts registered in the blockchain ledger, display the interactions among the system's users, the marketplace with a description of end-products and prices in tokens (D2.5, p.15).

The Pop-Machina platform is of considerable practical socioeconomic and urban metabolism value, both for the European Union, as the funding body, for the municipalities, but also researchers' work.

However, Pop-Machina has to consider factors such as diversity, digital accessibility and workforce inclusion of disadvantaged, marginalised and vulnerable social groups in the safe, decent and fair operation of a makerspace, needing gamification skills in the use of digital services. Therefore, two main policy actions have to be considered such as the European Accessibility Act⁵⁴ (aimed at

52 See **Makerspaces.com** <https://www.makerspaces.com/what-is-a-makerspace/> [last accessed 15/10/2020].

53 See **Digital Europe**. A Stronger Digital Europe: Our call to action towards 2025. Retrieved from <https://www.digitaleurope.org/wp/wp-content/uploads/2019/02/DIGITALEUROPE-%E2%80%93-Our-Call-to-Action-for-A-STRONGER-DIGITAL-EUROPE.pdf> [last accessed 15/10/2020].

54 **European Commission**. European Accessibility Act. Europa. Retrieved from <https://ec.europa.eu/social/main.jsp?catId=1202> [last accessed 27/10/2020].

improving access to goods and services for disabled or older adults) and the *Digital4Her declaration*⁵⁵ (aiming to get more women into the technology sector).

3.3 Industrial symbiosis

Industrial symbiosis (IS) is a systematic form of brokering businesses into innovative business collaborations, finding ways to use other's waste as raw material for another. The IS concept relates to sustainable and integrated industrial ecosystems sharing underutilised resources (materials, energy, water, capacity, expertise, assets) (Lombardi & Laybourn, 2012). IS involves organisations operating in different sectors involved in mutually beneficial transactions for the reuse of waste and by-products, sourcing, materials, optimising the value of the residues of their processes, using waste or by-products from one process as an input for another. Cooperation fostering industrial symbiosis requires market potential, good practice, and further policy actions.⁵⁶ Regional or more extensive cooperation in industrial symbiosis can reduce the need for virgin raw material and waste disposal, and become a fundamental driver of the circular economy, reducing emissions and energy use, creating new revenue streams.

Within the concept of Pop-Machina, pilot cities must register their urban stakeholders and the possibilities/willingness for them to create communities, synergies, and clusters. In order to create the right conditions for an industrial symbiosis strategic plan, it is essential the creation of an online digital platform where all industrial companies within a Region or a Municipality should present the qualitative and quantitative characteristics of their generated waste. In EU member states the required by law, environmental impact assessments (EIA Directive 2011/92/EU) of industrial activities should be linked to the IS digital platform for verification and acknowledgement firstly of the generated and then for the exchanged waste. Thus, EIA could become a credible component of the IS process and could boost its transparency and effectiveness.

Furthermore, the findings of any external audits to industrial facilities performed by Environmental Auditors should be recorded on the IS online digital platform. There are many symbiotic barriers to cooperative and collaborative initiatives. Still, there is a lack of supportive culture, which is an essential prerequisite for both the makers' movement, as well as the circular economy. If social entrepreneurs and local small businesses are willing and open to cooperate, the acceptance rate of new models of industrial action will increase. Municipalities, together with local Chambers of Commerce could identify potential local collaborative synergies of industrial symbiosis and enforce them. Urban resource management depends on the business and civic engagement of a city's metabolism, meaning that cities need to 1) identify and understand material stocks and flows within the participant cities, and, 2) the different turnover speed of the resource flows, depending on the type of secondary resources (Dimitriou, 2020, Deliverable 2.5:126).

3.4 Three-dimensional (3D) printing in makerspaces

The establishment of a fully equipped makerspace acting as a sustainability helpdesk for sharing designs and manufacturing ideas, especially for prototyping activities, is a much-needed enabler for the advancement of the makers' movement. Circular products and services will arise slowly as different industries adopt new technologies, such as 3D printing processes (or additive manufacturing) that can advance prototyping and spare parts replacement. 3D printing can contribute to many phases of the CE system (Van Wijk & Van Wijk, 2015); especially in maintenance (print broken parts),

55 **European Commission.** Women in Digital EU. Europa. Retrieved from <https://ec.europa.eu/digital-single-market/en/women-ici> [last accessed 15/10/2020].

56 **European Commission** (2018) Cooperation fostering industrial symbiosis. Doranova, Domenech & Smith. Technopolis group. Retrieved from <https://www.technopolis-group.com/wp-content/uploads/2020/02/Cooperation-fostering-industrial-symbiosis-market-potential-good-practice-and-policy-actions.pdf> [last accessed 25/10/2020].

reuse/remanufacturing (upgrading parts), and for the recycling of products and goods (by using secondary raw materials -usually plastics- as a resource for 3D printing).

However, 3D printing is a serial (very slow) process, prone to be used currently for prototyping or limited production of small batches. 3D printed metal parts are prone to fractures since they may not have the same granular composition than traditional manufacturing.

Nevertheless, CE can benefit from reusing, especially plastic waste as secondary raw material for 3D printers in makerspaces open to the public. In more detail, ISO/ASTM 52900:2015⁵⁷ defines 3D printing as a term ‘often used in a non-technical context synonymously with additive manufacturing.’ The term 3d printing refers to the low-end quality and price machines, while the industrial context relates to additive manufacturing. Both definitions have been standardised officially according to ISO/ASTM 52900:2015 – Additive manufacturing – General principles – Terminology, defined as: ‘3D printing is the fabrication of objects through the deposition of a material using a nozzle, print head, or another printer technology. The machine used for 3D printing is a 3D printer. Additive Manufacturing (AM) is a joining materials process to make parts from 3D model data, layer upon layer, as opposed to usual formative manufacturing methodologies. AM machine is a section of the additive manufacturing system including hardware, machine control software, required set-up software, and peripheral accessories necessary to complete a build cycle for producing parts. Among the benefits of AM are the low volume cost-effective production of parts, distributed manufacture of parts at remote locations, parts on-demand at maintenance, repair, and overhaul facilities, and waste reduction.

Different materials can be processed by 3D printing, such as polymers, metal alloys, composites, and ceramics. Peeters et al. (2019) groups the barriers for distributed recycling of 3D printing waste, as technical, economic, social, organisational, and regulatory. The cost of a 3D printer starts from \$200 for an entry-level hobbyist and exceeds \$100,000, for business and industrial printers. Depending on the equipment used and the material, the items that can be made range from elastic sealing rings, to refurbish, e.g., worn piston heads.

As pointed out in previous research (Kostidi & Nikitakos, 2017), users are mainly concerned with whether the parts made by the AM are comparable with the parts made through traditional methods (performance-wise). Certified processes will ensure standardised quality and independent testing (Monzon, Ortega, Martinez, Ortega, 2014). There are initiatives to standardise the manufacturing process and validate Quality assurance. There are respective guidelines to help manufacturers and sub-suppliers of materials, parts, and components, service suppliers, and end-users adopting AM technologies.

In the era of globalisation and emerging blockchain technology (Dagne, 2015) the evolution of 3D printing requires the practical re-examination of existing views on Intellectual Property Rights (IPRs) considering the legal aspects of copyright, design right, trademarks, and patents; therefore Section 4.4. thoroughly elaborates on the above subjects that are related to circularity labelling and certification.

⁵⁷ See ISO/ASTM 52900:2015 (en), Additive manufacturing-General Principles-Terminology. (n.d.). Retrieved from <https://www.iso.org/obp/ui/#iso:std:iso-astm:52900:ed-1:v1:en>; <https://www.iso.org/obp/ui/#iso:std:iso-astm:52900:ed-1:v1:en> [last accessed 15/10/2020].

Box 6 Key findings of Chapter 3 on governance

Governance relates to online project collaboration: sharing data, knowledge and IPRs among engaged makers in a CMC using smart contracts and digital tokens.

Sustainable Governance presupposes long-term public mechanisms for the interest of future generations.

Sustainable Governance Indicators (SGI) evaluate how a country's institutions advance the executive capacity and adaptability. Examples include: Open Government, Adaptability, Executive Accountability and Citizens participatory competence.

Fourth industrial revolution (IND 4.0) makes necessary a multi-level revolution in Governance.

Pop Machina explores the potential of digital collaboration in physical collaborative makerspaces (that engage in repairing or upcycling activities).

Industrial symbiosis (IS) is a systematic form of brokering businesses into innovative business collaborations (using other's waste as raw material).

Circular Economy (CirEc) benefits from reusing plastic waste as secondary raw material for 3D Printing (additive manufacturing).

4. Legal framework conditions of collaboration

4.1 Company legal forms

The typical users of makerspaces are freelancers/self-employed, under-employed or unemployed individuals (who may sometimes belong in the employment segments of the shadow or 'grey' economy). However, some are interested in upscaling their production and commercialising their ideas. Makerspaces provide them access to shared tools and know-how in order to create prototypes and become entrepreneurs. The vision of Pop-Machina is to inform and convince the majority of stakeholders to consider establishing formal collaborative business schemes, i.e., Social Enterprises, as defined by the EC. Under European law, the entrepreneurship terms and conditions of a maker are determined by the respective national (corporate) law. Collaborative makers' start-ups and spin-offs, under European Law, are considered legal entities, regardless of the formal or informal procedures required for their establishment or of whether they are engaged in profit or non-profit activities. Articles 48, 81 and 82 of the Treaty of the European Union, consider any entity engaged in economic activities to be an enterprise, regardless of its legal form. The term applies to sole-proprietors, family businesses, partnerships, and associations.

The Employment, Social Policy, Health, and Consumer Affairs Council of the EU in 2015 [13414/15 SOC 614] sent a clear political message to promote the social enterprise organisation model. The EU Member states were urged to develop an appropriate institutional, legal and financial ecosystem for all social economy enterprises and organisations. However, a formal and uniform national legal model for social enterprises does not exist in every pilot country. Some social enterprises are registered as private companies, limited by guarantee, some operate in the form of social cooperatives or mutual funded schemes,⁵⁸ and others are non-profit-distributing organisations, like provident societies, associations, voluntary organisations, charities or foundations.

Despite the lack of a uniform European legal model for Social Enterprises, the EU Directive on the European Cooperative Society⁵⁹ has come into force, aiming to upscale the cooperation of social enterprises at a European level. *Regulation 1296/2013* defined **social enterprises**, applying qualitative criteria to consider an enterprise as social. The legal form of social enterprises is not homogeneous. However, the EU acknowledges a social enterprise if its integral part is the promotion of a sustainable social market economy, thus helping to create employment opportunities, to promote social innovation and social inclusion, and finally, to rejuvenate local economies. The European Commission can qualify as social enterprises, businesses that have a social or environmental objective and reinvest their profits in societal innovation, use democratic or participatory principles (all partnerships are equal and represent one vote)⁶⁰ or focus on social justice.

58 See **European Commission**. Social Enterprises. Europa. Retrieved from https://ec.europa.eu/growth/sectors/social-economy/enterprises_en [last accessed 15/10/2020].

59 See **Regulation (EC) No 1435/2003**. European Cooperative Society Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3A126018> [last accessed 15/10/2020].

60 See **European Commission**. Definition of social enterprises. Retrieved from <https://ec.europa.eu/growth/sectors/social-economy/enterprisesen> [last accessed 15/10/2020].

A social enterprise is defined as follows:

A social enterprise is a company type of non-profit business that acts in the social economy, aiming to have a social or environmental impact than making a profit for owners or shareholders. It usually innovatively provides goods and services, using its profits primarily to achieve social objectives. A social enterprise is managed openly and responsibly and involves employees, consumers, and stakeholders affected by its commercial activities.⁶¹

Social enterprises operate in the following four sectors:

- work integration - training and integration of unemployed people or with disabilities;
- social services, e.g. medical care, professional training, education, health services, childcare & services for older people, or aid for the disadvantaged;
- local development of underprivileged areas, social enterprises in remote rural areas, neighbourhood development/rehabilitation schemes in urban areas;
- other sectors, e.g. recycling, ecology, sports, arts, culture or historic preservation, science, Research and Innovation, consumer protection.

Examples and best practices from innovative circular social enterprises can be found at the European Stakeholders circular economy platform, such as the Holy-wood social cooperative, based in Belgium.⁶²

Furthermore, the *EU Recommendation 2003/361* defines the **Small-Medium Enterprises (SMEs)** regulatory scope, setting two criteria to determine an enterprise as an SME: the staff headcount and turnover or balance sheet total, as specified below.

SMEs, including social enterprises, that contribute to the circular economy in areas such as recycling, repair, and innovation, face challenges, such as access to funding and know-how to implement a circular economy if not their core business.

In more detail, companies differentiate as follows in Table 2.

Table 2 Corporate categorisation, by the EC

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

As stressed in the 2014 Green Action Plan for SMEs,⁶³ the Commission tries to support these companies, analyse the barriers they encounter to find resources from waste management, and to encourage innovation and cooperation across sectors and regions. As stressed in the 2014 Green Action Plan for SMEs,⁶⁴ the Commission tries to support these companies, analyse the barriers they encounter to find secondary raw resources from waste management, empowering innovation and cooperation across sectors and regions.

61 See **European Commission**. Definition of social enterprises. Retrieved from https://ec.europa.eu/growth/sectors/social-economy/enterprises_en [last accessed 15/10/2020].

62 CE Stakeholder EU Platform Holy-wood social enterprise example. <https://circulareconomy.europa.eu/platform/en/content-search?populate=holy> [last accessed 26/10/2020].

63 See **European Commission**. COM/2014/0440. GREEN ACTION PLAN FOR SMEs Enabling SMEs to turn environmental challenges into business opportunities. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0440> [last accessed 15/10/2020].

64 Ibid.

4.2 Crowdfunding

There are several financing opportunities for circular makers and start-ups that deliver ESG goals by angel investors and crowdfunding⁶⁵ (Ellen MacArthur, 2020). Besides, reward-based crowdfunding presents an effective method of testing prototypes and Minimum Viable Products (MVPs) through pitching for pre-sales, that can advance open innovation and applied collaboration of circular start-ups and scale-ups. Circular entrepreneurs can assess the potential of their MVPs, build demand from backers and target end-users within a community. The Commission provides access to finance for social enterprises⁶⁶ through crowdfunding⁶⁷ and has proposed an EU framework on crowd and peer finance⁶⁸ that may interest the circular makers. Member states have transposed the Directive 2014/91/EU on Crowdfunding.

However, the market of Peer to Peer (P2P) lending, which is by far the most critical form of crowdfunding, is not yet open in all the pilot countries posing a significant challenge for start-ups funding solutions and, in particular, scaling up enterprises. Unregulated types of fundraising, self-executing agreements, cryptocurrencies and ICOs (Initial Coin Offerings) successfully accumulated over 8 billion Euros in March 2018.⁶⁹ The Capital Market Union (CMU) initiative⁷⁰ included crowdfunding for the financing of any project or venture by raising money from a vast number of people through website platforms assisting the interaction between fundraisers and the crowd (fund providers).⁷¹ CMU Green Paper consultation identified several barriers to the development of appropriately regulated crowdfunding platforms: regulatory barriers, low availability and quality of information, barriers on cross-border transactions, lack of secondary markets and taxation barriers.

Democratised capital markets and crowdsourcing methods are used by SMEs⁷² and start-up to gain early-stage equity and exchange value from digital platforms of low-income investors. Crowd investing portals have maximum monetary limits per investor in small economies. In principle, this could apply for the circular collaborative platforms using gamification and tokenisation. Blockchain platforms with the right technology and governance structures could seed-finance through tokens, the ventures and start-up enterprises of circular makers, without giving ownership or shares to venture capital investors, or pay interest to the banks.

4.3 The employment potential of the circular economy

The new circular entrepreneurial model described above, paves the way for a thorough transformation of the working environment. The EC, seeking to formulate a holistic strategy for the transition to a new growth model, has addressed issues related to the new labour paradigm, which closely affiliates with lower carbon and resource-efficient economies. In its Communication *‘Exploiting the employment potential of green growth’ [SWD (2012)0092 final]*, the EC elaborates on the notion of ‘green jobs’. That is, ‘jobs that depend on the environment or are created, substituted or redefined (in terms

65 **Ellen MacArthur Foundation** (2020) Financing the Circular Economy: Capturing the opportunity p.58. See <https://www.ellenmacarthurfoundation.org/assets/downloads/Financing-the-circular-economy.pdf> [last accessed 15/10/2020].

66 See **European Commission. COM (2015)614** EU Action Plan on the Circular Economy. Retrieved at <https://ec.europa.eu/transparency/readdoc/rep/1/2015/EN/1-2015-614-EN-F1-1.PDF> [last accessed 27/10/2020].

67 **Financial Stability, Financial Services and Capital Markets Union.** (2018). Commission Proposal for a regulation on European crowdfunding services providers. Retrieved from https://ec.europa.eu/info/business-economy-euro/growth-and-investment/financing-investment/crowdfunding_en [last accessed 15/10/2020].

68 See **European Commission.** Legislative proposal for an EU Framework on Crowd and Peer-to-Peer Finance. Retrieved from <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/1166-Legislative-proposal-for-an-EU-framework-on-crowd-and-peer-to-peer-finance> [last accessed 15/10/2020].

69 **European Law Institute Sijf van Erp** and Juliette Sénéchal (2018-December 2021). ELI Blockchain Technology and Smart Contracts project. European Law Institute projects - publications. Retrieved from <https://www.europeanlawinstitute.eu/projects-publications/current-projects-feasibility-studies-and-other-activities/current-projects/blockchains/> [last accessed 27/10/2020].

70 **COM (2020) 590** A Capital Markets Union for people and businesses-new action plan. Retrieved at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:590:FIN> [last accessed 15/10/2020].

71 **European Commission** Ref. Ares(2017)5288649 - 30/10/2017 <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/1166-Legislative-proposal-for-an-EU-framework-on-crowd-and-peer-to-peer-finance> [last accessed 15/10/2020].

72 **OECD** (2019) Initial Coin Offerings (ICOs) for SMEs financing Retrieved at <http://www.oecd.org/finance/ICOs-for-SME-Financing.pdf> [last accessed 15/10/2020].

of skills sets, work methods, profiles greened...) in the transition process towards a greener economy.’ New skills are needed to adjust to the 4th Industrial Revolution, and the sectoral changes it brings about in terms of job profiles and content. Sectors that move towards more environmentally friendly conduct have shortages in skilled workers. Circular collaborative makerspaces have the potential to function as educational centres for people that are unemployed and seek to develop new skills to re-establish themselves in the labour market. Familiarisation with new tools and innovative technologies can facilitate the reintegration of workers, as well as the creation of new markets. A Pop-Machina wide-scale survey (Panori, 2020, D2.2, p. 23) proved that there is a large gap between persons with primary or no education and persons with tertiary education (MSc, PhD or equivalent), on moderate/extreme familiarity with the terms ‘circular economy’ (21.07% and 26.54% respectively). However, these two educational groups differ significantly about their familiarity with the term ‘collaborative production’ (12.90%). Unemployed and retired persons are least familiar with the terms above (Deliverable 2.2, p. 20). Further, the survey found that the relationship between educational level and previous experience with maker movement either indicate primary or no education (the highest portion, peak share, of more than 20%), or tertiary education (second high-portion, peak share, of 20%). This finding evidence that technical activities related to the maker movement mainly interest low-skilled persons and upper education highly-skilled persons (Panori, 2020, D2.2, p. 23).

From a legal point of view, the people that join makerspaces are in legal limbo, since their employment status is not exact. They have flexible schedules and are not subject to a standard employment contract that will provide for their social security coverage. Their status complies with the definition set forward by the EU Court of Justice -CJEU on workers⁷³ since they resemble more with self-employed individuals (see below, under 5.2). Recognising the issue, EC has set forward a proposal for a Council Recommendation on the ‘Access to social protection for workers and self-employed’ [COM/2018/0132 final]. The existing framework on the field of labour law (i.e., Directive 2008/104/EC on temporary agency work, *Directive 97/81/EC* on a part-time job, and Directive 1999/70/EC on fixed-term position), only apply to employment conditions when there is some sort of contract or formal employment relationship.

Therefore, and based on the concurrent competence of the EU, the proposal and, particularly [COM/2018/0132 final] in articles 8 and 9, calls for the Member states to ensure that workers and self-employed will be given proper social security coverage on a mandatory basis.

[COM/2018/0132 final] on ‘Access to social protection for workers and the self-employed’ aims to support all self-employed and non-standard workers. Some are insufficiently protected, due to their contract type or labour market status, by social protection schemes, regarding unemployment, sickness, maternity or paternity leave, old-age, disability, accidents at work and occupational diseases. The initiative encourages the Member states to enrol individuals in employment and self-employment to social protection systems (closing formal coverage gaps). Regulators have to build up fair means with sufficient coverage and facilitate the transferability of social protection entitlements, with increased transparency, regarding social protection systems and rights.

Regarding jobs affiliated with online platforms, being a new and somewhat flexible way of employment, the employees do not necessarily consider themselves as employees in the traditional meaning (De Groen and Maselli, 2016). Therefore, they escape the classical dichotomies of labour law and workers’ protection clauses (Inglese, 2019). Work created by online platforms is not recorded in statistics because no relevant category exists in the national registries; work for online platforms is somewhat secondary or subsidiary to primary or full-time occupation; collaborative economy activity is under-recorded (De Groen, 2016). Regarding remuneration, online platforms act as agents, and work-

73 See **European Commission. Directive 89/391/EEC** Employment, Social Affairs & Inclusion. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01989L0391-20081211&from=EN> [last accessed 27/10/2020].

ers receive a fee after negotiation with the party interested in the task/service/product they provide. The amount ultimately paid to the worker/provider seems to depend on negotiation between the parties as well as the current status of supply for the relevant service/product. It, more or less, resembles an auction scheme where workers compete with each other in order to take on a job. Another characteristic of work through collaborative platforms is flexibility; they can choose when and if they are going to perform the task (De Groen, 2016). The abovementioned form of working resembles more to freelancers rather than traditional workers.

EU law sets minimum standards applicable to working relationships, but the national legislation remains the ruling authority as to how workers in the collaborative economy can be protected.

CJEU has put forward three criteria in order to consider someone as a worker: the subordination link, the nature of work, and the existence of remuneration [COM (2016) 356]. Key here is the subordination link: If the platform is the one that determines the choice of the activity, remuneration, and working conditions, then the service provider can be considered a worker [COM (2016) 356] and falls under the protective clauses of national labour law. The review mechanisms of online platforms give them the power to expel from the digital environment, a service provider that does not meet a certain threshold. Concerns are raised over the extent of discretion to remove users when online platforms are used as intermediaries to find employment (Inglese, 2019). Of importance is *Regulation 2019/1150*, which, as already discussed above, regulates relationships between online platforms and professional service providers and imposes certain obligations on online platforms to ensure the homogeneous treatment of professional service providers and to guarantee fair competition.

Further, the applicability of *Directive 2003/88* (Working Time Directive) is doubtful, given that Article 2(1) requires the classical dichotomy of employer-worker, and even if such a working relationship exists, workers in the collaborative economy do not work on a fixed and predetermined time-schedule (Inglese, 2019). Due to COVID-19, teleworking has been generalised as a working practice at a national level and was urgently legally allowed by recent regulations, that had to respond to the social distancing needs.

4.4 Occupational Safety Health (OSH) employment conditions

Throughout the European Community, the obligations of the employers are governed by the *Occupational Safety and Health (OSH) Framework Directive 89/391/EEC* (in detail at Appendix 3) on the safety and health of workers at work.⁷⁴ The employer has the full responsibility to ensure the safety and health of employees cautiously, preventing exposure to occupational risks, and avoiding the occurrence of occupational accidents and diseases (Art. 5, 6).

This Directive contains general principles concerning:

- the prevention of occupational hazards, i.e., prevention of unsafe working conditions (Art.6);
- the principle of precaution, when an activity raises threats of harm to the environment or human health, precautionary measures to be taken even if some cause and effect relationships are not fully established scientifically (Art.6 and 7);
- the principle of risk assessment as the critical element and defines its main features (e.g., hazard identification, worker participation, the introduction of adequate measures with the priority of eliminating risk at source, documentation, and periodical re-assessment of workplace hazards). (Art. 9);
- the establishment of minimum requirements for encouraging improvements in the working environment, protection of the safety and health of workers;

⁷⁴ See **European Commission. Directive 89/391/EEC** Employment, Social Affairs & Inclusion. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01989L0391-20081211&from=EN> [last accessed 27/10/2020].

- the compliance with 89/391/EEC requirements, the commitment of workers and their representatives to the principles of occupational safety and health (OSH) is required.

The Framework Directive applies to all sectors of activity, public and private. Therefore, collaborative production makerspaces that work under a CE action plan should comply not only with the requirements of the *OSH Framework Directive 89/391/EEC*⁷⁵ but also with regulations of safety and health at work, depending on activities, employees, and materials in use. The implementation of safety and health measures depend on a risk assessment that is a systematic evaluation of examining risks to workers' safety and health from workplace hazards, considering:

- what could cause injury or harm (1st step: Identification and analysis of hazards);
- how to eliminate the hazards and, if not, (2nd step: Estimation and assessment of risk);
- preventive or protective measures in place to control the risks (3rd step: Adoption of corrective measures to control risks) (EU-OSHA, 2008) (ILO, 2014).

Risk assessment involves evaluating, ranking, classifying risks. It should also include information on how the risks of hazards in the examined workplace may be eliminated or reduced. One should take into consideration to examine all possible hazards and risks that are present at a workplace such as: Equipment, signs and personal protective equipment; Exposure to physical, chemical and biological hazards; Workload, ergonomic factors and psychosocial risks (e.g., stress, violence at work); Special provisions for groups of employees (e.g., pregnant women, young workers, workers with a fixed-duration employment contract); New and emerging risks may be present, including poor design of human-machine interfaces due to excessively complex operations. Therefore, workers of waste management are at risk of exposure to newly emergent drug-resistant types of infectious diseases, anti-microbial-resistant organisms, animal wastes, and endotoxins.

In practice, a culture of safety includes⁷⁶ safety precautions, such as labelling tools that ensure clear pathways to move around freely, floors clean, areas near exits and safety equipment clear. Before participants work on projects, a preliminary safety training session has to gain their attention, under bright enough light. Printed safety plans must be ready to implement in cases of concern or emergency. A broad, printed list of standard safety rules and emergency numbers has to be in plain view. Makerspace participants may sign a liability waiver before starting projects, acknowledging the risks and responsibilities they assume when entering and working in the makerspace. The liability waivers should be kept on record with makerspace management, in case of possible future litigation.

'Green jobs' and 'jobs that depend on the environment or are created, substituted or redefined (in terms such as of skills sets, work methods, profiles greened in the transition process towards a greener economy', have some challenges in common. The first of these challenges is the decentralisation of the workspaces, which makes monitoring and enforcing proper Occupational Safety and Health (OSH) conditions and safe working practices more challenging (EU-OSHA, 2013). Furthermore, the movement of open access makerspaces that experiment with recycling materials has several DIY enthusiasts that frequently renew. These entrants often have a lower OSH awareness and culture and possibly access to fewer OSH resources and services. Many of them tend to become 'self-entrepreneurs,' eager to form start-ups or social enterprises'; thus, the responsibility of ensuring that the minimum OSH conditions must lay on multiple persons and should not follow that of the traditional business. In such cases, where self-employed people share workplaces, they need to cooperate among them to comply with their health and safety obligations (HSE, 2014).

⁷⁵ See **Council Directive 89/391/EEC** of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31989L0391&from=EN> [last accessed 27/10/2020].

⁷⁶ **ASEE** -American Society for Engineering Education (2016) Envisioning the future of the maker movement. Summit report, page 20. Retrieved from <https://www.asee.org/documents/papers-and-publications/papers/maker-summit-report.pdf> [last accessed 27/10/2020].

Another challenging aspect of handling secondary raw material (or waste streams) is to have access to information about the presence and composition of hazardous substances to improve dismantling and decontamination techniques, during the recovery of waste. The European Chemical Agency gathers information on a database to enhance knowledge about substances of concern⁷⁷ in products and products when they become waste. The ‘Substances of Concern In Products’ (SCIP) database⁷⁸ provides waste operators with information about the hazardous substances in the waste they process.

Therefore, waste material streams can potentially be ‘cleaned’ before recycling and reused in the production of new articles to ensure a correct and safe circular economy (ECHA, 2019). It is advisable to consult this primary database to start working on any waste stream, to ensure adequate measures according to the supplier. Greening the economy, therefore, means a fundamental transformation in terms of business processes and skillsets. There are new technologies and working methods where ‘old’ OSH knowledge are not always directly transferable, while special knowledge is needed but has not yet fully developed. There are also several ‘old’ risks, found in different situations and combinations equally requiring new skills. In terms of ‘old’ and well-established knowledge in the European Union, the pilot cities may refer to the extensive legislative framework that sets out minimum requirements and fundamental principles as described above. In conclusion, change management occurs, as a result of changes in technology and the working environment that will result to the rapid and constant variability in OSH risks among employers, employees, and workers’ organisations. It is, therefore, necessary to manage these changes at a European regulatory level.

4.5 Platform economy and digital collaboration

The platform economy trend is driven beyond the traditional development of vertical information and communication technology (ICT) solutions and unlocks additional business value by enabling synergetic innovative collaboration patterns between different players (e.g., companies, public authorities, and researchers) (Bonardi et al., 2016). Platform economy and robust digital systems could enable companies to engage customers in product development, as prosumers (customers who prefer to have control over the specifications of products that meet their exact needs). Nowadays, additive manufacturing and prototyping through 3D printing, enable personalised production, even for houses and buildings.

In this context, the Pop-Machina project develops the following community engagement enabling tools:

- an integrated social collaboration platform⁷⁹ that builds upon Factories of the Future (FoF) technologies to assist community cooperation, knowledge sharing, data collection, and analysis;
- users motivation and engagement methodologies;
- an online inventory of circular maker solutions and best practices;
- circular product/service prototypes developed and demonstrated by the communities;
- a Blockchain-as-a-Service (BaaS) mechanism for smart contracts and circularity certification;
- tokenisation, gamification and incentivisation schemes for behavioural change.

Transboundary digital collaborative platforms for data sharing (Airbnb, Uber, Booking, Amazon, Alibaba), e-commerce services (Etsy, eBay) or Creative Commons (CC) and other systems (e.g., Wikipedia) that share knowledge and ideas, became prominent in the past years. Digital innovation plat-

⁷⁷ According to **(REACH)** Annex XIII of Regulation (EC) No 1907/2006 on the **Registration, Evaluation, Authorisation, and Restriction of Chemicals**, substances with the hazard properties may be identified as SVHCs, on a case by case basis when they meet the criteria for classification as carcinogenic, mutagenic, or toxic for reproduction (CMR) category or are persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) or cause an equivalent level of concern as CMR or PBT/vPvB substances.

⁷⁸ See **European Chemicals Agency**. *SCIP Database*. Retrieved from <https://echa.europa.eu/scip-database> [last accessed 15/10/2020].

⁷⁹ **Pop-Machina project** collaboration platform https://pop-machina.eu/the_platform [last accessed 26/10/2020].

forms relating to the reuse and upcycling of waste materials (especially business waste) with gamification of utility tokens are only marginal (Openideo,⁸⁰ Solve challenges,⁸¹ (RE)SET,⁸² Loop by Climate KIC,⁸³ CITEO,⁸⁴ CIRC4Life⁸⁵). However, they could benefit every business, matching the respective circular supply and demand efficiently. Those digital platforms are reducing underutilisation and inefficient use of resources (both human, capital space, and material). An essential aspect of operating a platform economy refers to the inter-organisational learning networks and collaboration for the digital economy, particularly around culture, management style and leadership in virtual collaboration (Houldsworth and Gillian, 2005).

T2.4 examines the legal framework of a circular market, as well as national and municipal regulations on tokenisation through digital platforms of circular users based in each pilot city. Circular economy activities can significantly be facilitated by the establishment of blockchain **multi-sided platforms**, where, indicatively, businesses that need secondary raw materials and makers of upcycled products **match supply and demand** with collectors of recyclables or other businesses with access to these materials. Such multi-sided platforms can be established and operate based on the traditional centrally organised platform system, in the form of a modern decentralising technology system, called **distributed ledger technology (DLT) or blockchain**.

In terms of the difference between these two systems, in a common digital platform, a single entity stores data in the equivalent of a ‘master’ database. The platform becomes the single, ‘authoritative source of truth’ that the platform owner then shares with users. In the decentralised paradigm enabled by blockchain, a distributed, append-only database sustains a network of peers and acts as a ‘consensus version of the truth’. In the old world, centrally controlled servers process information and validate data. In the new world, decentralised networks of validating nodes - often global in scope - reach consensus via a protocol and without any third-party authority.⁸⁶

4.5.1 Blockchain

Pop-Machina digital blockchain platform will use ERC20 - Ethers (as utility tokens and pilot exchange currency) among its community ecosystem of users. In case actual transactions take place, e.g., sales of circular raw materials or products, monetary, tax and fiscal regulations are not yet applicable, but may apply in the future, as explained in depth at Chapter 7.

Ethereum is a blockchain platform that remotely executes software programmes on a distributed computer system, called the Ethereum virtual machine. Ethereum has its own cryptocurrency, called ethers, as by far the most open to experimentation. Unlike Bitcoin, Ethereum uses transactions that are mini-programmes, called smart contracts, written with unlimited complexity. Users interact sending each other transactions loaded with instructions, which miners then process. Miners usually are compensated for their intermediation. However, in Pop-Machina, it is decided not to use external miners; makers will be trained to easily embed a software programme into a smart contract trans-

80 **Openideo**. Using design thinking and collaborative design for circular economy solutions. So far, 2000+ circular ideas generated with 3.2m \$ of funding awarded. Retrieved at <https://www.openideo.com/circular-economy> [last accessed 26/10/2020].

81 **Solve challenges**, an MIT initiative in 2019, Solve ran a challenge on Circular economy, with 8 solutions being selected and receiving \$10k grant. Retrieved at <https://solve.mit.edu/challenges/circular-economy> [last accessed 26/10/2020].

82 **(RE)SET** an Open Innovation Agency entirely dedicated to Circular Economy and Environmental Challenges, based in France, and currently, they are using LinkedIn to announce partnerships and call for ideas. Retrieved at <https://theresetcompany.com/> [last accessed 26/10/2020].

83 **Loop by Climate KIC**. Loop is a unique global innovation platform on the circular economy, by EIT Climate-KIC aiming to close the loop on high-emitting material systems and dematerialise demand in urban areas. Retrieved at <https://www.climate-kic.org/areas-of-focus/sustainable-production-systems/our-initiatives/loop/> [last accessed 26/10/2020].

84 **CITEO** An open innovation programme companies to reduce their environmental impact of packaging and paper in three discrete steps: Detection, Experimentation, Acceleration. Retrieved at <https://www.circular-challenge.com/> [last accessed 26/10/2020].

85 **CIRC4Life** H2020 Circular Economy collaborative innovation project programme <https://www.circ4life.eu/innovation-camp/> [last accessed 26/10/2020].

86 See **EC European Union Blockchain Observatory and Forum** (Blog) (2018-2020) Blockchain technology and the law, p. 11/94, in Legal and Regulatory Framework of Blockchains and Smart Contracts, a thematic report prepared by EUBlockchain, available at: <https://www.eublockchainforum.eu/reports> [last accessed 15/10/2020].

action, unaltered and accessible for the life span of the project's blockchain. Theoretically, Ethereum replaces digital services, being invulnerable to censors and transparent policies, operating indefinitely, disconnected to its creators. In practice, one puts a computer programme on that network and, similar to Bitcoin, everybody on the system can agree on precisely what and when it happened (Morgen Peck, Oct. 2017 at Spectrum IEEE).

The question to be answered at Pop-Machina studies is whether the circular economy needs blockchain transactions, given that they require sophisticated digital skills for data and token mining. Moreover, blockchain requires the makers and makerspaces to instal computers, which consume excessive energy power and in the long-term, create significant quantities of e-waste. The End of Life of such kind of equipment and resources are energy consumption and sustainability factors of particular interest in Pop-Machina.

4.5.2 Blockchain as a Service (BaaS)

A blockchain is a database (also called ledger) documenting all transactions that have ever been executed on it (Menne, 2018). Satoshi Nakamoto first revealed the technology known as the Blockchain in his paper 'Bitcoin: A Peer-to-Peer Electronic Cash System' (Nakamoto, 2009). This paper laid out the mathematical foundation for the bitcoin cryptocurrency, although it was never actually submitted to a traditional peer-reviewed journal, and the author's true identity remains unknown. The Blockchain technology is the basis of cryptocurrencies (like bitcoins and Ethers), and applies mainly in the financial industry, using new applications such as smart contracts (Di Pierro, 2017). Blockchain managed to establish trust in a distributed system creating a distributed storage of timestamped documents where no party can tamper the content of the data or the timestamps without detection (Di Pierro, 2017). Traditional centralised platform business models can be disrupted by the blockchain system model, which facilitates decentralised data storage and communication and can deploy smart contracts as part of these blockchains, which can automate processes in a decentralised manner (Liu and Fraser, 2018). Several shortcomings of the centralised systems could be tackled, such as high mining service fees and the centralised storage of private data (Liu & Fraser, 2018). The blockchain technology is relatively new, and so are the legal issues relating to its use and operation. However, its future applications seem limitless; the legal implications of blockchain use are now starting to fall under the loop in many legislations and the EU.

Nevertheless, blockchain technology mostly exists today in legal and regulatory limbo.⁸⁷ Critical legal issues to be tackled in the immediate future regarding the operation of blockchain ledgers include: recognising the blockchain registries; settling problems of territoriality and applicable law; ensuring the enforceability of smart contracts; overseeing regulatory compliance with pertinent existing legislation (e.g., data protection regulation, money laundering legislation) and issues of liability. Notably, especially concerning the EU data protection framework and the GDPR, a recent study published by the EU Parliament examined its application to the blockchain technologies. It concluded that, despite some tension points, blockchain might help further some of the GDPR objectives. Consumers and businesses increasingly adapt to blockchain technology.

However, the technical and operational complexities in creating, and operating a blockchain and maintaining its infrastructure led to Blockchain-as-a-Service (BaaS) from third-party managers of cloud-based networks in the business of building blockchain applications and functions as a web host technology. Blockchain-as-a-service is based on the Software as a Service model and works similarly allowing customers to use cloud-based solutions, build, host, and operate their blockchain applications and related functions on the blockchain. In contrast, the cloud-based service provider retains the infrastructure operational. It is an exciting development in the blockchain ecosystem, boosting

⁸⁷ See **EC European Union Blockchain Observatory and Forum** (Blog) (2018-2020) Blockchain technology and the law, p. 11/94, in Legal and Regulatory Framework of Blockchains and Smart Contracts, a thematic report prepared by EUBlockchain, available at: <https://www.eublockchainforum.eu/reports> [last accessed 15/10/2020].

blockchain adoption across businesses. Blockchain-as-a-service providers act as a bridge between enterprise companies and blockchain platforms.

4.5.3 Smart contracts

In the blockchain context, a smart contract generally means a computer code that is stored on a blockchain that can be accessed by one or more parties.⁸⁸ These programmes are often self-executing and make use of blockchain properties, like tamper-resistance and decentralised automated processing.⁸⁹ They can be used to code and automate business processes that can be shared and executed among multiple parties offering increased trust and reliability in the process, often with significant gains in efficiency and cost reduction. Smart contracts can also be used for tokenisation purposes. Similarly, smart contracts are hard to code agreements between parties involving value and other types of asset transfer, like escrow agreements or payment vs delivery, that run with transparency automatically based on predetermined conditions, making it difficult or impossible for a party to back out. Smart contracts enhance trust and good faith but can be affected by changes in contractual circumstances.⁹⁰ It is doubted whether the current system of private law can readily cope with these novel forms of ‘self-executing’ computer programmes and agreements, or whether new solutions are required.⁹¹ Moreover, smart contracts create increasing uncertainty in the area of jurisdiction and choice of law.⁹²

4.5.4 Tokenisation

At Pop-Machina project, coded transactions do not necessarily mean that there is always a token exchange connected. However, tokenisation can be a powerful tool to facilitate and encourage recycling or exchange of circular materials, products, and services. Although there is no standard categorisation, there seems to be some consensus on three main general categories of tokens:

- i) Payment/exchange/currency tokens (virtual currencies or cryptocurrencies);
- ii) Investment tokens (meant to raise capital and to provide ownership and dividend rights of some kind);
- iii) Utility tokens (enabling access to products or services on the blockchain-based platform).⁹³

The first and the third category seem to be of particular impact in the cyclical economy, if used within an incentive scheme, e.g., for the supply of material on a blockchain platform. Tokenisation through smart contracts shares the same nebulous legal status with the blockchain ledger technology and presents substantial legal and regulatory challenges, with jurisdictional and taxation related uncertainties. The use of digital assets (tokens) creates problems of qualification or identification of the types of applicable law.⁹⁴ Notably, although investment tokens can fall under the EU securities and financial instruments regulations, utility tokens are not subject to these regulations,⁹⁵ since sometimes function like vouchers, that are generally not regulated unless defined as e-money (Henderson &

⁸⁸See **European Union Blockchain Observatory and Forum**. (27.9.2019) Smart contracts and the law in Legal and Regulatory Framework of Blockchains and Smart Contracts, EU Blockchain Forum, et seq, p. 22/38. available at <https://www.eublockchainforum.eu/reports> [last accessed 15/10/2020].

⁸⁹ Idem.

⁹⁰ **European Law Institute Sjef van Erp** and Juliette Sénéchal (2018-December 2021). ELI Blockchain Technology and Smart Contracts project. European Law Institute projects - publications. <https://www.europeanlawinstitute.eu/projects-publications/current-projects-feasibility-studies-and-other-activities/current-projects/blockchains/> [last accessed 15/10/20].

⁹¹ Idem.

⁹² Ibid.

⁹³ See **European Union Blockchain Observatory and Forum**. (27.9.2019) Smart contracts and the law, p. 22.

⁹⁴ Idem. ELI Blockchain Technology and Smart Contracts project. Sjef van Erp.

⁹⁵ See **The Regulation of Tokens in Europe**, p. 36 et seq., ThinkBlockTank Position Paper on the Regulation of Tokens in Europe, Parts A & B, available at <http://thinkblocktank.org/wp-content/uploads/2019/10/thinkBLOCKtank-Token-Regulation-Paper-v1.0.pdf> [last accessed 15/10/2020].

Burnie, 2019). To the extent in case utility tokens are used in an exchange platform for access to a specific product or service, Value Added Tax (VAT) and other tax considerations apply. However, no particular regulation is currently applicable at an EU level, since the European Court (ECJ) in 2016 ruled that VAT does not apply to bitcoin transactions.⁹⁶

4.6 Collaborative online platforms

Open innovation initiatives, such as boot camps (accelerator programmes), crowdsourcing, hackathons in the fields of civic-tech & smart cities, are facilitated by collaborative online information platforms. The services provided within the scope of Pop-Machina, by the collaborative platform fall within the scope of information society service. The actual scope of the Pop-Machina collaboration platform is publicly available online at the website www.pop-machina.eu/the_platform. It seems to provide an online space where the demand for materials and products meet supply by makers.

At European law level, the most recent and complete set of rules, regarding the operation of online intermediation services and online search engines is *Regulation EU 2019/1150*⁹⁷ enforced in June 2019.⁹⁸ The European Union, having recognised the importance of online platforms in the restructuring of the Common Market towards a digitalised one, has set forward this Regulation to secure transparency and trust among the users of such platforms. An essential provision of the Regulation is that it applies to online intermediation services and online search engines, irrespective of their establishment if two criteria are met; that business users, as well as the targeted audience, are both established in the European Union. The criterion of establishment is quite peculiar since national corporate laws sometimes contest the criteria set forward by the ECJ in its rulings. The Regulation imposes several obligations on online platforms regarding the provided services; applies to any online platforms irrespective of whether the contract among the parties is concluded or not, or whether the law governing the contractual relationship, is governed by national or international private law. The online collaborative marketplaces fall into the scope of the Regulation, provided that business users are active. According to the Regulation, a business user is defined as ‘any private individual acting in a commercial or professional capacity who, through online intermediation services offers goods or services to consumers for trade, business, craft or professional purposes.’ In agreement with this rationale, regarding the legal characterisation of collaborative makerspaces as enterprises, the collaborative platform that engages the makers’ movement is, to our understanding, governed by this Regulation.

Directive 98/34 Article 1(2) introduced the definition of information society service. It describes a service provided for remuneration, at a distance, by electronic means and at the individual request of a recipient. Some digital platforms are considered as intermediaries, providing information society services, and other platforms as providers of services. This distinction is crucial because the platform may be subject to restrictions or market access requirements.

EC has introduced indicative and not exhaustive criteria that help identify whether the platform is engaged in trade:

1. the platform setting the price to be paid by the user;
2. imposing key contractual terms;

⁹⁶ **Court of Justice of the European Union** (CJEU) Judgment in Case C-264/14 Skatteverket v David Hedqvist. The exchange of traditional currencies for units of the ‘bitcoin’ virtual currency is exempt from VAT. PRESS RELEASE No 128/15 Luxembourg, 22 October 2015. See <https://curia.europa.eu/jcms/upload/docs/application/pdf/2015-10/cp150128en.pdf> [last accessed 15/10/2020].

⁹⁷ See **the EU Regulation 2019/1150** on online intermediation services <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0356&from=EN> [last accessed 15/10/2020].

⁹⁸ Idem.

3. ownership of critical assets [EC COM (2016) 356].⁹⁹

Furthermore, the *Directive on Electronic Commerce* (2000/31/EC) provides a beneficial exemption regarding the liability of online platforms that serve as intermediaries. Of importance is recital 42, asserting that the exemption of liability can be invoked in cases where the platform's activities are technical, automatic and passive, which assumes that the platform has no control over the information transmitted or stored. The establishment of the service provider is determined in recital 19 in conjunction with Article 3, 'which ensures that providers of online services abide with the law of the Member State of establishment and not with the law of the State where the service is accessible.' *COM 2016/356*¹⁰⁰ clarifies that a scheme of liability exemption solely applies for the hosting of services, not to other services performed by a collaborative economy platform.

The collaborative platform economy also needs to comply with the *General Data Protection Regulation* (GDPR – Regulation EU 2016/679). Regarding contractual protection of consumers, the Community Acquis applies *Directive 93/13/EEC* on unfair terms in consumer contracts and *Directive 97/7/EC* on the protection of consumers in respect of distance contracts.

Finally, Articles 49 (freedom of establishment) and 56 of the TFEU (freedom to provide services) and the *Services Directive* (Directive 2006/123/EC) apply and call for Member states to respect the principle of proportionality when setting out market access requirements.

Moreover, for the case of online dispute resolution, the European Online Dispute Resolution (ODR) platform is set by the European Commission to make online commerce safer and fairer through access to quality dispute resolution tools.¹⁰¹ Consumers can use the ODR platform to contact the trader to resolve the dispute directly, to try reaching an amicable agreement within 90 days, or if an agreement is not reached to get a dispute resolution body to solve the dispute. They have 30 days to agree with the trader on which dispute resolution body to use. The ODR platform of use by consumers or traders who live or are based in an EU country or Norway, Iceland, or Liechtenstein for complaints about goods or services bought online.

To ensure fair access to websites and mobile applications, the European Union has adopted *Directive (EU) 2016/2102*¹⁰² in alignment with the United Nations Convention on the Rights of Persons with Disabilities.¹⁰³ Although this *Directive (EU) 2016/2102* applies to webpages and applications of public sector bodies, it may be used to collaborative online platforms to ensure the inclusion of people with disabilities. The *Directive (EU) 2016/2102* along with the European Accessibility Act and harmonised standard EN 301 549 V.2,¹⁰⁴ published in 2018 according to the latest Web Content Accessibility Guidelines (WCAG 2.1),¹⁰⁵ aim to improve the overall user experience of a website, applicable to all and not only for users for disabilities. For example, listening to a text when there are no adequate lighting conditions, not only increases the accessibility of people with visibility problems but also allows a broader range of users' access content while performing other tasks. All the guidelines, as mentioned above, should be considered upon the design of online collaborative platforms. A shortlist

⁹⁹ See **COM(2016) 356 final European Agenda for collaborative economy** <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0356&from=EN> [last accessed 15/10/20].

¹⁰⁰ Idem. See **COM(2016) 356 final European Agenda for collaborative economy** <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0356&from=EN> [last accessed 15/10/20].

¹⁰¹ **European Online Dispute Resolution (ODR)** <https://ec.europa.eu/consumers/odr/main/?event=main.home2.show> [last accessed 15/10/2020].

¹⁰² **Directive (EU) 2016/2102 of the European Parliament and of the Council** of 26 October 2016 on the accessibility of the websites and mobile applications of public sector bodies (Text with EEA relevance) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016L2102&from=EN> [last accessed 15/10/2020].

¹⁰³ **Convention on the Rights of Persons with Disabilities (CRPD)** <https://www.un.org/development/desa/disabilities/convention-on-the-rights-of-persons-with-disabilities.html> [last accessed 15.10.2020].

¹⁰⁴ **Harmonised European Standard EN 301 549 V2.1.2 (2018-08)** on Accessibility requirements for ICT products and services https://www.etsi.org/deliver/etsi_en/301500_301599/301549/02.01.02_60/en_301549v020102p.pdf [last accessed 15/10/2020].

¹⁰⁵ **Web Content Accessibility Guidelines (WCAG) 2.1 W3C Recommendation** June 5th, 2018 <https://www.w3.org/TR/WCAG21/> [last accessed 15/10/2020].

of applicable EU Regulations¹⁰⁶ as copied from the latest ELI publication (2019) on Model Rules for online platforms can be found as Appendix 4.

4.7 Intellectual Property Rights (IPRs) and patents

Intellectual Property (IP) is a property category that includes intangible creations of the human intellect. Intellectual Property Rights (IPRs) are business assets, and as such, they are a powerful tool for economic growth. Deliverable 8.3 explored in detail the categories of most common types of IP within the Pop-Machina project (Schiza, 2020, Pop-Machina D8.3 Innovation, Exploitation and Sustainability Plan -1st Version-, p.6): Trademarks, Patents, Design, Utility mode, Copyrights and Trade secrets are the core IPRs expected to be encountered as of interest for most of the consortium partners; cities, academic, technical and consultants (D8.3, p. 7).

Intellectual Property (IP) law and policy should be crafted to encourage cultural creativity and participation through the free use and sharing of discoveries via 3D printing technology. As Dagne (2015) stated, IP law and policy around 3D printing regard IP serving social and cultural values in a balanced environment for consumers, manufacturers, and IPR owners. Lee (2019), questions in the context of patent law, if disruptive technologies such as 3D printing technology called for harmonisation of rules, including new meanings for ‘making’ of a patented invention. In the digital process, from the initial conception of the idea to the end-user using the printed object, many steps are involved. As 3D printing utilises online platforms that operate globally, it may require cross border sharing of data sets, data files, or other information. For the final 3D printed products, apart from quality assurance, the imputation of legal responsibilities needs to be considered since there are similarities between the distribution of printable files over the internet and the distribution of digitised music and media, about corresponding copyright laws. The emerging literature analyses the implications of consumer 3D printing in the field of copyright, design rights, trademarks, and patents across different jurisdictions. In case the makers’ objective is to produce or remanufacture spare parts massively, one has to explore the warranty liability of 3D printed products.

Although there are similarities with existing legal problems, new issues arise by 3D printing, since the digital distribution of files can be materialised into items, easily even by amateurs, and the technology will influence - and be influenced by - societal norms. Unlike the digital piracy battles, which involved mostly individuals against a wealthy, well-organised music industry, the 3D printing war will include a well-organised, determined, and increasingly wealthy 3D printing industry. The political power of 3D printing aspires that well-organised groups will lobby in favour of the 3D printing revolution. The 3D printing industry entails a substantial R&D background for results to become exploitable, often demanding significant initial investments. To this end, intellectual property rules generally safeguard this kind of investments, ensuring a competitive advantage for owners in the R&D market. The protection of intellectual property rights requires a time-consuming process, effort and resources for research organisations and companies; however, it enables technology transfer, increasing the possibilities for a company to grow (Schiza, 2020, D8.3, p. 9). From a regulatory standpoint, IPRs systems are the means to protect innovation for the benefit of innovators, the effectiveness of public governance and long-term interests of all types of organisations, i.e., public and large companies, spin-offs, small-medium enterprises (SMEs) (D8.3, p. 8).

Pop-Machina involves a large number of stakeholders, as well as several different technologies, products, services and methodologies, Pop-Machina is, therefore, expected to make use, as well as generate a high amount of creative intellectual assets (Deliverable 8.3, 2020, p.9). Accordingly, since the Pop-Machina Grant Agreement (GA), all Pop-Machina partners have to manage IPRs in line with General Data Protection Regulation (GDPR) and general Commission policies, regarding ownership,

¹⁰⁶ See **European Law Institute** (ELI) publication (2019) Model Rules of Online Platforms https://www.europeanlawinstitute.eu/fileadmin/user_upload/p_eli/Publications/ELI_Model_Rules_on_Online_Platforms.pdf [last accessed 15/10/2020].

exploitation rights and confidentiality. Pop-Machina ensures free access to peer-reviewed articles resulting from the project. Beneficiaries deposit the digital research data in a research data repository, accessible to third parties, to mine, exploit, reproduce and disseminate - free of charge for any user-, including associated metadata to validate the results presented in scientific publications (Deliverable 8.3, p. 10).

4.7.1 Product certification - circularity labelling

The design stands at the beginning of the products' lifecycle. Circularity requires quality standards and records on 'historical' data on the origin of a circular product. New international standards such as 'British Standards BS8001:2017 circular economy', have created the path for similar certifications by the International Organisation for Standardisation (ISO) Technical Committee 323, via the new, currently under development, standards ISO59000 series, at a global level. The circular products certification and labelling are of paramount importance so that the 'social licence (for circular makers) to operate' and social trust to upcycling, are gradually built. Circular business models could boost social inclusion in local economies through the use of smart contract agreements on reuse or repair, buy-back, resale, and product services. Circular schemes could advance if social trust builds on the accuracy of historical agreed data through smart contracts. Buy-back agreements, resale agreements (where users purchase the product and sell it to a third party who recovers the item after use, for lower-value) and product service agreements (where users pay per use or pay for certain levels of performance, without owning the product/supply). With the assistance of blockchain technology, the open innovation community can produce certified circular products that bear a QR tracking label. The QR (Quick Response) code is the trademark for a matrix barcode (or two-dimensional barcode) machine-readable optical label that contains product information. The creation of a Static (for a one-off event) QR code is free of charge, but dynamic barcodes apply for business use. Circular business models could embody dynamic QR labels and smart contracts through agreements ensuring optimum value retention via reuse or repair, e.g., in green procurement.

4.7.2 Copyrights shared in a community

Pop-Machina incrementally creates its own creative makers' community to exchange circular designs, materials, and best practices. At a global scale, creators, entrepreneurs and prosumers in the creative industries can digitally share designs, and enjoy, under conditions, the public protection of their intellectual property (IP) rights, on inventions, trademarks, copyright, and patents.¹⁰⁷ Based on the composition structure of IPRs, the copyright owner can sell or license work to others, through a contractual agreement. Alternatively, a creator can visit [Copyright Hub](#) websites.¹⁰⁸ Creators obtain information on how to get permission to use somebody else's work, or how copyright relates to his/her work. Another option is Creative Commons (CC) licences that explicitly encourage the free reuse of work. By distributing work under a Creative Commons licence, a creator will allow the public to reuse it for free. That should help collaboration and dissemination of work and, more generally, the spread of knowledge and creativity. A few creators choose to join a collecting society, which then licenses and collects royalties on their behalf. The licenses of Creative Commons are internationally the most known. In particular, these licences are used by Pop-Machina Collaboration Platform¹⁰⁹ and Maker Academy consortium and community, collaboratively with the Institute of Advanced Architecture of Catalonia (IAAC), Fab Lab Barcelona. A public license is interpreted as a contract, where the maker is granted the licensed rights in consideration of the acceptance of CC terms and

¹⁰⁷ See [Copyrightuser.org](#), How do I sell/license my copyright? What is Creative Commons? Retrieved from <https://www.copyrightuser.org/faqs/question-6/> [last accessed 15/10/2020].

¹⁰⁸ See [the Copyright Hub](#). Retrieved from <http://www.copyrighthub.org/> [last accessed 15/10/2020].

¹⁰⁹ See [Pop-Machina Project collaboration platform](#) https://pop-machina.eu/the_platform [last accessed 15/10/2020].

conditions. The Licensor grants the maker such rights in respect of benefits the Licensor receives from making the licensed material available under cc terms and conditions.¹¹⁰ There are four components of CC rights, arranged in six configurations: BY - attribution required; NC - no commercial use; ND - no derivative works; SA - Share-Alike- same license on any derivative works. The Creative Commons (CC) website¹¹¹ illustrates the permissions¹¹² allowed by each license, as follows:

Table 3 Creative commons licences

CREATIVE COMMONS LICENSES		COPY & PUBLISH	ATTRIBUTION REQUIRED	COMMERCIAL USE	MODIFY & ADAPT	CHANGE LICENSE
	PUBLIC DOMAIN	✓	✓	✓	✓	✓
	CC BY	✓	✗	✗	✓	✓
	CC BY-SA	✓	✓	✗	✓	✗
	CC BY-ND	✓	✓	✗	✗	✓
	CC BY-NC	✓	✓	✓	✗	✓
	CC BY-NC-SA	✓	✓	✗	✓	✗
	CC BY-NC-ND	✓	✓	✗	✗	✓

You can redistribute (copy, publish, display, communicate, etc.)
 You have to attribute the original work
 You can use the work commercially
 You can modify and adapt the original work
 You can choose license type for your adaptations of the work.

CC BY-SA based on a work at <http://bit.ly/1eWg7W5>

The ND and SA components cannot be combined, as SA only applies to derivative works. The six licenses (excluding CC-0 which is an equivalent to the Public Domain) are CC-BY, CC-BY-SA, CC-BY-ND, CC-BY-NC, CC-BY-NC-SA, CC-BY-NC-ND. Pop-Machina, Copyright User website,¹¹³ specifies that any content released has to abide under the CC licence Attribution 4.0 (CC BY)¹¹⁴ international public licence. That means that all the materials on CC network (videos, illustrations, texts) can be reused on the condition that the authors of the website are acknowledged (credited).¹¹⁵

110 See Pop-Machina Maker Academy <https://flbcn.gitbook.io/pop-machina-maker-academy/-LryYrDJokjmSHOT9erU/> 27/10/20.
 111 See Copyright licences <https://creativecommons.org/> [last accessed 15/10/2020].
 112 See Copyright user FAQs <https://www.copyrightuser.org/faqs/question-6/> [last accessed 15/10/2020].
 113 See Pop M Maker Academy <https://flbcn.gitbook.io/pop-machina-maker-academy/-LryYrDJokjmSHOT9erU/> 27/10/20.
 114 See Creative Commons <https://creativecommons.org/licenses/by/4.0/legalcode> [last accessed 15/10/2020].
 115 See <https://www.copyrightuser.org/faqs/question-6/> [last accessed 10/2/2020].

Box 7 Key findings of Chapter 4 on legal issues

Social enterprises may get access to finance through crowdfunding.

Green jobs may support the transition process towards a circular economy.

Workers in the collaborative economy are protected through EU law and national legislation. On the protection of workers at work, the Occupational Safety and Health Framework Directive applies.

Circular economy activities are facilitated through blockchain multi-sided platforms, that operate in the form of a modern decentralizing technology system, called blockchain distributed ledger.

Blockchain technology remains today mostly in legal and regulatory limbo.

Smart contracts, namely computer codes stored on a blockchain and accessed by one or more parties, remain today in legal uncertainty.

No particular regulation is currently applicable at an EU level on tokenisation.

Regulation EU 2019/1150 applies on online intermediation services and online search engines.

Intellectual Property (IP) law and policy should encourage makers' creativity through the free use of designs and sharing of know-how and patents via 3D printing technology.

Circularity requires social trust on quality standards, QR on historical data and waste flows records.

Pop Machina uses the international copyright licences 4.0 (CC BY) of Creative Commons.

5. Waste regulatory framework conditions

Circular upcycling activities are not directly governed by the European Waste legislation, since, according to the *Waste Framework Directive 2008/98*, the circular movements fall under the prevention aspect of the pyramid of waste.¹¹⁶

Figure 4 The European Waste Management Hierarchy



Source EC¹¹⁷

EU policymakers issued and recently updated the ‘*European Action Plan on Circular Economy*,’ as a holistic regulatory framework for the circular economy.¹¹⁸ Complementary EU regulations aim to regulate the emerging circular market proactively. It is important to examine at a governance level whether the EU regulations apply in every Pop-Machina country and how state actors should cooperate to achieve a transition to a circular economy model (for instance, through a ‘national strategy on the circular economy’). Appendix 3 of this publication cites critical points of EU waste legislation.

The circular economy could flourish when the consumers realise that in essence, the ‘Pay as you Throw (PAYT)’ waste management system imposes by law the burden of products End of Life (EoL) on them as municipal residents and users, based on weight, volume or size of the housing. In any case, the consumers and end-users of a product ultimately pay the recycling or waste landfilling cost, based on the financial and fiscal ‘Pay as you throw’ (PAYT) policy, applied by default in many countries.

Collective Producers Responsibility Schemes (PRS) or the municipalities usually collect fees for the waste collection and treatment service, often as a lump sum per capita and not based on the volume or weight of waste (although the residents may be recycling most of their waste). There are various

116 See **European Parliament**. (2016, January). Circular Economy Package: Four Legislative Proposals on Waste. Retrieved from <https://www.europarl.europa.eu/EPRS/EPRS-Briefing-573936-Circular-economy-package-FINAL.pdf> [accessed 15/10/20].

117 See **European Commission** ‘Urban Agenda for the EU Circular Economy Action Plan’ available at https://ec.europa.eu/futurium/en/system/files/ged/ua_ce_action_plan_30.11.2018_final.pdf; https://ec.europa.eu/environment/green-growth/waste-prevention-and-management/index_en.htm [last accessed 15/10/2020].

118 See **European Commission** EU strategy on Circular Economy, available at <https://ec.europa.eu/environment/circular-economy/> [last accessed 15/10/2020].

waste management systems (door to door collection with differently coloured bags, weighing or titration of waste volume), but the PAYT financial charging method is predominant. It would be helpful to have a complete picture of the current status of waste management (inflows and outflows) per country and city.

Figure 5 visualises below the rate of imports of waste for recycling, as essential indicators for the need for sustainable inflows to recycling waste management (and consequently to the circular economy). It showcases waste management results in the EU 28 countries, Belgium, Netherlands, Greece and Spain as indicative of inflows needs of the pilot countries. Lithuania had not reported till 2016 its imports of waste. The statistical figures do not include Turkey either, in Figure 5, because there were no statistics on the material flows for its circular economy. Turkey generally harmonised in 2015 its Environmental and Waste Management Legislation¹¹⁹ with the Waste Framework Directive of the EU.¹²⁰

Figure 5 EU imports of waste materials



Source EUROSTAT,7.03.2019/Extracted: 27.10.2019

5.1 Critical raw materials/conflict materials

According to the Pop-Machina KPI 4, and feedback from municipalities on their interest for secondary raw materials, there are five categories of waste at focus: plastics, food, critical raw materials, biomass, as well as construction and demolition materials. Accordingly, the circular production processes and potential upcycled products expected are specified. Furthermore, incineration is not among the circular instruments¹²¹ and the Member states and Turkey have to limit down such solid waste management practices.

Open access to raw materials is generally a growing concern within the EU and across the globe. The European Commission has therefore created a list of critical raw materials (CRMs) of high importance to the EU economy and high risk associated with their supply, regularly reviewed and updated. The raw materials now considered critical for the EU 27 Member States, are the three grouped metals: HREEs (heavy rare earth elements), PGMs (platinum group metals) and LREEs

¹¹⁹European Commission COM 2019/220, STAFF WORKING DOCUMENT Turkey 2019 Report <https://ec.europa.eu/neighbourhood-enlargement/sites/nea/files/20190529-turkey-report.pdf> [last accessed 15/10/2020] pp.93. The Turkish legal framework on waste management is mostly aligned with the EU's. Turkey adopted a strategy promoting a zero-waste management approach, efficient use of natural resources, landfilling reduction and increased recycling and reuse. Legislation introducing a ban on the free distribution of lightweight plastic bags came into force in January 2019. Significant efforts focus on bringing local and regional waste management and treatment facilities up to acquis standards. Economic instruments to promote recycling and the prevention of waste generation are improving, but remain limited.

¹²⁰ See **Waste Framework Directive (WFD) 2008/98/EC** <https://ec.europa.eu/environment/waste/framework/> [last accessed 28/9/2020].
¹²¹ See **EPRS European Parliament Study**. (2017). Towards a circular economy- waste management in the EU. Scientific Foresight Unit (STOA) PE 581.913. Last accessed 27/10/2020/ retrieved from [https://www.europarl.europa.eu/RegData/etudes/STUD/2017/581913/EPRS_STU\(2017\)581913_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2017/581913/EPRS_STU(2017)581913_EN.pdf).

(light rare earth elements).¹²² Specific critical raw materials of interest to Pop-Machina project are the conflict minerals (tin, tungsten, tantalum, and gold) or '3TGs'. Conflict minerals often come from politically unstable areas that are associated with armed conflict or are mined using forced labour. An EU regulation on conflict minerals¹²³ will come into force on January 1st, 2021, initially for the upstream companies, namely in mining, raw material traders, smelters, and refiners. 3TG minerals are widely used in mobile phones, cars, and jewellery.

For EU upstream companies that import, trade, smelt, or refine above a certain threshold of the four 3TG components, mandatory due diligence for their supply chains will be required. However, the EU will gradually launch a due diligence toolkit for conflict materials, according to the OECD¹²⁴ guidelines. The toolkit could be of voluntary use by downstream SMEs, namely traders, component producers, contract assembly manufacturers, and end-users, who are the kind of makers that Pop-Machina plans to engage.¹²⁵ Downstream companies that operate beyond the metal-stage (of secondary raw materials) do not have obligations under the forthcoming Regulation other than a due diligence report, according to the non-financial reporting directive *EC COM 2019/C 209/01*.¹²⁶ Related international, EU and national legislation will advance further under the recently launched new European Green Deal 2020 priorities¹²⁷ with an ambitious package of circular measures and funding schemes. A reference on the circularity potential of critical raw materials, in alignment with the Extended Producer's Responsibility (EPR) and the Circular Economy Action Plan, is deployed at the following Section 5.2. This analysis unveils the association among EPR, resource efficiency, and circularity of critical raw materials.

5.2 Extended Producer's Responsibility (EPR)

The EU issued the *Waste Framework Directive (WFD)* to mandate each Member State apply a national Extended Producers' Responsibility (EPR) industry scheme. The production industry was held liable for end-of-life (EoL) treatment since the WFD 'polluter pays' principle applies horizontally.

However, in practice, it became very challenging to track responsibility once the products entered the market. That is why consumers pay municipality duties for waste management and additional recycling fees for certain products, such as electrical and electronic appliances (WEEE),¹²⁸ to collective EPR schemes, called Producers' Responsibility Organisations (PROs) or PRS (PR schemes).

122 See **European Commission** on Critical Raw Materials. Retrieved from https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en [last accessed 15/10/2020].

123 See **European Commission**, The Conflict Materials regulation explained. Retrieved from <https://ec.europa.eu/trade/policy/in-focus/conflict-minerals-regulation/regulation-explained/> [last accessed 27/10/2020].

124 See **Organisation for Economic Co-Operation and Development (OECD)** Guidelines on Responsible Minerals Supply Chains from Conflict-affected and High-Risks Areas, available at <https://www.oecd.org/daf/inv/mne/mining.htm> [last accessed 15/10/2020].

125 See **European Commission**, The Conflict Materials regulation explained. Retrieved from <https://ec.europa.eu/trade/policy/in-focus/conflict-minerals-regulation/regulation-explained/> [last accessed 27/10/2020].

126 See **European Commission**. Guidelines on non-financial reporting: Supplement on reporting climate-related information (2019/C 209/01). Retrieved from [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0620\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0620(01)&from=EN) [last accessed 15/10/2020].

127 See **European Commission**, A **European Green Deal**. Retrieved from https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en [last accessed 15/10/2020].

128 **DIRECTIVE 2012/19/EU** on waste electrical and electronic equipment (WEEE) <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012L0019&from=EN> [last accessed 15/10/2020].

OECD defines Extended Producer Responsibility (EPR)¹²⁹ as an environmental policy approach so that the producer's responsibility for a product's lifecycle extends to the post-consumer stage.¹³⁰

An EPR policy:

1. shifts upstream responsibility (physical/economical/fully or partially) towards the producer and away from the municipalities;
2. it provides incentives to producers to consider their environmental impact from the design phase throughout the production chain of their product.

In a generalised context, a key goal of EPR legislation is to provide incentives for producers to design their products for recyclability. Typically, EPR takes place in a collective system, where a network of recycling stakeholders cooperates to fulfil the EPR obligations of a set of producers, who share the resulting system cost among them. Collective EPR is considered prevalent because of cost-effectiveness advantages. However, collective EPR is certainly providing inferior design incentives comparing to an individual implementation, where producers fulfil their EPR obligations individually (Gui, Atasu, Ergun, & Toktay, 2018).

Based on the aforementioned introductory analysis, it can be stated that KPI 4 (on waste streams of Pop-Machina focus), 10, and 12, at the Pop-Machina project are directly related to the EPR policies. Remarkably, at the policy discussion phase, the consortium partners could advocate so that upcycling services should be legally implemented at the expense of the product manufacturer, in a way that would benefit the circular maker movement (CMC). Large scale manufacturers and retailers should absorb the full cost of their products' negative externalities on the environment, e.g., of extensive packaging, otherwise partner with circular makers. Corporate Social Responsibility (CSR) actions as offsets of negative externalities on the side of manufacturers are not enough. Technologies would otherwise compete eternally without counting their real negative impact on the environment and without investing in long-lasting quality. Collective efforts are required so that environmental regulations fairly impose, according to the Extended Producers' Responsibility, the upcycling or recycling cost at the expense of the manufacturers and not on consumers (municipalities and taxpayers).

From a European viewpoint, the EPR has shown to be unsuccessful of promoting a crucial process of circularity at productive systems, such as the environmentally friendly packaging, due to the economic instrument used, the producer fee (Pires, Martinho, Ribeiro, Mota & Teixeira, 2015). The producer fee could impact the packaging that producers prefer to use; a proposal of modelling is the calculation of a differential fee, the sustainable producer fee (SPF). Such modelling involves the steps of selection of sustainability criteria, aggregation of measures using multi-criteria decision making, formulation of the SPF calculation, of a web-based interface for packers and product importers to calculate the differential fee applying to their packaging.

The sustainability-driven aspects include the environmental elements resulting mostly from life cycle assessment and social elements (managed at KPI 10), e.g. environmental information at the packaging process (e.g., the recycling bin symbol and carbon footprint information). Future Socio-economic considerations (managed at KPI 10) as well as legislative and taxation measures (managed at KPI 12) determine the potential packers and importers to change the packaging behaviour fostering the level of sustainability of packaging in the future (Pires et al., 2015).

The EPR (Extended Producer Responsibility) policy, is also implemented in Japan, the US and others, encouraging eco-design. By legislating all goods to be returned to the producer once they break or become outdated, producers may make products that can be de-assembled easily or reused

¹²⁹ See **OECD** (September 26, 2016) *Extended Producer Responsibility: Updated Guidance for Efficient Waste Management*, OECD Publishing, Paris. doi: <http://dx.doi.org/10.1787/9789264256385-en> Retrieved and last accessed 27/10/2020 from <https://www.oecd.org/development/extended-producer-responsibility-9789264256385-en.htm>.

¹³⁰ Idem.

in some ways (the University of Cambridge, Department of Architecture, 2020, Pop-Machina D2.3.: 27/98).

Furthermore, the EPR policies, in terms of a circular economy concept, have positively impacted the shift from selling goods to selling services. This shift among leading international industrial producers have impacted the product design and extended the operational life of the products. The product-as-a-service offers a whole new approach, with responsibility remaining with the manufacturer. Several interconnected benefits are associated with this model. Leasing or renting was not in the past associated with environmental issues. However, reuse or remanufacture of components and better design of the machine - for extended product life and re-selling or re-leasing of refurbishing units into secondary markets such as housing associations - boosts circularity and avoidance of waste generation, achieving environmental benefits and financial cost savings. Better quality and durability pay for its own from the manufacturer's point of view, while generating lower costs per use for the customer who does not have to take on the upfront purchase cost.

Box 8 Main points on extended producer's responsibility

Pop-Machina could advocate over the proper implementation of Extended Producer's Responsibility (EPR) and request the manufacturers to undertake upcycling and recycling liability, applied even retrospectively to sales, as an after-sales service. Digital and tracking QR code technology can be of assistance nowadays, easily tracking products back to the producer. However, this policy shift to imposing the cost of the negative externalities of EoL on the producer may bring about a fierce pressure on manufacturers' economic interests. Therefore, stricter EPR regulations and can apply in practice, so that the municipalities and taxpayers are not overburdened with the 'Pay as you Throw (PAYT)' system. The EPR implementation is limited to collection and subsequent material recycling processes with collective Producer Responsibility Schemes (PRS), offering no incentives for individual actors to reduce their EoL costs and improve resource recovery.

Moreover, collective Producer Responsibility Schemes (PRS), as discussed in the following Section 5.3. of this study, are likely to ultimately restrict competition with circular makers and independent service providers, since they involve the collaboration of product market competitors and exclusive agreements among them.

5.3 Producer Responsibility Schemes (PRS) and competition

Pop-Machina makers' communities will need continuous and uninterrupted access to secondary raw materials, usually collected for recycling. Cartons, cans, bottles, and newspapers are examples of waste generated by households, that the municipalities manage through PRS after tendering assignments, even though local producers could aim to fulfil their EPR obligations individually. However, as previously discussed, in response to the adoption of collective EPR, in most countries, waste management is assigned to Producer Responsibility Schemes ('PRS') to impose fees on their members (producers) that should reflect the net cost of handling production waste. Some secondary raw materials have a considerable market value; for example, wasted glass is used to produce container glass, at a lower cost than virgin raw materials. Packaging waste, electrical and electronic equipment, and batteries/accumulators have, among other types of waste, been subject to take-back obligations. Some PRS endorse innovation processes that transform waste into secondary raw materials and residual waste and have enabled the achievement of challenging recycling quotas.

However, some national PRS are accused of unfair competition since they began as monopolies, and over time, some PRS opened up to competition, building markets for secondary raw materials. Such practices come under scrutiny following the EU legislation on the protection of free competi-

tion (Articles 101, 102, and 106 TFEU), as well as the respective national antitrust legislation of each EU member state. PRS may be relatively dis-integrated into the three complementary activities, collection, sorting, and treatment/recovery, with competitive tendering. Therefore, PRS may affect tendering competition for services by individual or alternative providers of collection and treatment for waste materials (that interest Pop-Machina maker movement). Competitive tendering strict conditions, time limits on exclusivity agreements (e.g., no more than 15 years),¹³¹ and limits on tying and bundling are often imposed to reduce the potential anti-competitive practices, e.g. market sharing and price-fixing.¹³²

Nevertheless, consumers' associations could advocate stronger over the proper implementation of Extended Producer's Responsibility (EPR), by requesting the equipment manufacturers to undertake upcycling and recycling liability, applied even retrospectively to sales, as after-sales service for buyers. Pop-Machina explores ways to boost collaborations of circular makers and creation of circular secondary markets in pilot cities. Joint ventures that include PRS, independent manufacturers, circular makers, taxpayers, and consumers' associations could spur a creative, collaborative secondary product market, and synergies even among competitors. Potential schemes that can restrict competition should be avoided, for example, exclusivity agreements among PRS with circular service providers and potentially abusive practices.

*Directive (EU), 2018/851 amending WFD*¹³³ on waste, addressed this phenomenon by setting general minimum requirements for PROs. The new regulations aim to reduce costs and boost circular performance, as well as to ensure fair competition, among SMEs and e-commerce enterprises in the internal market. Overall, new requirements improve the governance and transparency of EPR schemes and conflicts of interest emerging between PROs implementing stricter extended producer responsibility obligations on behalf of producers of products and waste operators. Moreover, the end-of-life (EoL) costs should be incorporated into product prices in a just and transparent way. Nevertheless, a transitional period is deemed necessary to adapt EPR structures and procedures to such new requirements.

Box 9 Key findings of Chapter 5 on waste regulatory framework conditions

The critical raw materials are plastics, food, biomass, construction and demolition materials. EU will gradually launch a due diligence toolkit for conflict materials of voluntary use by downstream SMEs.

Under the Waste Framework Directive, each Member State must apply a national Extended Producer's Responsibility (EPR) industry scheme. EPR has to shift responsibility to the producers to design for reuse and recovery of their products

Producer Responsibility Schemes (PRS) impose fees on their members (producers) that should reflect the net cost of handling production waste, but are under scrutiny following the EU legislation on the protection of free competition.

131 **DIRECTIVE (EU) 2018/851 on waste** of the European Parliament And the Council of May 30th, 2018 amending Directive 2008/98/EC. Retrieved at <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0851&from=EN> [last accessed 15/10/2020].

132 See **European Commission**, DG Competition (2005) Concerning Issues of Competition in Waste Management Systems. Retrieved at https://ec.europa.eu/competition/sectors/energy/waste_management.pdf [last accessed 15/10/2020].

133 **Directive (EU) 2018/851** Section 22, amending Directive 2008/98/E Waste Framework Directive. See <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0851&from=EN> [last accessed 15/10/2020].

6. Competitive circular products and services

6.1 Discrepancies between local and transboundary circular markets

The pilot cities are situated in six different countries; thus, the Pop-Machina shared online collaboration platform must address potential discrepancies of European transboundary markets. It was crucial to explore the prevailing regional and national legal framework of each circular market, such as issues of international shipments, competition, reverse logistics, food safety. Resource efficiency and circularity of critical raw materials is a central pillar of the European Green Deal,¹³⁴ that aims to create a robust system to collect, sort, recycle, and reuse critical raw materials.

Manufacturers should know at the design phase of their products, the standards and potential incentives to effectively consider durability, reusability, reparability, and hazardous substances. Products must be repairable with a long time use by design, even for renewable technologies. Local circular markets will be fostered in case the WFD principle of proximity referred at 2.4, is widely implemented.

The introduction of carbon pricing regulations could further a market disruption between on-line shopping giants and local circular makers. The carbon footprint from air-delivery and excess waste packaging may incentivise online commerce to introduce more upcycling, sharing, and reuse practices. Through social innovation partnerships with local and regional value chains, international brands can respond to the need for reverse logistics, external processing, and marketing of circular products. However, digital platforms related to the reuse and upcycling of materials, are only marginal, unlike prominent digital platforms that host and match sharing services (Airbnb,¹³⁵ Uber). At a next market level, the introduction of digital platforms, like the Pop-Machina pilot one, can provide the social entrepreneurs, consumers, prosumers, B2B and B2C product suppliers, a better overview of the secondary options in each side of the market (supply and demand), regarding the upcycled and reused products available, a transboundary perspective and a better overview of their options in each side of the European market.

6.2 Synergies of circular makers

Pop-Machina develops a pilot ecosystem for the circular makers' communities (CMCs) that requires abundant, inclusive and easy access to secondary raw and recycled materials. The makers' movement in Pop-Machina could create synergies with stakeholders eager to donate or support the circular economy concept (e.g., local repairers, consumer associations, manufacturers). EPR-based waste management system aligned with circular economy principles must render individual producers responsible for EoL collection and treatment, by re-organising business models and product designs. Repair and reuse of EoL e-products, to conserve many critical raw materials usually lost during recycling, is almost non-existent (Parajuly et al., 2020). CE leads the way ahead if in line with incentives for responsible consumption and waste prevention and aligned with EoL collection and treatment as well as EPR (responsible innovation & manufacturing). Prosumers have to realise the significance of large manufacturers collective Extended Producer's Responsibility (EPR), in order to demand their compliance with the CE. Nowadays, linear economy manufacturers, online commerce giants and

134 See The **European Green Deal** launched on 12.12.2019 https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en [last accessed 15/10/2020].

135 See **Airbnb terms** <https://www.airbnb.ie/terms> [last accessed 15/10/2020].

global forwarders, like Amazon, e-shop, and the like, are using excessive packaging practices. However, some are offering upcycling services (innovative products from waste, by repairing e-waste or refurbishing engines) jointly. The partnerships with local circular makers and service providers can create win-win business opportunities. Synergies can become a responsible and fair competition practice, compared to linear supply chains, dominated by global influential market players. Besides, partnerships could reboot the repair economies with the support of the right regulations. Regulations could provide incentives for establishing a competitive disruption in favour of the local circular makers. EPR should oblige large companies to introduce upcycling locally, by offering their clients sharing, reverse logistics, taking and leasing back and reusing services.

Carbon pricing regulations and tax of the extreme carbon footprint already address the negative externalities of on-line commerce, air-delivery, and excess packaging of giant e-companies. There is an opportunity to request the cooperative support of circular makers, repair technicians, and small artisans, as sub-contractors for upcycling products and services. Large forwarders produce packaging waste that could become the concentrated material for the local small circular businesses. All companies (especially the social enterprises) could benefit from joining a community or platform ecosystem matching the respective circular supply/demand/provision of secondary raw materials efficiently.

6.3 Waste 'passport' and 'right to repair'

The New Circular Economy Action Plan (dated 11.3.2020),¹³⁶ empowers consumers to access reliable information about the source, reparability and durability of products, with environmentally sustainable options. The Commission introduces an EU-wide, harmonised model for separate collection of waste streams, Ecodesign, and End of Life (EoL) product labelling; an advanced best practice example is the Nordic Swan Ecolabel, widely recognised in the Scandinavian countries.¹³⁷ The European Parliament recently (26.10.2020) voted¹³⁸ to support in practice consumers' 'rights to repair', focusing on the prevention of waste and into the transition to a functioning market for secondary raw materials. They considered restricting practices that intentionally shorten a digital product's lifetime, utility and performance or making it difficult to repair and replace parts.

Sharing and reuse practices through local municipal platforms are upcycling services considered at Pop-Machina. Pop-Machina could inspire and motivate the maker movement by better explaining the new global trends over the 'waste passport' and 'right to repair' concepts. The maker movement can drastically upscale the circular secondary market if makers sustain their commercial right to prolong the product lifecycle before becoming waste. Giant business manufacturers make it difficult for small businesses to repair, and some have voiced concerns about threats to intellectual property. However, there is a trend shift to circularity (the European Parliament pushes for removal of legal obstacles that prevent repair, resale and reuse).¹³⁹ Besides, in the US, 18 states have passed a 'right to repair' legislation giving independent repairers access to tools, spare parts, and documentation enabling to carry out repairs).

Another way to facilitate the re-use of critical raw materials, e.g., steel is the enforcement of the requirement for a building material 'passport,' containing the specifications of materials used in each building. Batteries, electrical and electronic devices across homes and businesses in the EU, contain valuable materials, providing a home-grown supply of increasingly limited resources, like cobalt and lithium, used in batteries and indium used in touch screens. 'Urban Mining' of gold from discarded

¹³⁶ See **European Commission** (11.3.2020) Changing how we produce and consume: New Circular Action Plan shows the way to a climate neutral competitive economy. https://ec.europa.eu/commission/presscorner/detail/en/ip_20_420 [last accessed 15/10/2020].

¹³⁷ See **Nordic Ecolabel** <http://www.nordic-ecolabel.org/> [last assessed 15/10/2020].

¹³⁸ **EU Parliament News**. (26/10/2020) EU consumers should enjoy a 'right to repair' and enhanced product safety <https://www.europarl.europa.eu/news/en/press-room/20201024IPR90101/> [last accessed 27/10/2020].

¹³⁹ Idem.

electronics produces 80% fewer emissions than mining it from ore.¹⁴⁰ Forced by environmental concerns, *Apple*, as a giant e-waste producer, claims to use only recycled tin resources to build its elements and reports on the sourcing of four conflict minerals and rare earth elements.¹⁴¹ In any case, as already cited at 5.1, following the non-financial reporting directive *EC COM 2019/C 209/01*,¹⁴² due diligence reporting and inventories for this kind of minerals will become mandatory for every business.

Therefore, European researchers developed an EU-wide urban mine platform that reveals material flows to help recyclers, industry, and policymakers to make informed choices.¹⁴³ Based on the above, Pop-Machina could advocate in favour of a European mandate on waste prevention, circular product and waste passport and right to repair, e.g. on electronics, regardless of patent rights, in case the negative externalities of EoL and EPR are not guaranteed, by the traders.

6.4 Circular eco-design and waste flows

The Pop-Machina collaboration platform that shares the circular vision, diverting some of the collected recyclable material to makers as raw material for creative work, could assist in revealing the actual waste quantities and enhance the symbiotic exchange of waste materials and circular products. Better waste management would facilitate the fair taxation of the linear producer and manufacturer, while a boost to the circular economy would be feasible. For example, a nationwide online platform under the name of *E-Business Registry of Waste* exists in Greece, handled by the Ministry of Economy, Growth, and Competitiveness, connected with every Commercial and Industrial Chamber of Commerce. Greek-based industries voluntarily record the output of their waste (but not the input of resources). An equivalent European Union online Waste Registry that mandates a comparison between the input of material resources and waste output could advance circularity and effective waste management of more waste streams. Waste streams separate into two main categories: material-related streams (including metals; glass; paper and cardboard; plastics; wood; rubber; textiles; bio-waste) and product-related streams (including packaging; electronic waste; batteries and accumulators; end-of-life vehicles; mining, construction, and demolition waste).¹⁴⁴

Creative Cradle to Cradle, refurbishment, reuse, repair, sharing schemes and the ecodesign concepts could include design specifications for disassembling and transforming by-products, waste materials, into new materials, or services or products of longer or better quality and environmental value. Product designers can become relevant actors in the circular economy. The design of a product as durable, repairable, reusable with easily dismantled components, crucially starts from the designer's desk. The EcoDesign Directive DIR 2009/125/EC¹⁴⁵ was a first helpful step towards circular transition. The European Commission¹⁴⁶ showcased ecodesign rules as necessary considerations for implementing the Circular Economy Action Plan on reparability, durability, upgradability, or recyclability. The researchers analysed existing eco-design principles, categorising guidelines into five groups:

1. extending lifespan and durability of products through adaptability, upgradeability, and 'timelessness', using modular design and standardised components;

140 See **Ethical Corporation** 2019 Circular economy briefing Our Throwaway planet: Can we end the scourge of single-use', pp.30-39 available at: <https://bertaux.files.wordpress.com/2019/05/ethical-corp-briefing-circular-economy-2019.pdf> [last accessed 15/10/2020].

141 See **Apple's video** on e-waste <https://www.youtube.com/watch?v=YdW38m9IMNA> [last accessed 15/10/2020].

142 See **European Commission**. Guidelines on non-financial reporting: Supplement on reporting climate-related information (2019/C 209/01). Retrieved from [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0620\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0620(01)&from=EN) [last accessed 15/10/2020].

143 Ibid above. Ethical Corporation, 2019.

144 See **European Parliament** (July 2015) Understanding Waste Streams <http://www.europarl.europa.eu/EPRS/EPRS-Briefing-564398-Understanding-waste-streams-FINAL.pdf> [last accessed 15/10/2020].

145 See **EU Parliament & Council** on ecodesign requirements of energy related products DIR 2009/125/EC, latest version: 4/12/2012 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0125> [last accessed 15/10/2020].

146 See **European Commission** (Feb. 21st, 2019) Ecodesign for a circular economy: a methodology for circular product design. https://ec.europa.eu/environment/integration/research/newsalert/pdf/ecodesign_for_a_circular_economy_methodology_for_a_circular_product_design_521na2_en.pdf [last accessed 15/10/2020].

2. disassembling, enabling easy access to parts, encouraging their re-use;
3. product re-use, promoting easy maintenance and cleaning of products and their parts;
4. component re-use of standardised parts with minimal variation in product design;
5. material recycling, with labels that enable materials to be easily identified, separated, and recycled, avoiding complex mixtures of materials.

Further, the New Circular Economy Action Plan also puts forward a series of actions to minimise EU exports of waste and tackle illegal shipments. The European Waste Shipment Regulation¹⁴⁷ is directly applicable in all EU Member States, since it applies to all waste, whether or not hazardous, banning the export of waste from the EU for (i) disposal outside the EU and EFTA and (ii) recovery to any location outside of the OECD.¹⁴⁸

Box 10 Key findings of Chapter 6 on competitive circular products and services

Pop Machina develops a pilot ecosystem for the CMCs that requires abundant, inclusive and easy access to secondary raw and recycled materials.

Synergies between large companies, local circular makers, and service providers create win-win business opportunities.

Pop Machina could inspire the maker movement by promoting concepts like the waste passport and the right to repair (independent repairers have access to tools, spare parts, and documentation enabling to carry out repairs).

The EcoDesign Directive DIR 2009/125/EC is a first step towards circular transition.

The New Circular Economy Action Plan (11.3.2020) sets a series of actions for product durability and upgradeability, and aims to minimise EU exports of waste and handle illegal shipments.

¹⁴⁷ See **Regulation (EU) No 660/2014** of the EU Parliament and of the Council of 15 May 2014 amending Regulation (EC) No 1013/2006 on shipments of waste.

¹⁴⁸ See **Regulation (EU) 2016/1245** of 28 July 2016 is in line with the Commission's Circular Economy Action Plan adopted on 2 December 2015 to help ensure that the Waste's Shipment Regulation is properly implemented; that illegal shipments causing raw materials leakage are addressed more effectively; and that customs officials will be able to identify potential waste streams.

7. Taxation challenges

7.1 Fiscal, taxation policy and potential incentives

This part outlines the EU tax regulations when BaaS platforms are used for collaboration and tokenisation on circular services. Separate reports clarified for Pop-Machina consortium use, some tax matters and the basics of national tax regulations for Belgium, Greece, Lithuania, Spain and Turkey.

D2.4 is an open-access publication that elaborating on the above, addresses main taxation conditions for general information purposes of makers and collaboration platform users.

The makers' movement and social entrepreneurship seem to expand, but supportive strategies and feasibility plans vary among cities and countries. For a circularity shifting, tax incentives at any governance system must address the full value chain of stakeholders (producers, consumers, and governments). Besides, specific tax incentives would help to boost the circular collaborative production, i.e., municipal tax breaks and exemptions from duties, as well as tokens. Notably, Pop-Machina sales of circular products or services take effect with digital utility tokens and smart contracts (not involving monetary rewards in fiat currency).

Box 11 Taxation regarding the Pop-Machina project

The Pop-Machina platform www.pop-machina.eu/theplatform, is a time-limited pilot testbed of a European H2020 funded project, so there are no practical tax concerns, once it functions as a digital pilot platform for social communication and collaboration.

Tax, fiscal, or social security challenges are minor when a prosumer or a maker creates a product or spare part for personal use or in a limited number (i.e. as prototypes). In case the makers use the open innovation collaborative platform as a marketplace to expose services and promote sales (even with the exchange of utility tokens among the CMCs), then tax concerns arise. If the digital transactional platform puts in contact buyers and sellers or connects advertisers and prosumers for business and commercial purposes, then brokerage service tax issues must be considered. However, *Directive 2006/112/EU*¹⁴⁹ on the common system of Value-Added Tax (VAT) provides Member States with the opportunity to use a reduced VAT rate for small repair services: bicycles, shoes, leatherwear, clothes, and linen (the full list of possibilities is in Annex III of the Directive).

Currently, there is a lack of a uniform European legal framework regulating the taxation issues arising from the use of digital platforms, but new regulations are imminent. The European Commission is considering a uniform **European Digital Services Tax (DST)**¹⁵⁰ to address the misalignment between the place where value is created and the place where profits are taxed, **levying a single rate of 3% on gross revenues**. Delays in the proposed Directive are expected due to COVID 19, and OECD pending decisions (as explained below).

Tax implications arise when the decentralised digital marketplace facilitates the open exchange of large numbers of data and information to users (producers, customers), of fixed prices, and bulk volumes of products and materials. This kind of utility tokenisation transactions may incur a sales tax

¹⁴⁹ See *Directive 2006/112/EU*¹⁴⁹ on the common system of Value-Added Tax (VAT) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32006L0112> [last accessed 15/10/2020].

¹⁵⁰ See **European Commission DG TAXUD**. PPT Presentation on Fair Taxation of the digital economy. Retrieved from https://www.europarl.europa.eu/cmsdata/152963/Commission_powerpoint.pdf [last accessed 15/10/2020].

or VAT; therefore, tokens should correspond to currency equivalents. VAT, social security dues and income tax apply in case commercial transactions take place between legal entities or private persons on a professional basis. Regardless of the amount, value, or quantity of transactions and the trading willingness for mass production at regional or transboundary level, VAT taxation of the actual or virtual online transactions incurs a sales tax, according to the law of the place where profit occurred.

In practice, currently:

1. a Value Added Tax (VAT) applies for traders, e.g., 24% for Greece, 21% for the Netherlands;
2. a national sales tax applies on sales of new products or services created by individuals when sold to a legal entity, even at a small scale, local secondary market and at limited quantities (e.g., a neighbourhood bazaar), e.g., of 3.6% for Greece.

The European Commission has realised that the current tax rules were not designed for the recent boom in global digital businesses, of little or no physical presence. Under current international corporate tax regulations, businesses are taxed on the profits earned in the country; they are physically based, but not if trading is conducted through digital means. Thus, there is a discrepancy between where value occurs and where taxes are due.¹⁵¹ Regarding VAT in the digital economy, the Commission addressed related challenges with its proposal on E-commerce between the Member States, in line with the COM 2016/148, Action Plan on VAT¹⁵² and the amendment proposal COM 2018/329¹⁵³ that is part of the package referred to here-below.

Inadequate tax rules for digital services incur:

- difficulty in tax controlling processes become opportunities for tax evasion;
- distortion of competition (since the platform owns the data and may abuse its powerful market position, by having access to confidential information and personal data, and the ability to manipulate competition);
- less revenue for public budgets/negative impact on social fairness;
- risk of internal market fragmentation. The digital economy increases user contribution to value creation, use of knowledge, data as a new source of revenue, intangible assets of more complex and global value chains. Thus, the market position and the revenue of the owner of data are prone to be gradually regulated.

Pop-Machina's pilot cases, non-profit city portals function as digital circular marketplaces, but not as a business; such open innovation structures will have a privileged tax treatment.

Collaborative online platforms raise regulatory taxation discussions and proposals, mainly by the European Commission, heading to a uniform European legal framework. The European Union's tax legislation ranges within the scope of Article 115 of the *Treaty on the Functioning of the EU* (TFEU).¹⁵⁴ That is why the European Commission is considering a uniform **European Digital Services Tax**

151 See **European Bank Federation** (EBF) Tax challenges of digitalisation - EU workstream on taxation in a digital world, accessible in <https://www.ebf.eu/priorities/cybersecurity-innovation/taxation-of-the-digital-economy/> [last accessed 15/10/2020].

152 See **Council of the European Union**, Proposal for a COUNCIL DIRECTIVE on the common system of a digital services tax on revenues from certain digital services, Brussels, March 22nd 2018 (OR. en), 7420/18, FISC 151 ECOFIN 277 DIGIT 48 IA 78, Inter-institutional File: 2018/0073 (CNS) [last accessed 15/10/2020].

153 See **European Commission**. (2018). **Urban Agenda for the EU – Action Plan** (30.11.2018) EU regional and urban development, Regional Policy, 'New Cohesion Policy' pp. 64-79. Last accessed 15/10/2020 and retrieved from https://ec.europa.eu/futurium/en/system/files/ged/ua_ce_action_plan_30.11.2018_final.pdf. As described in Urban Agenda on CE action plan 30.11.2018 final, Directive 2006/112/EU on the common system of Value-Added Tax (VAT) regulates and establishes a common system of VAT between the EU Member States. The Commission's VAT proposals based on the 'VAT Action Plan,' grant Member States more flexibility on the use of reduced VAT rates (see VAT Action Plan (COM (2016)148, adopted in April 2016) and its 'Follow-up,' namely the Commission proposal for amending the VAT Directive (COM (2018)329, adopted in July 2018). Several EU Member States differentiate VAT to promote environmental purposes.

154 See Consolidated version of the Treaty on the Functioning of the European Union - Protocols - Annexes - Declarations annexed to the Final Act of the Intergovernmental Conference which adopted the Treaty of Lisbon, signed on December 13th, 2007 - Tables of equivalences, Official Journal C 326, 26/10/2012 P. 0001 – 0390.

(DST)¹⁵⁵ to address the misalignment between the place where value is created and the place where profits are taxed. The issue in the digital economy is:

1. Where to tax? There is a need to update the taxable nexus in the absence of physical presence.
2. What to tax? There is a need to adapt the criteria for profit allocation – when data and users contribute central input to the digital business models.
3. How is the platform going to be compensated for its intermediate role? How will the revenues of the platform be taxed, and where?
4. Furthermore, to ensure that the transactions are held through the platform and that users do not bypass the platform. For that reason, the legislative framework has to be constructed in a way that does not favour tax evasion or the shadow and grey economy.

However, waste-materials and waste management fees are generally regulated as a municipal duty. At the same time, both EPR producer responsibility and (tax) legislation are usually imposed at a national or European level. A proper mix of right incentives as governance instruments can advance the circularity concept, in close collaboration with the value chains. Currently, different waste materials and circular value chains, face regulatory obstacles, safety requirements, and local conditions; the challenge is how to encompass the full manufacturing ecosystem of products, materials, and services in the circular economy.¹⁵⁶

Directive 2008/98/EC on Waste Framework (WFD) underlined economic instruments to be used by the Member States, providing incentives for the application of the waste hierarchy, including, *inter alia*, the ‘Pay as you throw’ (PAYT),¹⁵⁷ Extended producer responsibility schemes, and incentives for municipalities to promote CE. Specifically, Article 8 WFD describes the use of Extended Producer Responsibility (EPR) in the Member States. The ‘Pay-as-you-throw’ systems charge waste producers based on the amount of produced waste and provide incentives for separation at source of recyclable waste and reduction of mixed waste. Regarding circular production based on waste (as secondary raw material), it could be therefore proposed that transactions between consumers, individual circular makers and social enterprises focusing on circular production are tax-free or tax-deductible from users’ annual income.

7.2 Commission’s proposal: EU digital services tax

At EU level, fair rules for the taxation of the digital economy are part of the European Commission’s Fair Tax Agenda, which guides the improvements of the corporate tax frameworks in recent years. In this respect, the EC relaunched in 2016 the proposal on a *Common Consolidated Corporate Tax Base (CCCTB)* which will provide a competitive, fair and robust framework for taxing companies in the Single Market. The European Commission proposed a ‘package’ on the taxation of the digital economy that comprises a proposal for corporate taxation of a ‘**significant digital presence**’; a Recommendation on profit allocation in double tax treaties of Member states with third countries. Moreover, a proposal for a Directive for an ‘interim solution’ in the form of a new ‘**Digital Service Tax (DST)**’ to be applicable until the new provisions enter into force.¹⁵⁸

The proposal for a DST Directive presented on March 21st 2018, deals with two main issues. First, rules for establishing a taxable case for digital businesses operating across the borders in evidence of

155 See **European Commission DG TAXUD**. PPT Presentation on Fair Taxation of the digital economy. Retrieved from https://www.europarl.europa.eu/cmsdata/152963/Commission_powerpoint.pdf [last accessed 15/10/2020].

156 See https://ec.europa.eu/futurium/en/system/files/ged/ua_ce_action_plan_30.11.2018_final.pdf, pp. 55-59 [last accessed 15/10/2020].

157 See <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32008L0098> [last accessed 15/10/2020].

158 **Garbarini Cristiano** (Partner, Gattai, Minoli, Agostinelli & Partners), April 20th, 2018, ‘Six questions plus one about the proposed EU Directive on the taxation of a ‘significant digital presence,’ Kluwer International Tax Blog, available at <http://kluwertaxblog.com/2018/04/20/six-questions-plus-one-proposed-eu-directive-taxation-significant-digital-presence/> [last accessed 15/10/20].

a non-physical commercial presence, namely a ‘significant digital presence’. For that reason, the Directive extends the concept of ‘permanent establishment’ to encompass a ‘significant digital presence’. According to the Directive propositions, significant digital presence indication is required, such as a) revenues generated in a particular State, b) the number of users located in that State, and c) the number of business contracts with users located in that State. Second, the same proposal sets out principles **about profits** from a digital business value creation from intangible assets.¹⁵⁹ The proposal answers the question ‘where’ and ‘what’ to tax in the digital economy if there is a significant digital presence (even when there is no physical presence) in a member state (tax residence).¹⁶⁰ This Directive applies to the national legislation of all EU member states and the cross-border digital activities within the Union. There is no need to modify applicable double taxation treaties between the Member states. The Directive applies if businesses established in a non-Union jurisdiction have a significant digital presence in a member state, without double taxation treaty in force between jurisdictions. The proposed Directive on the common digital services tax on revenues from digital services aligns with the Consolidated Regulation - Treaty on the Functioning of the European Union (TFEU)¹⁶¹ Article 113 for a harmonised legislation concerning excise duties, turnover taxes other forms of indirect taxation in the internal market, and distortion of competition. The proposed Directive on a common system of a digital services tax on revenues minimises disparities of unilateral measures by the member states. The EU Directive mainly proposes a coordinated approach into tax revenues from certain digital services, and a **common DST that could apply on January 1st, 2021** (initially set for 1/1/2020), **levying a single rate of 3% on gross revenues:**¹⁶²

- of certain digital services, such as the provision of advertising space, online marketplaces facilitating transactions directly between users, and exchange of user data. In contrast, the supply of digital content or payment services, as well as trading venue and regulated crowdfunding services, would be excluded;
- businesses that meet cumulative thresholds would be subject to the DST, i.e., with a total annual global revenue above EUR 750 million and total annual revenue above EUR 50 million from digital services in Europe. Thresholds should be assessed at a group level if the entity is part of a consolidated group;
- the DST applies in the Member states where the users are located. If the users are based in different Member states, the proposal also provides for the tax base’ attribution between the Member states, based on specific allocation keys.

This Directive provided for cooperation between the EU Members as a one-stop-shop mechanism, allowing taxpayers to have a single point of contact to fulfil all administrative obligations concerning the new DST tax (e.g., identification, reporting, and payment). Besides, taxpayers should have the possibility to deduct the DST from their income tax liability and mitigate double taxation.¹⁶³ The EU member states were unable to reach a compromise on an EU digital economy tax proposal, despite various attempts to reach a broad agreement.¹⁶⁴

¹⁵⁹ See **European Commission**, Proposal for a Council Directive relating to the corporate taxation of a significant digital presence, Brussels, 21.3.2018, COM (2018) 147 final, 2018/0072(CNS).)

¹⁶⁰ See **European Parliament**, LEGISLATIVE TRAIN 12.2019, ‘CORPORATE TAXATION OF A SIGNIFICANT DIGITAL PRESENCE/2018-3’, available at <http://www.europarl.europa.eu/legislative-train/theme-deeper-and-fairer-internal-market-with-a-strength-ened-industrial-base-taxation/file-significant-digital-presence-for-corporate-taxation> [last accessed 15/10/2020].

¹⁶¹ **European Parliament and Council** TFEU REGULATION ECJ 26.12.2012 Official EU Journal C326/49 <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:12012E/TXT&from=EN> [last accessed 15/10/2020]

¹⁶² **EPRS Digital Taxation** - State of Play and Way forward (March 2020) European Parliamentary Research Service (EPRS) [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/649340/EPRS_BRI\(2020\)649340_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/649340/EPRS_BRI(2020)649340_EN.pdf) (accessed 27.10.2020)

¹⁶³ See **KPMG**, Euro Tax Flash from KPMG’s EU Tax Centre, EU Commission releases package on Fair and Effective Taxation of the Digital Economy, p. 2, available: <https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/03/elf-360-oecd-and-eu-council-digital-economy.pdf> [last accessed 15/10/2020].

¹⁶⁴ See **European Council** Digital Taxation, <https://www.consilium.europa.eu/en/policies/a-digital-future-for-europe/> available and last accessed 27/10/2020].

The European Commission conceded that it would wait for progress at the OECD level and revisit both proposals in 2020, in case there is no progress. The Von der Leyen Commission committed to achieving a solution under the OECD/G20 framework. If there is no OECD consensus by the end of 2020, then the EU will prepare a new proposal for a fair European digital tax to prevent fragmentation and unilateral measures.¹⁶⁵ Due to the political pressure of the US to impose tariffs, the European Council postponed work until the end of 2020, expecting developments at the OECD level. Due to COVID-19, further delays will most likely occur.

This deadlock led some EU Member states to introduce national taxes on digital companies, which would expire if an agreement is achieved at an international or European scale. For example, Austria introduced from January 1st, 2020, a digital services tax of 5% on digital advertising service providers. Regardless of the tax-payers domicile and company's turnover from digital advertising services, being less than 25 million euros, all companies have to file tax-returns in Austria. By October 2020, Turkey (7,5%), Spain (3%), UK (2%), France (3%), Italy (3%), Poland (1,5%), Czech Republic (5%) and Hungary (7,5%), have implemented a digital services tax. Belgium proposed a DST at 3% on the selling of user data.¹⁶⁶ Differences among unilateral measures based on the previous EU proposal may lead to double taxation of cross-border transactions. Most EU Member states are discussing some form of local measures that will influence or cause tensions at a global political level.

7.3 Tax and other incentives for circularity users

This section mentions some exemplary tax and housing best practices, such as tax credits, deductions and vouchers for circular products and services.

The trend of social rental housing in OECD¹⁶⁷ countries could incentivise the makers' movement, by boosting the, so much needed, uninterrupted flow of secondary trade.

The current trend to offer unfurnished housing (like in France,¹⁶⁸ Germany)¹⁶⁹ and empty flats for rentals, e.g. not equipped kitchen, motivates the new tenants to consider buying second-hand equipment (electrical appliances, such as ovens, dishwashers, or even cupboards, sink and toilets). Sometimes new movers get vouchers to buy these second-hand articles from the prior tenant or operating businesses of secondary household goods since there is a growing market for all kinds of used items.

Further, in Germany, property owners get tax breaks, in case they opt to frequently offer their property 'empty' for rent, (as a way to boost the circular concept and the local repair services and secondary trade). Usually, there are no curtain rods or light fixtures in the apartment. That way, immigrants and other vulnerable groups can accommodate their low-budget needs with such a secondary market.

In the USA, the taxpayers steadily support the qualified tax-exempted non-profit organisations,¹⁷⁰ with charitable contributions, to earn charitable vouchers that equal federal tax deductions.¹⁷¹ There is a transparent and systematic way of attributing value¹⁷² to used items by qualified appraisers and a

165 See **European Parliament** (EPRS, March 2020) Digital Taxation- The way forward [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/649340/EPRS_BRI\(2020\)649340_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/649340/EPRS_BRI(2020)649340_EN.pdf) [last accessed 15.10.2020].

166 **Digital Tax Europe** Update. Tax Foundation <https://taxfoundation.org/digital-tax-europe-2020/> [last accessed 15.10.2020].

167 **OECD Social Policy Division**. Affordable housing database. Social Rental housing (11.12.2019) <https://www.oecd.org/social/affordable-housing-database/> [last accessed 15.10.2020].

168 **France**: There are Private Ads on the OECD Intranet, at foreign churches' bulletin boards, in France-USA Contacts (FUSAC <http://www.fusac.fr/>) magazine, or at websites such as 'Le Bon Coin', OECD (2015). [last accessed 15.10.2020]

169 **Germany**: <https://alisajordanwrites.com/2018/08/06/apartments-dont-come-with-kitchens-in-germany/> accessed 15.10.20 Kholodilin Konst. (2015) Fifty shades of State: Quantifying housing market regulations in Germany. DIW Berlin German Institute for Economic Research https://www.diw.de/documents/publikationen/73/diw_01.c.521370.de/dp1530.pdf last accessed 15.5.2020

170 **US Department of Treasury** Tax-exempt organisations IRS Publication 1771 <https://www.irs.gov/pub/irs-pdf/p1771.pdf> [last accessed 15.5.2020].

171 **USA Charitable contributions and deductions** <https://www.irs.gov/charities-non-profits/charitable-organizations/charitable-contribution-deductions> [last accessed 15.5.2020]

172 US Department of Treasury (Feb. 2020) Determining the value of the donated property. IRS Publication 561 <https://www.irs.gov/pub/irs-pdf/p561.pdf> [last accessed 15.5.2020].

detailed list of charitable contributions¹⁷³ ranging from used clothes, household appliances, patents, stocks, to cars and real estate (after independent appraisal, depending on if deduction exceeds 500\$, 5.000\$ or 500.000\$). As shown in Appendix 5, the Fair Market Value (FMV) corresponds to federal tax deductions. FMV almost equals the secondary market sale price of used items, in good condition or better, if compared to open market price by private traders. Fair market value (FMV) is the price that property would sell for, on the free market as agreed between both willing buyer and seller, with neither being required to act, but on fixed formulas, rules, or methods. The US Department of the Treasury sets the fixed terms of ‘Determining the value of Charitable contributions’ for a long list of items, at the Internal Revenue Service (Rev. 2007) and can be found at ‘US IRS Publication 561 (indicative snapshot at Appendix 5). The paradigm of the US tax initiative is cited in line with *COM 2012/497* for international cooperation in R&I outside the EU, aiming to foster global standards in tackling circularity challenges, potentially with internationally common tax incentives.

Pop-Machina could open an EU policy discussion so that at EU level, similar tax benefits and value is attributed to donated secondary raw materials. The charitable value would correspond to Pop-Machina ERC20 tokens. Users could donate used items and waste materials in exchange for earning tokens to buy circular products or services. A tax deduction, for tokens received by users joining the circular collaborative community, could become a legitimate way to serve the real economy, legally endorsing the otherwise shadow transactions, boosting the secondary market of the makers’ movement. Another example of municipal incentive is to provide users with credits to pay municipal services, e.g., bus tickets or other public means of transportation, vouchers for theatre, festivals, coffee shops. Santander already offers a ‘Smart Card’ to its citizens to be used at public transportation services.

Moreover, private donors (mobile companies, supermarkets) may offer vouchers or products and services in exchange for tokens and not fiat money (that means government-backed currency not commodity-linked, e.g. gold). In case ERC20 tokens are linked to euro, the wide public can quickly embrace the above tax incentives, in the context of the creation of shared value. European, national or municipal policymakers could effectively promote the CCP symbiotic partnerships of companies with tax incentives, to secure the sustainable flow of materials and users, in the context of corporate social responsibility (CSR) and R& D investments. Moreover, the donations in kind and the circular trade can create tax credits or tokens valued in actual income. Such value could be used by otherwise unemployed, or underemployed makers so that they meet their tax obligations and living standards as officially registered circular makers.

7.4 Practical issues and suggestions

The maker movement could benefit from measures incentivising investments that discourage the consumption of primary resources and support more circular and sustainable choices through taxes, subsidies, deposit-return systems, and product/material standards (Metta, D2.1: 62). There are many practical obstacles before the CCP legislative framework effectively combats the shadow economy and grey digital transactions. The national taxation laws of the digital platforms are areas of further research, especially on how the intermediary role of a platform is compensated (for membership or transactions) and how such revenues are taxed and where. Also, a commercial problem to be considered is that users may opt to bypass the platform in their transactions. The future introduction of a tax on the registration fee for each user that uploads a product for sale on a digital platform is an effective measure to ensure the taxable transactions conclude through the platform. Practical permanent measures (like Green Public Procurement, tax deductions, tax credits, vouchers and exemptions from municipal duties) could boost social entrepreneurship. Beyond the operation of the platforms

173 US Department of Treasury (March 2020) Charitable contributions. IRS Publication 526 <https://www.irs.gov/pub/irs-pdf/p526.pdf> [last accessed 15.5.2020].

mentioned above, when a prosumer or a maker (e.g., social enterprise) creates a product as a prototype, *ad hoc* for own use or limited sales (e.g., in a closed access bazaar), there are no tax or social security concerns.

However, feasible options vary among cities and countries, regarding Corporate Social Responsibility (CSR) actions and Research and Development (R&D) investments that are not tax-deductible in all Member states from the corporate gross income. Tax credits for CSR, R&D and technological innovation are ways to decrease the cost of investment in R&D and stimulate the advancement of CCP. In Spain the eligible base for deduction includes personnel costs, materials, outside services and depreciation of assets used for R&D; it excludes investment in buildings; tax credits can be claimed on all R&D expenditure remaining after subtracting 65% of the subsidies received. Another alternative option in Spain is to deduct expenditures in innovation from the social security tax or cap the tax liabilities or tax credit with a multiplier 0,85. Lately, in Greece, R&D corporate expenses can be deducted from expenses by 200% and taxable income by 100% (it applies in Greece from 29.7.2020 and on).¹⁷⁴ The EU aims to harmonise rules on R&D incentives defining which expenses qualify for the deduction; the European Law Institute elaborates such standards¹⁷⁵ under the project name ‘For a European approach to R&D expenses qualifying for the Common Tax base Super Deduction’ following the CCCTB rules.

Moreover, donations in kind or monetary values are other sectors of tax benefit interest¹⁷⁶ for makers, as a source of secondary raw materials and potential income. As the Pop-Machina project progresses, best practices evolved from the interviews with national experts, and the reports elaborated by support partners; some are cited in Chapter 8.2. To conclude, the authors suggest user-friendly national or municipal tax-incentives that can advance CCP & waste management, as follows:

- Circular Public Procurement under specific standards and penalties to the municipalities for non-circular practices;
- Lower Value-added Tax (VAT) on the use of upcycled materials or services;
- R&D expenses (including staff and equipment) to be deductible from corporate taxable income in the year they incurred (in Greece by 200% since 29.7.20);¹⁷⁷
- Angel investors contributing equity to duly registered start-ups to deduct an amount equal to 50% of the gross amount of their contribution from their taxable income (applies in Greece);¹⁷⁸
- Depreciation of investments in 3-5 years, if not longer, with a percentage added on corporate capital;
- Reduced staff cost (with a state subsidy on social security) of new R&D personnel;
- Incentives for Private, Public Partnerships (PPPs) and Joint Ventures;
- Incentives on Extended Producer’s Responsibility (EPR), eco-design, reverse engineering/reverse logistics;
- State subsidies on social insurance for employment from vulnerable groups;
- CSR corporate contributions of industrial symbiosis from manufacturers to circular makers to be tax-deductible from their annual ta; (in Greece by 130%);¹⁷⁹
- Donations to municipalities, communities, non-profit organisations of social purpose¹⁸⁰ or social enterprises to be excluded from VAT (as generally applied during COVID 19) or be

174 Greek Law 4712/2020 Article 22A as amended on 29.7.2020 on R&D expenses https://www.ev.com/en_gr/tax/tax-alerts/amendments-in-the-taxation-of-legal-entities [accessed on 15.10.20]

175 **European Law Institute (ELI) project on Tax.** Georges Cavalier ((2017-October 2020) <https://www.europeanlawinstitute.eu/projects-publications/current-projects-feasibility-studies-and-other-activities/> [last accessed on 27.10.20]

176 **EY Greek law on tax** https://www.ev.com/en_gr/tax/tax-alerts/amendments-in-individuals-taxation

177 Greek Law 4712/2020 Article 22A as amended on 29.7.2020 on R&D expenses.

178 Greek Law 4197/2013 Article 22 as amended on 29.7.2020 by Law 4712/2020 Article 70A over capital equity to start-ups.

179 Greek Law 4197/2013 Article 22 on CSR expenses <https://www.taxheaven.gr/law/4172/2013> [last accessed on 27.10.20]

180 **European Foundation Centre.** (2016) Transnational Giving Europe Greece. https://www.transnationalgiving.eu/wp-content/uploads/2017/09/TGE_EFC_CountryProfile_Greece_2016.pdf [Retrieved and last accessed 27.10.2020].

subject to donation tax of 0,5% if they exceed the tax-free limit of 1000 euro (as applicable in Greece);

- The value derived from Pop-Machina tokens (if monetised after an applied circular collaborative transaction), to be deductible from taxable income;
- Exemption of social enterprises from annual Operating Tax;
- Environmental risk, liability & accident insurance for makers from vulnerable groups;
- Allowance for circular social enterprises to operate even at a loss-making for five years, with no penalty on their license to operate;
- Unused tax credits to be carried forward up to 15 years;
- The loan interest for social and circular enterprises to be an exempted cost.

Box 12 Key findings of Chapter 7 on taxation challenge

The European Digital Services Tax (DST) will address the misalignment between the place where the value is created and the place where profits are taxed.

EU policy discussion is necessary to develop tax benefits and incentives so that value is attributed to donated secondary raw materials.

States should adopt practical measures to discourage the consumption of primary resources, boost social entrepreneurship, and support more circular and sustainable choices (e.g tax deductions for Corporate Social Responsibility actions or Research & Development corporate investments).

8. Theory, method, results, discussion

8.1 Theoretical background and research framework of knowledge-based questionnaires

Governance operates in shared partnership between national and regional governments, cities and their institutions. Pop-Machina problem-orientation depends on one end, on the local authorities, and at the other end, at the general programme responsibility of the national/regional governments.¹⁸¹ This deliverable addressed the stakeholders' mapping, based upon perceptions of the circular collaborative framework conditions in the seven Pop-Machina pilot cities.

The identified interrelations amongst value chains, guided the qualitative baseline evaluation of the pilot cities' background capacity, maturity and readiness, according to expert practitioners. Municipal and governmental experts delivered feedback on Pop-Machina's needs, through perception and knowledge-based questionnaire interviews from January 2020 till May 29th, 2020, at a confidential mode and for consortium use. For GDPR reasons, the names of the interviewees are disclosed, only if the interviewee noted such relevant consent. The respondent had the option to disclose his/her details, to join the Pop-Machina Network of Interest.

Pilots' expert practitioners, mostly employed at municipal departments, responded to the fixed interview questions on governance, legal, blockchain, and technical questions included herewith as Appendix 2. The guidelines were to collect three (3) answers per municipal expert category and per pilot city, at a response rate higher than 80% per questionnaire. Our researchers expected that the interviewed experts knew Pop-Machina's objectives and had the necessary basic know-how on CCP. Municipalities' experts were expected to present their views formally (report style) and not in a survey style (Yes or No answers). Every expert was expected to provide reliable and detailed information about the status and framework conditions of its city and not only personal views and perceptions. The fifth set of questions was addressed to the National decision-makers of each country. CommonLawgic approached decision-makers on the National circular strategy for Greece. The municipalities and their support partners for the other countries assisted in the selection of experts that commented on the stakeholders' ecosystem.

CommonLawgic (LAW) provided the support partners not only the questionnaires as Appendix 2 but also a template of contents and instructions on how to research and deliver comparable results on their national framework conditions. LAW performed the analysis of the national legal framework for Greece; in parallel, CREVIS/ETAM for Belgium, UNICAN for Spain, PLANET for Turkey, and ISM for Lithuania delivered similar studies of framework conditions for their national legislation. The Questionnaires were therefore drafted, considering the different administration governance systems of each EU Member and candidate Member State (Turkey).

There were some overlaps noticed among WP2 assigned tasks over the assigned task of rendering a value chain analysis for each of the seven pilot cities of Pop-Machina project (Leuven, Piraeus, Thessaloniki, Venlo, Kaunas, Santander, Istanbul). The overlaps were resolved among consortium partners in February 2020, in a way that other deliverables (D2.1, D2.2, D2.5, as well as D5.1 and 5.2), addressed in extensive detail the engaged value chains and stakeholders' ecosystems of pilot cities. However, T.2.4 had already requested and received -by the end of December 2019-, the initially

181 **Urban Future.** The 'Acquis URBAN' Using Cities' Best Practices for European Cohesion Policy. Retrieved from https://ec.europa.eu/regional_policy/archive/newsroom/document/pdf/saarbrucken_urban_en.pdf [last accessed 15/10/ 20].

needed, value chain information, directly from the pilot cities, which was later enriched, by the municipalities, for use to other Pop-Machina tasks.

T2.4 deemed that KPIs of socio-economic impact (infrastructure, digital skills, social and labour market inclusion), are depending on the executives' adaptability to technical, blockchain, legal, policy and governance challenges¹⁸² (of executive capacity, of urban licencing, of taxation policies). However, the evaluation of findings on the actual framework conditions will become more accurate at the end of the Pop-Machina project. Further, feedback and blended information were additionally extracted from submitted national reports, as well as from workshops and surveys, accumulated within the framework requirements of other Tasks (2.1., 2.2, 2.5, 5.1, 5.2, 8.3). Finally, a similar follow-up interview from respondents could take place at a later time of the project's deployment, to assess the outcome of Pop-Machina on KPI 12 (framework conditions), at the WP7 evaluation and WP8 policy discussion stage.

8.2 Method to process municipal experts' perceptions

The knowledge and perceptions-based valuation concerned the participant pilot cities Santander, Kaunas, Istanbul, Thessaloniki, Piraeus, Leuven and Venlo. Municipal experts that specialise on municipal policy, legal, business, blockchain, and technical fields responded to questionnaire interviews from January to April 2020. The selection of the interviewees was at the discretion of the Pilot Cities (and their support partners). The minimum expected from each municipality was unstudied and spontaneous interview answers from twelve municipal experts (three for each of the four sets of questions). Similarly, three interview answers from national strategy Decision Makers were collected by May 2020 to gauge their baseline knowledge of Pop-Machina concepts.

Given that the responses were verbal, the authors systematised them qualitatively in a numerical codification of descriptive statistics; and then evaluated the scores quantitatively under the Excel software tool. Specifically, in order to make the gathered data tractable within a computational process, it was critical to apply a methodological approach to 'translate' verbal responses into equivalent numerical indicators, a topic already developed in the relevant literature (Tavana et al., 1997; Malena and Heinrich, 2007; Pathak et al., 2020). In particular, the individual verbal evaluation of the causative relations created by the respondents, it was transformed into numerical form, based on the following two main categories: Firstly, neutral to positive responses were considered as 'drivers' so that the 'scale of achievement {1}' has been attributed to them. Secondly, negative to neutral responses were considered as 'barriers'; therefore, the 'scale of constraint {0}' has been attributed to them.

Consequently, in conducting the numerical codification of the verbal responses' available, each verbal evaluation was associated with the {driver, barrier} duality, and a numerical index {1, 0}, respectively. This operation allowed transforming the comparison questionnaire-tables of each respondent into a numerical matrix containing individual weights associated to each causal relationship among variables. These individual weights were yielded after summing all drivers and barriers per response and, then, calculating the subtotals of drivers and barriers as percentages to the total number of the questions' answered per questionnaire-experts (no-responses were excluded from the summing). This process enabled the correlation of no-countable narrative information to a numerical matrix containing countable individual weights on the causality among variables. These individual weights were yielded, considering that the total number of questions per questionnaire answered, corresponds to 100%. Therefore, summing up all drivers and barriers subtotals, each subtotal account to a relevant percentage portion (less than 100%).

In contrast, the sum of both 'drivers-barriers' subtotals, when summed to 100%, corresponds to the total number of questions contained in each questionnaire. These descriptive statistics represent

182 SGI Sustainable Governance Indicators https://www.sgi-network.org/docs/2018/basics/SGI2018_Overview.pdf [last accessed 15/10/2020].

the basis from which a socio-technological map of priorities and actions/recommendations can be obtained.

The calculated results on the above weights have been organised, under the **pair of ‘drivers-barriers’** per participant country, are collectively presented in the following Table 4.

Table 4 The profile of drivers-barriers per participant country and expert questioned

City experts	Municipal policy makers	Legal & business experts	Blockchain experts	Technical experts
Santander -drivers	65	74	67	38
Santander-barriers	35	26	33	62
Kaunas-drivers	47	53	56	63
Kaunas-barriers	53	47	44	37
Istanbul-drivers	47	37	56	50
Istanbul-barriers	53	63	44	50
Thessaloniki-drivers	53	58	67	63
Thessaloniki-barriers	47	42	33	37
Piraeus-drivers	47	52	44	50
Piraeus-barriers	53	48	56	50
Leuven-drivers	53	74	44	75
Leuven-barriers	47	26	56	25
Venlo-drivers	71	37	-	63
Venlo-barriers	29	63	-	37

8.3 Results of interviews with municipal experts

The practitioners interviewed from each pilot city were selected at the discretion of the Pop-Machina consortium support partners. Moreover, were categorised, according to their expertise, as follows:

- 1) **municipal policy decision-makers**, aware of circular economy governance (e.g., governmental & municipal experts respectively from the departments of entrepreneurship, of waste management, of human resources (HR), of the legal and urban planning) from each pilot city;
- 2) **legal experts** on business and company law (e.g., startups, social cooperatives or SMEs with a social purpose) tax, labour, competition law, patent rights, blockchain regulations;
- 3) **technical experts** on business, occupational health, safety (OSH) and materials flow risks and other issues related to the licensing and operation of a makerspace;
- 4) **blockchain and ICT experts**, regarding smart contracts, social collaboration open access platforms and tokenisation, through gamification;
- 5) **decision-makers** on the national strategy of the circular economy, who responded to the fifth set of questions (herewith as Appendix 2.5).

For our analysis, the interview results have been divided per city, at Figures 6 up to 12, corresponding to the municipal preparedness, the legislative framework, the technological maturity, and the blockchain rewarding/transactional tools, that significantly differentiate among municipalities.

Such diversification is reflecting the municipal experts’ perceptions and knowledge regarding the framework conditions in real-world, impacting each society’s adaptability and municipal executive capacity differently.

Therefore, these consist of a guide for each participant country to perform such measures, reforming barriers to become drivers while redirecting the constraints towards developmental policies/choices. In this way, the collaboration and the know-how diffusion among countries support each country's efforts to growth and development.

Diagrams visualising pilot cities drivers-barriers were drafted based on authors assessments as follows:

Figure 6 Santander overview upon drivers-barriers

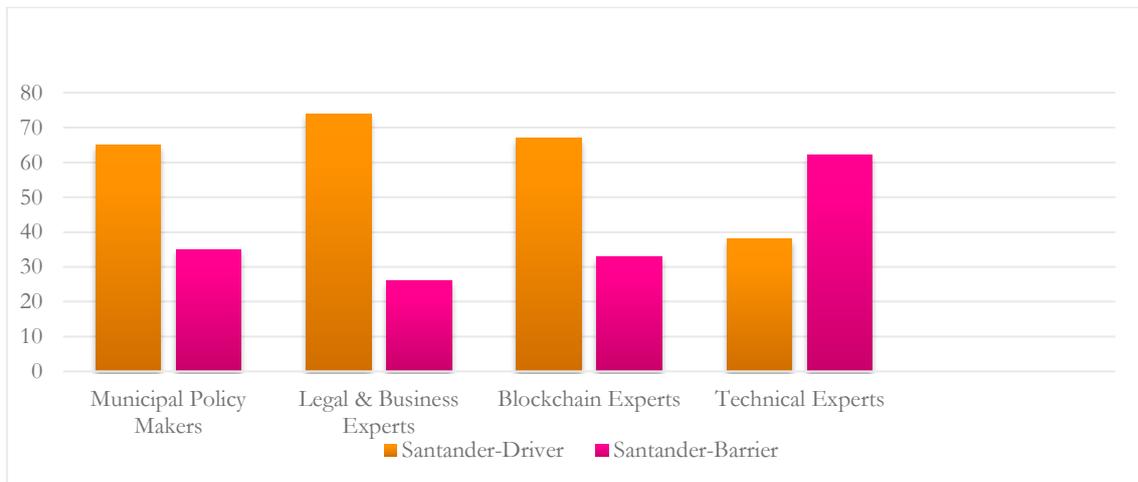


Figure 7 Kaunas overview upon drivers-barriers

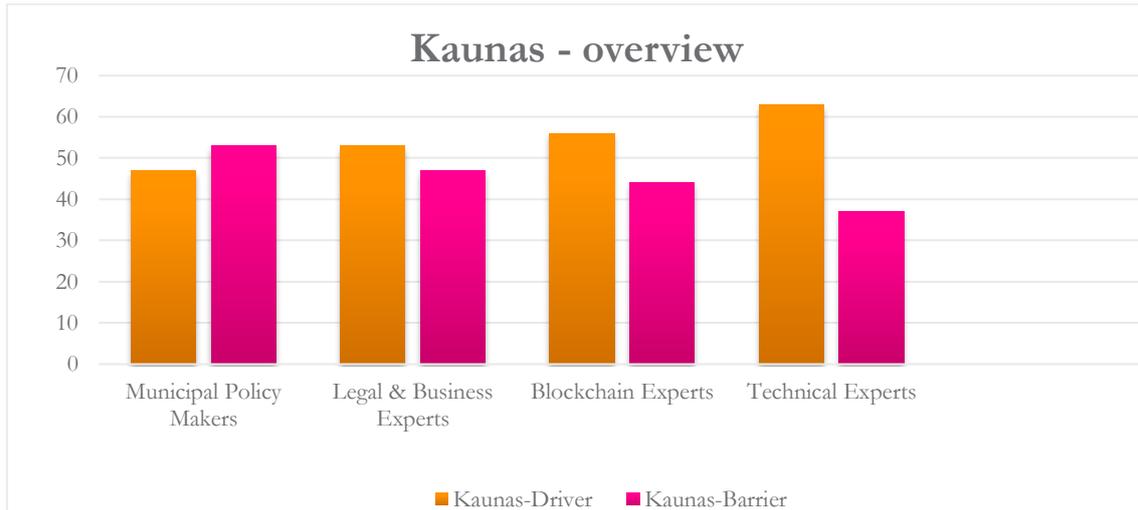


Figure 8 Istanbul overview upon drivers-barriers

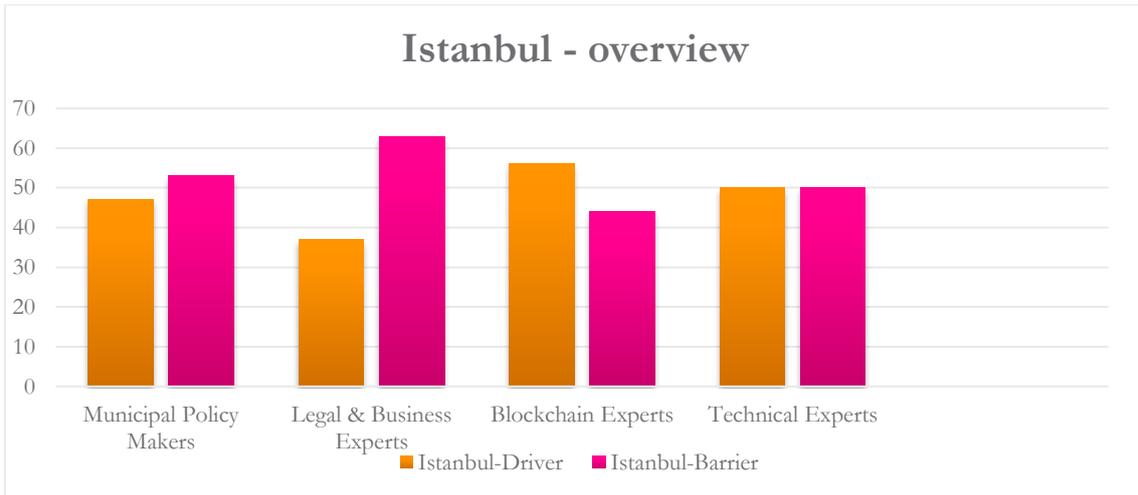


Figure 9 Thessaloniki overview upon drivers-barriers

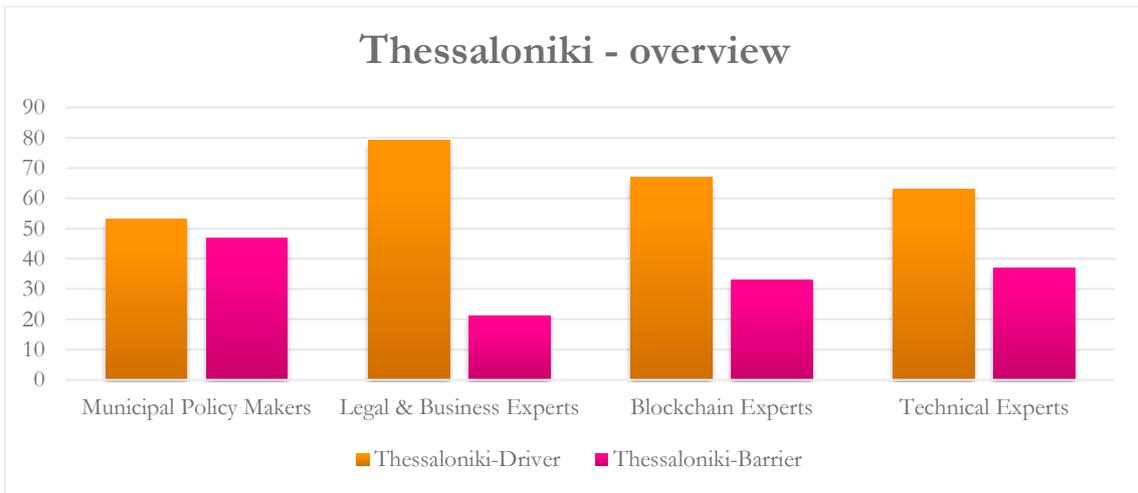


Figure 10 Piraeus overview of enablers and barriers

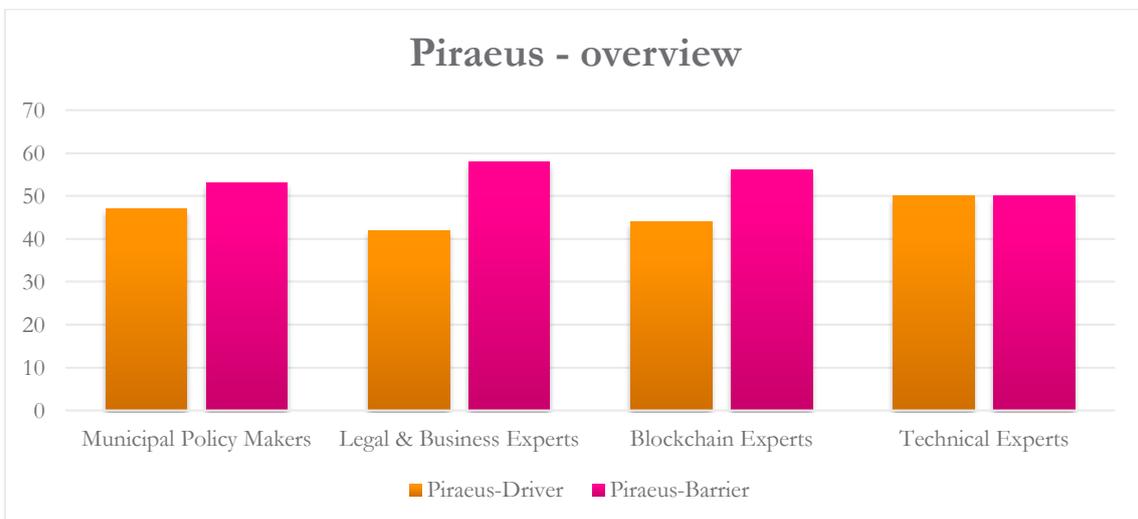


Figure 11 Leuven overview upon drivers and barriers

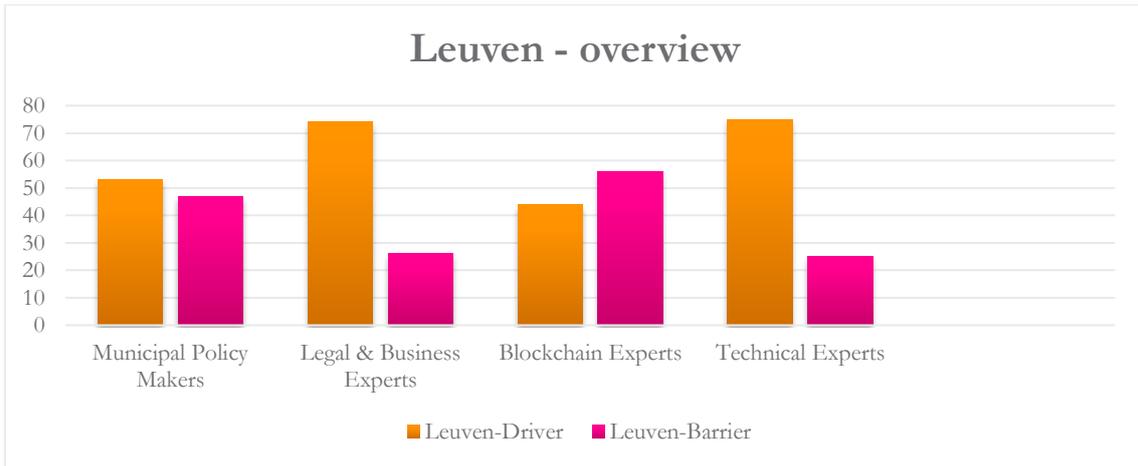
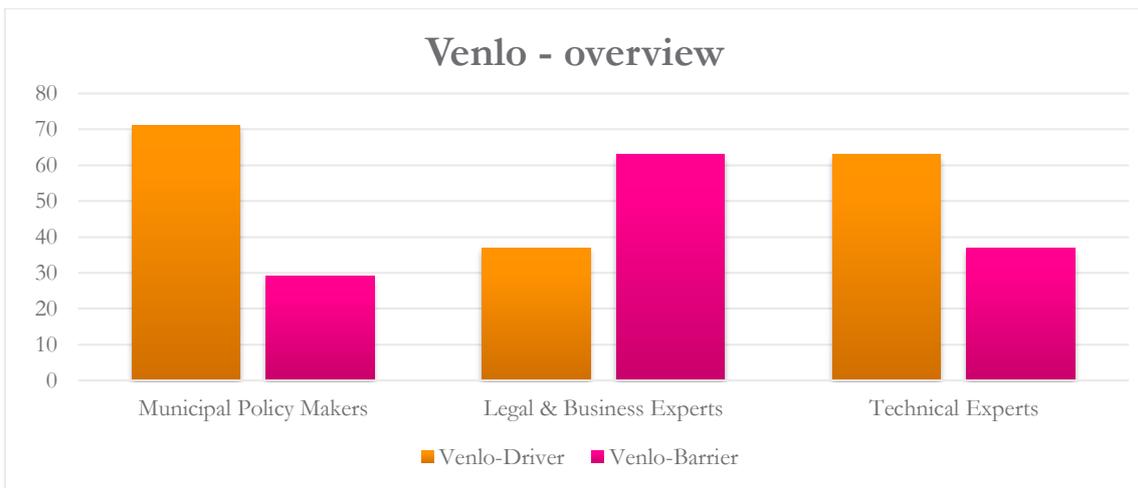


Figure 12 Venlo overview upon drivers-barriers



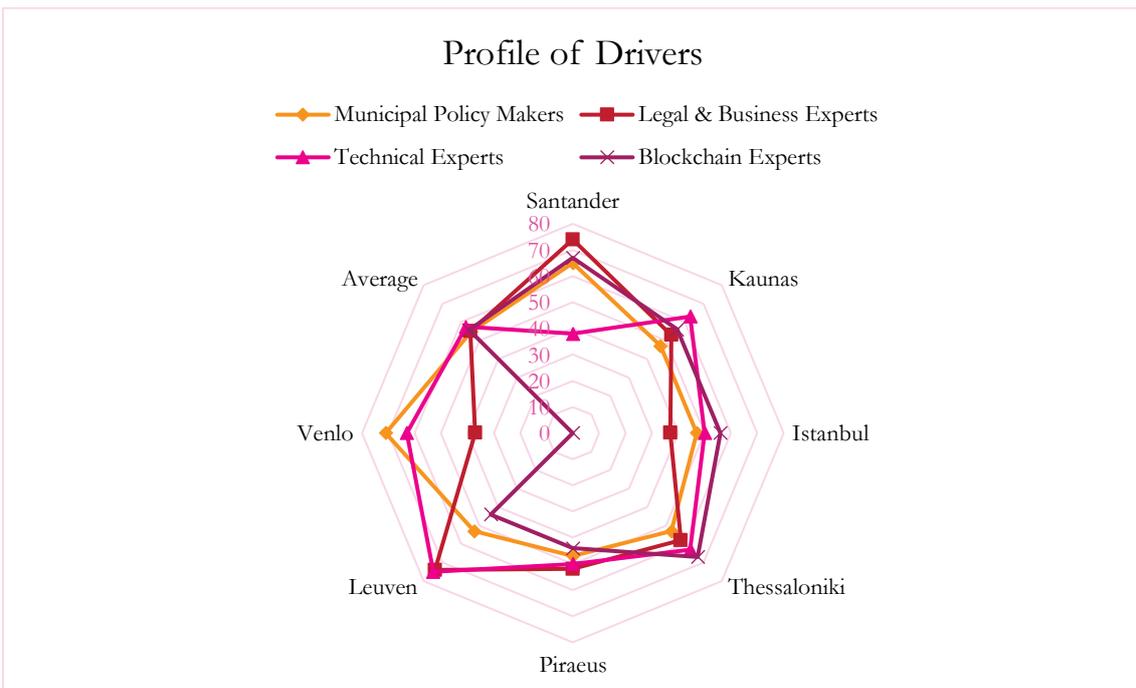
8.3.1 Profile of drivers for participant municipalities (perception-based)

The following Table 5 quotes the profile of drivers of a ‘scale of achievement {1}’ for participant municipalities based on a PBA of the responses of the national decision-makers. Besides, the comparative PBA among participant countries is pictorially represented below in Figure 13.

Table 5 Drivers for each participant country per surveyed expertise

Drivers	Municipal Policy makers	Legal business experts	Technical experts	Blockchain experts	National strategy makers
Santander (ES)	65	74	38	67	65
Kaunas (LT)	47	53	63	56	47
Istanbul (TR)	47	37	50	56	47
Thessaloniki (GR)	53	58	63	67	53
Piraeus (GR)	47	52	50	44	47
Leuven (BE)	53	74	75	44	53
Venlo (NL)	71	37	63	-	71
Average	55	55	57	56	55

Figure 13 The profile of 'drivers' as 'scale of achievement' for participant municipalities



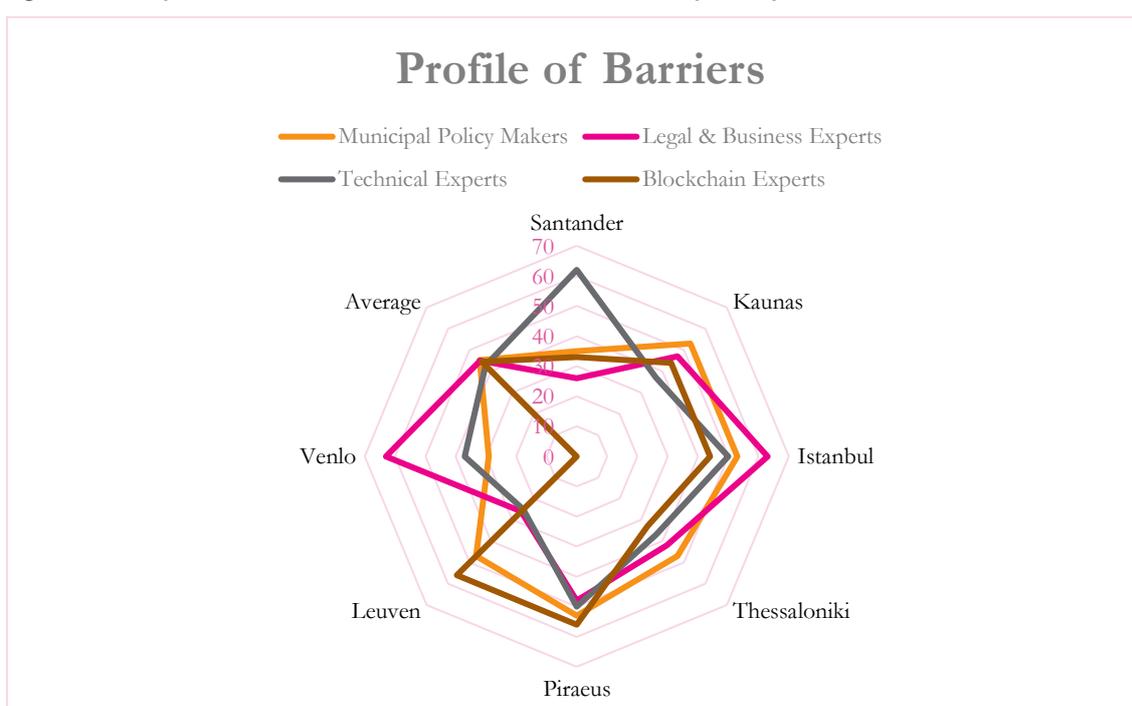
8.3.2 Profile of barriers for participant municipalities (perception-based)

Table 6 shows the profile of barriers at the scale of constraints {0} in the CCP of participant municipalities. Based on the responses of the National Decision-makers, the comparative PBA among participant countries is pictorially represented in Figure 14, below:

Table 6 Barriers for each participant city and country per surveyed expertise

Barriers	Municipal policy makers	Legal business experts	Technical experts	Blockchain experts	National strategy makers
Santander (ES)	35	26	62	33	43
Kaunas (LT)	53	47	37	44	57
Istanbul (TR)	53	63	50	44	27
Thessaloniki (GR)	47	42	37	33	40
Piraeus (GR)	53	48	50	56	40
Leuven (BE)	47	26	25	56	36
Venlo (NL)	29	63	37	-	-
Average	45	45	43	44	41

Figure 14 The profile of 'barriers' as 'scale of constraints' for each pilot city



8.4 Discussion analysis of pilot cities' framework conditions

A descriptive narration of the received perception and knowledge-based responses from the pilot cities by municipal policy, legal and business, blockchain, and technical experts, is grouped as follows:

8.4.1 Santander [ES]

Santander's perception-based analysis is illustrated in Figure 6.

Santander shows strikingly high municipal preparedness, applicable legislative framework, technological maturity, and a blockchain rewarding/transactional tool, being ranged at 57% up to 74% considered 'as drivers, of the scale of development', Table 4; but seems to fell behind its expectations. There is still room in Santander for technological improvements, as it has been further implied by the low scoring of 38% at the scale of development, in Table 4. According to the **policymakers**, the profile of responses yielded a relatively mature preparedness of 65% score, as a driver, Figure 13.

Notably, the DIY makerspaces in the form of occupation of unused buildings must follow usual licensing procedures as any other activity; presumably, considering health and safety hazards. There are not yet specific licenses required, health and safety provisions for the operation of living labs as open-access workspaces, nor treated as a differentiated activity in obtaining a license. The same occurs for social security and insurance risks, even for the vulnerable groups. Presumably, there are relevant risks for a maker at the upcycling process but are not yet communicated in multiple languages. The usual employment status of those working/cooperating within a makerspace has not a definite profile. Crypto coins have been declared in Spain as a valid and well-established means of payment (Figure 6) and investment, according to the **Blockchain experts**. Blockchain has the potential to establish trust among the actors collaborating in an industrial symbiosis scenario. Crowdfunding is allowed in Spain, but there is no prior experience in Santander municipality incentivising the users with credits and tokens. Taxes involved in selling assets are mainly at the national level, so the municipality has no authority over them. Experience with blockchain is limited, but some projects are currently in place, Table 4. **Technical experts** argued that, as long as Fab Labs are privately owned, and have no hazardous machinery, no special licenses are needed, Table 6. The administrative steps to open space take up to three to four weeks, have to conform to some rules, mainly related to emergency exits and adaptation of areas for impaired people. For the mainstream kind of projects, standard safety precautions prevent risks. The experts think that when upcycling IPRs or patent rights are not violated, which counted as a barrier in valuation, Figure 14.

8.4.2 Kaunas [LT]

Kaunas's perception-based analysis is illustrated in Figure 7.

Kaunas presents advanced blockchain rewarding/transactional tools and technological maturity (reaching respectively 56% up to 63% 'as drivers, the scale of development'). However, it seems to lag in municipal preparedness and national strategies reaching respectively 53% up to 57% 'as barriers, the scale of constraint', Table 5; as well as the average in the legislative framework (reaching 53% 'as drivers, the scale of development'), Table 6. **Policymakers** replied that there is no special regulation for DIY makerspaces regarding the use of unused buildings since health and safety regulations should be ensured at any working place and manufacturing activities. A municipality can influence both society and business by regulating the upcycling processes or implementing specific measures. Safety and health requirements must be ensured at any workplace, as required by people's social security, Figure 7. However, in Lithuania, upcycling is not understood as a high priority matter of community development phase, and makers initiatives are based on voluntary principles.

Regarding traceability, labelling requirements for the use and sale of recycled/upcycled/reused products **blockchain experts** referred to the Packaging Waste Management Act. Tax limitations on smart contracts of a user-friendly open-source platform depend on the general business models, the Blockchain or distributed ledger technology transparency barriers for makers' open-source industrial symbiosis is no different than for major industrial companies. Crowdfunding is a regulated activity; tokenisation is not. The needed infrastructure does not exist to incentivise users with tokens; either does the city have the digital infrastructure to implement blockchain; its usage for trade and other financial activities is not widespread, Table 6 (barriers). According to **technical experts**, Fab Labs as a DIY makerspace needs to have standard laboratory legal regulations. The average time to get urban licenses is one week. There is a lack of appropriate waste disposal sites and information regarding e-waste platforms. 3D printing rights most likely apply under the same regulations for IPRs and patent rights, Figure 14.

8.4.3 Istanbul [TR]

Istanbul's perception-based analysis is illustrated in Figure 8.

Istanbul seems to lag in the legislative framework and municipal preparedness, being ranged at 53% to 63% as 'barriers, scales of constraints', Table 6; but blockchain rewarding/transactional tools are used and is showing some technological maturity, reaching up to 50% as 'drivers, scales of development', Table 5. According to **policymakers**, municipally-owned areas can be created for projects with public and private partnerships. However, they must operate according to Occupational Health and Safety legislation, that apply to the privately operated areas as well. There is no cooperation of state actors (ministries, municipalities) within the private sector on the circular economy in the context of the local government. There is no provision for different employment status for those working/cooperating within a makerspace. A makerspace should obtain a 'license to operate' safeguarding healthy and decent working conditions for makers as any lab. The city does not offer tax incentives, but incentivises the users with credits and tokens, like smart cards, Table 5. The **blockchain** experts claimed that no legislation is currently implemented for the traceability labelling requirements for the use and sale of recycled/upcycled/reused products. Crowdfunding is allowed in Turkey/Istanbul, and there are no restrictions on incentivising the users with credits and tokens on behalf of the Municipality. There are three types of corporations active in ICT infrastructure to implement blockchain. Although Blockchain as a Service (BaaS) and (OSS) online platforms exist, they are not widely used, Figure 8. According to the **technical** views, health and safety hazards at the expropriation of unused buildings are possible by the DIY makers' movement, depending on the type and condition of the buildings. However, the general provisions can be applied for the licensing of Fab Labs as open access spaces. Also, there is no e-waste platform in order to compare the resources input to the waste output of every manufacturer/retailer in Istanbul, Figure 14. The general provisions for patent rights are applied, when 3D printing technology is used for upcycling uses without prior IP and patent rights or 'license to repair'.

8.4.4 Thessaloniki [GR]

Thessaloniki's perception-based analysis is illustrated in Figure 9.

Thessaloniki is well ahead in the legislative framework, blockchain rewarding/transactional tools, and technological maturity, reaching more than 60% as 'drivers, scales of development', Table 5. However, averages, at almost 50% in municipal preparedness, considered as a 'barrier in the scale of constraints', Table 6. **Policy experts** argued that DIY makerspaces (as urban gardening and musical/artistic creation pop-up environments) operated for many years with the informal tolerance of the authorities (under the status of training centres or offices). The poor conditions of maintenance mainly provoke health and safety hazards at the takeover of unused buildings. The licensing of fab labs is that of low-tech craft labs. The national waste recycling system is based on private or Private-Public Partnership (PPP) recycling companies. Self-organised ventures involve creators who do not engage in formal economic activity; therefore, there is no working relationship between the site and the producers/creators. A makers' fab lab should adopt all the hygiene and safety measures of the participants, following the legal framework in place for craft businesses, Figure 9. The municipality does not face social security and insurance risks as the people/groups that work there, are considered as training beneficiaries and not workers. The same is applied for sensitive population categories. There is no procedure of tax incentives on waste exchange in place, neither on credits and tokens, which is deemed as a barrier, Figure 14. **Blockchain experts** stated that traceability labelling requirements for the use and sale of recycled/upcycled/reused products are those that exist for any other products. The open-source platforms must follow existing regulations. Coded transactions do not necessarily mean that there is a token exchange connected. Open-source industrial symbiosis applies with transparency requirements by the platform operator, Table 4. However, there is no legal framework for crowdfunding and tokenisation. The municipality cannot provide tax or duty breaks, since

the municipality is limited to use fees and dues on specific maintenance and infrastructural expenses and waste management. Only one institution in Thessaloniki (named CERTH) -who is a Pop-Machina consortium partner- provides Blockchain as a Service (BaaS) and (OSS). However, in the city, there is existing scientific, research, and technical expertise and infrastructure to implement blockchain solutions. The city's **Technical experts** stressed the lack of a proper legal framework for DIY makerspace in Greece. Fire protection licenses depend on the machinery used in the makerspace. The licensing procedure is around two months, depending on the ministry of Growth or the Prefecture of Central Macedonia. The rules that apply are the same as of new use of an old building. Health and safety provisions for the operation of makerspaces as open-access workspaces depend on the number of people that use the makerspace. Upcycling is a factory process with obvious health hazards. If a patent protects a product or idea, then a license is needed from the ministry of Growth or the Prefecture of Central Macedonia.

8.4.5 Piraeus [GR]

Piraeus's perception-based analysis is illustrated in Figure 10.

Piraeus falls short in municipal preparedness, legislative framework, blockchain reward-ing/transactional tool, and technological maturity. It is noteworthy that for all expert- classifications, the developmental perspectives are quantified slightly lower or about average 50% in terms of drivers 'scale of development', Table 4. On the question, if DIY makerspaces are allowed in Piraeus, in the form of occupation of unused buildings, **policymakers** answered that nothing is forbidden. Further, they thought that there are no specific licensing, health and safety provisions for makerspaces facilities and workspaces. The employment status of those working/cooperating within a makerspace depends on the case. The same occupational, health and safety (OHS) considerations apply for sensitive population categories as for all people. There is a legal framework for the collection of municipal wastes but no procedure of tax incentives on waste exchange in place, neither municipality incentives with credits and tokens, Figure 14. According to **blockchain** experts, traceability labelling requirements for the use and sale of recycled/upcycled/reused products is not straightforward. There is no legal framework that tackles crowdfunding and tokenisation explicitly through digital platforms by the municipality. ICT infrastructure to implement blockchain is needed per case. There is no Blockchain as a Service (BaaS) and (OSS) online platforms, a common and widely acceptable trade and knowledge sharing methods in Piraeus, Table 6. **Technical** experts replied to the question concerning the licenses needed for the safe operation as a DIY makerspace that vary case-by-case. There are no specific licensing, health and safety provisions for the operation of makerspaces as open access workspaces. Fab Labs and the maker movement are free to access, and all works are supervised by a technical expert that can guide the users. Risks for a maker while upcycling, depends on the working process of each maker. There is a platform that deals with wastes (production, collection and transportation, reuse/disposal), Figure 10.

8.4.6 Leuven [BE]

Leuven's perception-based analysis is illustrated in Figure 11.

Although **Leuven** presents an adequate legislative framework and technological maturity (reaching 53% and 63% respectively 'as drivers, in the scale of development'), Table 5, it seems to sustain average in municipal preparedness and to lag in national strategies, 53% and 57% as 'barriers, the scale of constraints, Table 6. **Policymakers** informed that DIY Makerspaces in the form of occupation of unused buildings are allowed in Leuven, but not appropriated in a legal sense, since health and safety hazards can occur from low maintenance. The experts did not know the lab licensing procedures, social security, insurance risks matter, as well as the considerations for the sensitive population, Figure 14. The local experts agreed that there are relevant risks for a maker while upcycling.

The city helps the organisation (use of space or other support). The Flemish regional government has an active policy to promote circular economy initiatives with decrees. **Blockchain experts** claim that a circular economy can more likely be useful when traceability is implemented. There are not tax limitations because of any particular components used in the underlying technology. There are probably transparency barriers for open-source industrial symbiosis, Table 6. Crowdfunding and tokenisation through digital platforms are allowed on a national level. Although there is the digital infrastructure to implement blockchain in some cities, blockchain as a service (BaaS) and (OSS) online platforms are not a common and widely accepted practice, Figure 14. From a **technical** point for the safe operation of a DIY makerspace, permits or notifications may be required, and the average time needed depends on the project. For each public space, favourable fire prevention advice must be obtained before commissioning, and there are specific rules for working safely and healthily. Decent working conditions for makers such as welfare law and codex for well-being at work must be obeyed to prevent relevant risks, Figure 11.

8.4.7 Venlo [NL]

Venlo's perception-based analysis of the municipal experts is illustrated in Figure 12.

Venlo and its support partner had no access and resources to collect answers neither from Blockchain experts nor from decision-makers on the fifth Questionnaire on the National Strategy for the Circular Collaborative Economy.

Venlo shows strikingly high technical and municipal-policy preparedness, being ranked at 63% up to 71% 'as drivers, at the scale of development', Table 5. However, it sustains relatively low performance in **legal** development on the legislation of social economy or entrepreneurship schemes, being ranked at 62% at the scale of constraints, Table 6. Regarding the **municipal policymakers**, the main findings are interpreted as follows: The central policy of DIY makerspaces has not been concretely developed in the form of occupation of unused buildings. However, it is under consultation with the Municipality of Venlo whether future possibilities could be explored. Another critical issue is about health and safety hazards at the appropriation of unused buildings as envisioned by the DIY makers' movement. Specifically, health and safety risks can be considered, since in many cases these are old buildings. Within the running sustainability and circularity programme of the municipality of Venlo, there are concerns about making municipal real estate more sustainable, looking at whether the involvement of repair cafes from vacant buildings could contribute to circular ambitions, Figure 12.

According to Venlo's **technical experts**, the licenses needed for the safe operation of a DIY makerspace relate to health and safety coordination in supervising and advising on the safety/working conditions at the workspace. Besides, an external occupational health and safety investigation should be scheduled at appropriate intervals, providing recommendations for implementation. Similarly, health and safety legislation in the municipality of Venlo, ensures that the Working Conditions Act (in Dutch 'ARBO') complies with various obligations in order to create the safest and healthiest possible working conditions for vulnerable participants, as well as all professionals and volunteers working there. Other licenses apply to sell the manufactured products; thus, permits for a) subordinate retail trade, b) necessary insurances, c) maintenance, management and operation of the buildings, Table 5. Moreover, according to **legal experts**, the DIY makers' movement is related to health and safety hazards at the expropriation of unused buildings, being envisioned by the rules of the Working Conditions Act, according to the policies from the municipality of Venlo. These administrative tools are operating as safeguarding healthy and decent working conditions for makers while ensuring compliance with the safety regulations. Specific aspects that determine drivers of future development necessitate a risk inventory and evaluation to ensure the safety of the participants, Figure 13. The Dutch legal experts' feedback is cited in length at 8.5.2.

8.5 National framework conditions for participants

8.5.1 Background of framework conditions

Pop-Machina aspires to enhance the circular maker ecosystems for the sustainable development of urban areas. The challenges of Pop-M in terms of effective human resources management arise from the combination of the maker movement and collaborative production with the EU circular economy. The CE and the maker movement are current concepts, but their implementation can drive the future of European cities. Pop-Machina develops innovative solutions (skills, infrastructure, tools, and methods for engagement) to address these challenges. Empowered cities can enable the circular maker movement (CMM), enacting resilient and adaptive ecosystems that tackle socio-economic and environmental challenges (Metta. J. Deliverable D2.1, p.12). The main points of national regulations are cited below:

8.5.2 Evaluation of national law, based on primary feedback

Turkey [Istanbul] (TR)

According to municipal legal experts, there is no specific legal status of the makers' movement and no legislation of social economy/entrepreneurship schemes. EU Regulations and Directives on Circular Economy and Social Economy are adopted in the Turkish national law. The general provisions are applied for IP and Patent rights. There is no national strategy/legislation on Social and Solidarity Economy that is considered as complementary to the circular economy at the moment. Although Turkey's law on waste is harmonised with the EU Waste Framework Directive, additional effort should be made for separation of various forms of wastes, recycling, treatment of medical wastes, recycling of hazardous wastes and minimisation of the biodegradable wastes. The adoption of a zero-waste management system by the municipalities may enhance separate accumulation and collection of waste. Measurable targets, as set by the 2018/98/EC, have not been adopted at a municipal district level, which is the competent authority to collect waste separately. The same pattern applies to the establishment of facilities for disposal and utilisation of waste which is under the current legislative framework an obligation of the Metropolitan Municipalities and not that of the District Municipalities. This role distribution does not leave room for development at a local scale as proposed by the principle of the proximity of the Waste Framework Directive. Therefore, all initiatives for services, facilities, development of 'green jobs' relevant to the circular economy depend on the state authorities (e.g. Metropolitan Municipalities).

Tax policies in Turkey fall under the law of 2010 on 'The Decision on State Aid in Investments'. Exemption from VAT for the purchase of investment equipment, exemption from customs duties on imports of investment equipment, withholding of income tax and additional funds and surcharges are some of the incentives also applied to CE initiatives. The latest 2019 incentive programme of Turkey has aimed to (a) direct savings into high value-added investments, (b) increase in production and employment, (c) encourage large-scale strategic investments, increasing international competitiveness and high content for research and development; (d) Raise direct foreign investment; (e) Reduce geographical inequalities in development to attract investment. The majority of the incentive programme is addressed on large investments rather than SMEs and start-ups. In the less developed regions of Turkey, EU funds have been used to set up Enterprise Development Centres (ISGEM) to promote local economic development. These centres, although their sustainability has yet to be tested, are considered the adequate tools to improve local economic potential.

There is currently no flexible framework between the municipal and private sectors to help the transition to a circular economy model. Consumers pay all the costs to buy; however, they are not incentivised to buy recycled products, contrary to the existing legislative framework. Limited priority

to selling recycling products is the consequence, especially for SMEs. Regular changes of legislation in Turkey and limited access to funding are some of the weak points of the Turkish legislative framework relevant to CE. Closing, no specific legislation applies to blockchain platforms in Turkey. In conclusion, Turkey needs additional effort and tuning of the legislative framework in order to promote collaborative actions for CE.

These were conclusions from the national report findings provided by PLANET TURKEY.

Lithuania [Kaunas (LT)]

According to municipal legal experts' views, the most usual status of the makers' movement in Lithuania is an association or NGO. The concept of social business and the circular economy proposed by the EU is taken into account in the national legislation. There are not specific comprehensive constraints, nor penalties for not being circular. Licensing for DYI makerspace is required just like any business entity, so the average time needed could be up to 12 months. Upcycling makers can use 3D printing technology without prior IP and Patent rights, but manufacturers patent rights could block the reuse/upcycling. Waste legislation could address supply chain barriers when informal makers perform upcycling and commercialise their ideas.

In Lithuania, the national report (provided by ISM) concluded that the importance of waste prevention is emphasised in legal acts and state plans. Although this is a priority for public action, there are no binding requirements on the private sector with strict restrictions on the use of raw materials. In order to promote prevention in the private sector, there is a liability mechanism for producers and importers based on the 'polluter pays' principle. Producers and importers are subject to waste management tasks; they are obliged to provide data, reports, education to consumers. Waste management differs slightly among waste streams, and there are no generalised enforcement schemes for producers and importers. Although much attention is paid to the field of waste prevention and control in Lithuania, the implementation of the circular economy is still in its infancy. There is much discussion about the importance of transition; projects are being developed, examples of the circular economy are generally activated 'from the bottom', although the legal framework is not yet created. For example, many businesses operating following the principles of the collaborative economy can be found in Lithuania. However, there are no special regulations in this area; general provisions apply or different interpretations of the responsible institutions. In the case of collaborative makerspaces, this area can be described as a 'grey area' because their activities are not subject to separate regulation and the operation of makerspaces are not among the licensed activities. Makerspace is subject to the same requirements as other business entities. However, by interacting with practitioners, examples can be found of how makerspaces themselves create their specific regulations or licensing rules on spaces for makers. The situation in Lithuania is entirely different in the field of blockchain tokenisation, in which the Bank of Lithuania is particularly active in promoting this area while increasing its transparency and accountability. Lithuania has a system that ensures secondary material flows, as well as The Unified Product, Packaging and Waste Accounting Information System, which keeps records of products, packaging placed on the market, waste generation and waste management.

However, there is no special national regulation of critical raw and conflict materials. Nor does the regulation of industrial symbiosis exist, although in practice it is happening. In Lithuania, tax incentives to investments aimed at promoting entrepreneurship, competitiveness, creating and implementing innovations. In addition to tax benefits, Lithuania offers other measures to promote small and medium-sized businesses. Invega is a state-established financial institution responsible for implementing these measures. In Lithuania, there is a precise regulation of green public procurement for the public sector; the private sector can implement green procurement at its discretion. There is a considerable variety of employment and company legal entities in Lithuania, and this provides flexible business opportunities. Lithuanian law encourages small businesses or to employ people with severe disabilities in social enterprises. However, there is no legal framework for social entrepreneurship and employment in the circular economy. Occupational safety and health regulation in Lithuania is com-

prehensive, defining the protection of vulnerable groups as well. There is also a detailed regulation of product labelling and patenting in Lithuania, specifying which activities are regarded as unfair competition.

These were the main conclusions from the national report findings provided by ISM, University of Management and Economics, Vilnius, Lithuania.

Belgium [Leuven (BE)]

According to the municipal legal experts, the most usual legal status of the makers' movement is that of social purpose company. There are regulations for industrial and household waste, implementing the EU Circular Economy directives. Safety licenses of a Fab Lab abide by the general legislation. The licensing process for a makerspace takes up to two months. 3D designs are either free or are purchased; therefore, IP rights are not affected. Manufacturers patent rights do not block the reuse/upcycling or recycling services which are not considered as unfair competitive practices. Any initiatives for the development of social enterprises in Belgium are regulated at a regional level. The following elements characterise social enterprises: primary social aim, self-generation of market income, at least one FTE employed, limits on the distribution of profits and assets. The terms social enterprise and WISEs (Work Integration Social Enterprises) are often used interchangeably in Flanders. A transparent and open database may become an enabler for open-source symbiosis.

As in the other EU member states, Belgium's environmental law derives predominantly from EU law, either by directly applicable legislation or directives which are transposed into Belgian national law. Both the legislative and the executive implementation of the legislation is organised regionally. The regions are responsible for the majority of environmental protection issues. Notably, the Flemish Environmental Policy plan (in force until 2015) had set a clear framework for CircEc for the city of Leuven. Flanders' policy is undergoing a shift from a waste policy (focusing on environmentally sound waste management) to a sustainable materials management policy (focusing on closing material cycles and developing a circular model of production and use, that is, shifting people's perspective on waste). Nowadays, the Flemish Waste and Materials Decree (Vlarema) along with its executive decisions, supports the circularity of the materials. In this context in Flanders, new more ambitious targets have been set, and an extensive network of local collaborative spaces has been collected to assist the promotion of the CircEc via the Policy Agreement Leuven 2019-2025. One of the main five themes of Programme 9 of the roadmap towards a climate-neutral city 'Circular Leuven' focuses on Circular Entrepreneurship in Leuven. The Flanders Circle is the focal point, the catalyst and matchmaker for Flanders' circular economy. It is a collaboration between governments, corporations, non-profit organisations and the field of science who work together to engage in action. Embedded in the Flemish Waste Agency OVAM (*Openbare Vlaamse Afvalstoffenmaatschappij*) is the operational team responsible for day-to-day activities.

Belgium raises investment in research and development (R&D) to 3% of GDP. As of 2007, Belgian companies can choose between a tax deduction or a tax credit for investment in R&D. The tax deduction can be carried forward for an unlimited period if profits are insufficient to benefit from the deduction. Any business (regardless of the number of employees) can take a 25 per cent deduction (for the tax year 2016) for environmentally-friendly investments in Research and Development, based on the depreciation of the investment. No VAT exemption applies. Green Public Procurements is an additional incentive adopted by Belgium.

There is no specific legislation for blockchain tokenisation. Crowdfunding in Belgium is regulated by Belgium's Act of 18 December 2016. It is expected that the current limits will be increased to become more in line with neighbouring countries. The market of P2P lending is not yet open, which is by far the most critical form of crowdfunding, posing a significant challenge for start-ups funding solutions and, in particular, scaling up enterprises.

In general, it can be claimed that Leuven has the most mature conditions for the promotion of cooperative circular economic activities.

These were the main conclusions from the national report findings provided by CREVIS/ETAM.

Greece [Piraeus, Thessaloniki] (GR)

For **Piraeus**, municipal legal experts believe that the legal status of the makers' movement is either related to local businesses, universities, public or private schools. There are no regulatory incentives or penalties for not being circular yet. National and regional authorities of Greece comply with laws and regulations, as harmonised with EU regulations and Directives. The average time needed for a makerspace to get urban licenses to operate as a technical training centre is approximately six months. The maker movement has relied upon open licensing to help share and disseminate 3D printing files. If reuse/upcycling of products complies with EU Regulations and Directives, then there is no unfair competitive practice.

Thessaloniki's municipal legal experts believe that, the most usual legal status of the makers' movement in Thessaloniki is a sole proprietorship, and that legislation of social economy/entrepreneurship schemes can take place. The national or regional legislature is not differentiated from the EU original legal provisions. The administrative licenses involve the physical inspection of the makerspace. The average time needed for a makerspace to get urban licenses depends on bureaucracy, from a couple of weeks to a few months. 3D printing designs and implementation must be based on lawful IPRs. National strategy/legislation on social and solidarity economy conforms to the EC regulation. There are existing transparency barriers for open-source industrial symbiosis, and there is a national e-waste platform, a registry for start-ups 'Elevate Greece', a registry for Shareholders' Real Beneficiaries and a National Real Estate Registry.

The current waste management system in Greece is based nationwide on the private sector and PPP's projects. The role of the third sector and social economy is still minimal. The makers' movement may seek unused buildings, keeping in mind that ownership laws and the Greek Constitution do not allow illegal expropriation. There are regulations for industrial and household waste, implementing the EU Circular Economy directives. A makerspace or a maker that decide to involve waste treatment activities need a prior permit for both facilities and activities before any waste treatment is carried out. All studies, information and technical data concerning waste treatment, should be submitted to environmental authorities as a part of the 'environmental impact assessment study'. There is a legislative background for the social economy but not a concrete national policy supporting the development of social enterprises. Itinerant Roma, immigrants and social enterprises of vulnerable groups, sometimes illegally empty the blue bins of recyclables. The state plans to inform, guide and encourage enterprises to introduce circular changes to their benefit. The Greek government takes measures to enforce Extended Producer Responsibility (EPR) schemes for targeted waste streams as well as the separate collection and sorting infrastructure, and deposit refund systems. Greece's environmental law derives predominantly from EU law transposed into Greek national law, or by directly applicable legislation. The thirteen regions (prefectures) are responsible for the implementation of environmental legislation across the country.

The national circular economy strategy provides for future tax incentives, such as the removal of VAT in recyclables; reduction of tax on repair services; shifting labour taxes to raw material taxes; financial incentives to circular enterprises; reduction of licensing charges; as well as incentives for credit foundations to finance industrial symbiosis projects. Green Public Procurement is an additional incentive recently adopted in Greece. There are already proposals for establishing regulations on fair digital taxation at EU level, but currently –and until the end of 2020- Greek legislation anticipates the global solution decided at OECD level. On a national level, there are well-established state authorities and institutions for securing and promoting the culture of safeness. Their contribution to circular actions in makerspaces in the context of Pop-Machina may be crucial since they offer training for OSH risk assessment. Regarding blockchain tokenisation, Directive 2014/91/EU on crowdfunding transposed in a Greek regulation on crowdfunding platforms (Law 4416/2016) but neither a culture

for crowd investing nor a relevant capital market exists. Very recently, a new Greek law on trademarks has entered into force incorporating Directive (EU) 2015/2436 relating to trademarks.

The integrated waste management ranking of **Greece** is very low compared to the rest of EU27, in terms of the circular economy, waste recovery - recycling and final disposal to landfills.¹⁸³ Municipalities recycle only 15% of municipal solid waste, and 80% ends up at landfills or illegal dumping sites. Therefore, the most critical issue for Greece is to create the right mechanism for reducing the municipal duties, by auditing the waste management performance among the 323 municipalities at a national level. Pop-M as a digital platform could contribute to registering part of the associated activities. Primary drivers for the circular economy can be the Green Public Procurement, the enforced inspection of the EPR system and communicative campaigns. Main barriers are the lack of knowledge of entrepreneurs and citizens, lack of financial incentives and reduced support to entrepreneurship. The Greek government¹⁸⁴ put as its key cross-sectoral priority the implementation of circular economy objectives,¹⁸⁵ by extending up to 2025, the National Strategy and Action Plan for the Circular Economy,¹⁸⁶ accelerating action and results through concrete performance indicators.

CommonLawgic (LAW) elaborated on the above in a special report for Greece.

Spain [Santander] (ES)

According to the municipal legal experts, the most usual legal status of the makers' movement in Santander is a private association. At the same time, the country has the legislation of social economy/entrepreneurship schemes. The national or regional legislature is not differentiated from the EU's. There is no licensing difference between a Fab Lab operation and any other activity. It takes from two to six months to get the licenses, depending on the complexity of the facilities. Upcycling makers cannot use 3D printing technology without prior IP and patent rights. Patent rights can be established on products/materials which have been used/upcycled on recycled, under the scope of patent legislation.

A multitude of legal texts emerged from the transposition into Spanish law of the European Waste directives. The novelty of the Spanish legal framework lies in the fact that the autonomies are allowed to regulate specific issues of waste and circular economy. In this way, their role is strengthened.

In order to support the circular economy in Spain, several measurable goals have been set. The reparability of products and the fight against programmed obsolescence, as well as the conversion of waste into resources, reduction of food wastes, minimum separate collection of the organic fraction and reduction of plastic bags are some of the initiatives that apply all over Spain. Specific focus on plastics has been set by the city of Santander, which has created a framework aiming the promotion of the use of recycled plastic and the generation of quality recycled plastic products.

The autonomous communities at a regional level are halfway between national and local areas and can form the ideal link between the two levels. On the other hand, it offers the necessary scope for articulating and pursuing circular economy policies that are enforced at a local level, depending on its territorial dimension and the competencies given. Thus, Local Authorities act not just in the sense of co-responsibility, but by positioning themselves as catalysts and circular motors for the transformation of the local economy.

In terms of incentives for CE actions, there are many financial instruments available for promoting investment in R&D through public grants, guarantees, granted loans and other fiscal instruments, i.e. corporate tax allowances and tax credits. However, the nature of these instruments differs significantly, especially in terms of the methodology used for promoting investments and in the quality of

183 IOBE Policy report. Greece 2020. Factsheet on Green Policies. Retrieved at http://iobe.gr/EC_Conference2020/Factsheet_Green%20Policies_Greece%20July%202020.pdf [last accessed 15/10/2020].

184 Hellenic Ministry of Environment and Energy, See <https://www.circular-economy.gr/%20:%20http://www.ypeka.gr/%3E> [last accessed 15/10/2020].

185 UN SDG Partnerships Platform (2020) Greece's commitment to green growth through circular economy. Retrieved at <https://sustainabledevelopment.un.org/partnership/?p=33843> and accessed 15/10/2020.

186 Idem.

the projects. The goal of the tax credit is to reduce the R&D investments after-tax price by maximising investment income. Two significant drawbacks are the tax credit. First, it welcomes any organisation that invests in R&D, regardless of project quality. Secondly, it can deter SMEs and new enterprises due to the most significant variability in their profits. Additionally, a Green Public Procurement Plan for the General State Administration and its Public and Social Security Bodies has been adopted in Spain. It is considered as an essential role in sustainable consumption.

Although there is no specific framework for blockchain platforms, the law 5/2015 that regulates crowdfunding applies if the crowdfunding activity takes place in Spain. In case the platform is based in Spain specific requirements and authorisations by the Spanish National Securities Market Commission apply.

Overall, the Spanish legal framework provides a complex but clear structure for the development of collaborative activities with a focus on the circular economy.

These were the conclusions from the national report findings provided by the University of Cantabria (UNICAN).

Netherlands [Venlo] (NL)

According to the municipal legal experts of Venlo, the makers' movement has not fully developed a legal status for social entrepreneurship; the development of specific legislation is evolving, focused on regulatory incentives or penalties for not being circular. Besides, the EU Regulations and Directives on CE and Social Economy were adopted in the national law and have been reported in the 'Netherlands Circular 2050' programme, as the government's vision to follow on the circular economy, aiming to bring a transition to a fully circular economy by 2050.

Moreover, regarding the licenses needed for the safe operation of Fab Lab type workspace, as a DIY makerspace, there are few paradigms where such rights applied to get a license for subordinate retail trade for specific locations. There are special provisions on necessary insurances, which are required to be able to operate the relevant facilities. Furthermore, the maintenance, management and operation of the buildings belong to the responsibility of the real estate municipal department. Other interested parties of circularity could be that of the manufacturing industry and entrepreneurship.

In this direction, the crucial aspects, yet to be addressed, are that of: a) involvement to the employment status of those working/cooperating within a makerspace, b) the social security and insurance risks identified when using a makerspace, being referred to liabilities in case of an accident or unaccepted behaviour, thus protecting the public order and safety (security), c) the risks for a maker while upcycling, such as manual handling, potential exposure to dangerous objects, hazardous chemicals upon processing, biohazards, toxic or flammable gases d) city offering of tax incentives on waste exchange e) municipality motives to users with credits and tokens f) regional funding opportunities for joining upcycling g) concrete proposals for better legal and tax practices as drivers of the makers' movement.

Another critical issue is that the mandatory 'Green Public Procurement' can be considered as a state subsidy. Moreover, the upcycling makers use 3D printing technology without prior IP and patent rights or 'license to repair'; the reuse or upcycling of products is considered as fair, competitive practice. However, the provision of manufacturers patent rights is required regarding the reuse, upcycling, or recycling of second market products and materials.

Critical issues of future reference consist the main barriers addressed, including (Figure 14), such as (a) current e-waste platforms effectively comparing the resources input to the waste output of every manufacturer/retailer (b) Upcycling use of 3D printing technology with or without prior IP and patent rights or 'license to repair' (c) Shorter average time needed for a makerspace to get urban licenses to operate as a technical training centre, mainly trainers' credentials, emergency exits, adequate restrooms, fire precautions.

9. Navigating the challenges of circular collaboration

Recent literature on CE has identified various factors that suspend or promote the transition from a linear production-consumption model to a circular one. Pop-Machina Deliverables 2.1, 2.2, 2.5, 5.1. and 8.3. respectively deployed ‘circular-based’ approaches. D2.4 focused more on the collaborative economy aspects as an innovation strategy that sets up an explicit roadmap with long-term goals altering traditional governance structures. The main contributing factors for innovation include, amongst others, technological advantages, competition increase and changes in consumer preferences (Schiza, 2020, Deliverable D8.3, p.12). According to Pop-Machina deliverable D2.2, drivers associated with the degree to which individuals join the maker movement, are valued as positive to perceptions and willingness to join, irrespective of a specific reason (Panori, 2020, Pop-Machina D2.2, p. 65). Drivers to join makerspaces depend on characteristics, such as the openness to ethnic diversity and altruistic values; on demographic characteristics of gender (women are positively affected by makerspaces’ perception, but unwilling to join them). Age is another factor since young people show positive perceptions of makerspaces, but older people are more willing to join them (D2.2, p. 60).

9.1 Drivers and barriers to a circular economy

Key drivers to a CE include a) incentive strategies, b) transparent formation of supporting alliances c) alignment of conventional policies with the circular economy, d) measurable targets easily absorbed by society (WBCSD, 2018). Whereas the critical barriers identified are a) the logistics of the circular economy especially the lack of support in supply and demand of materials and products, b) cultural or consumer reserved attitude towards green products designed with circular principles, c) financial ‘lack of capital’ or insecure profitability of circular products and services (Rizos V. et al. 2016; Kirchherr J. et al. 2018). Further, the EU has officially identified in 2016, via a ten-case studies analysis,¹⁸⁷ three main themes of barriers referring to the circular economy:

- collection of waste streams: Several regulatory barriers often relate to lacking legislation that would allow the collection and pre-treatment of homogenous waste streams. Without specific legislation, many waste streams end up as mixed waste where high-quality recycling costs are higher than the income from its recycled materials (e.g., in the field of plastic packaging);
- uptake of secondary resources: The second type of barrier referred to legislation that hinders the use of recycled materials in production processes. The rationale behind such legislation is frequently motivated by aspects of health and consumer protection and often undermines opportunities and benefits of circular approaches. Besides, in many cases, a lack of harmonised EU legislation mandating specific quality requirements has been identified as a significant obstacle to high-quality recycling;
- design for reuse, repair or recycling: The third type of barrier is related to the lack of concrete and enforceable product requirements. The leading example used was the problematic enforcement of

¹⁸⁷ European Commission EC Final report - **Regulatory barriers for the Circular Economy**, Document date: 13/07/2016 - Created by GROW.DDG1.C.4 Retrieved at <https://ec.europa.eu/docsroom/documents/19742?locale=en> [last accessed 15/10/2020]

requirements of the WEEE Directive for the recyclability of electronic products, especially concerning the disassembly of batteries.¹⁸⁸

These initial findings remain in most cases as challenges at EU level, and Pop-M contributes to solutions. Pilot cities of Pop-Machina delivered through D2.4, a detailed reference on the circular economy policies, regulatory frameworks and incentives. A comparative analysis of the pilot cities showed that each city has a different level of maturity towards circular actions.

It was noted that the Circular Economy Action Plan and the current European regulatory framework on wastes jointly promote the CE initiative. The alignment with conventional policies in each pilot city can be achieved by the adoption of measurable targets for specific waste streams as described in the updated Waste Framework Directive. An effort to align with EU waste framework is being made in Istanbul since the harmonisation of national legislation with the European is a requirement of joining the EU as a candidate country. National strategies and roadmaps showcased that Belgium, Greece, Lithuania, Spain and Turkey present slightly differentiated targeting, as follows:

Turkey adopted a rather ambitious policy named the Zero Waste Regulation, which aims to establish and support general principles regarding the establishment of waste management systems. The clarity in goal setting and engagement of the society needs further development in Turkey and therefore, in the Municipality of Istanbul (IMM). New policies should be carefully scheduled in Turkey, according to the 'waste hierarchy' to ensure the long-term alignment with the goals of the EU for the protection of the environment (for example the reduction of CO₂ emissions). Notably, the IMM vision includes incineration practices which, however, are the least favourable ones towards the CE integration.

The city of Leuven is by far the most advanced of pilot cities in terms of the formation of supporting alliances and the transparent dissemination of these actions via the hub 'Circular Flanders'. This hub is a notable attempt for networking and building public, private partnerships (PPPs). Additional incentives such as taxation and funding for R&D projects on CE also contribute in this direction. Although the general public in Belgium highly supports CE, the city of Leuven intends to put more effort into the engagement of society. The only barrier towards CE in the city of Leuven is the local waste incinerator that demands a certain amount of waste to operate, which may pose a market limitation to the materials that could re-enter the value chain.

The Lithuanian legislation also aligns with the European framework and has adopted a national waste management plan focusing on prevention; further, the state provides taxation incentives for R&D investments for CE activities. The city of Kaunas follows this strategic design. An impressive driver is an established system that ensures secondary material flows, as well as a unified product, packaging and waste accounting information system, which keeps records of products, packaging placed on the market, waste generation and waste management. Although the society is engaged in circular actions, there are also market barriers present in Lithuania because of specific industrial sectors that have not moved forward towards the circular economy. Additional effort should be made in this direction without affecting the established industry.

Spain and the city of Santander have a very advanced approach towards CE. However, the city's primary focus is on the reparability of products and conversion of waste into resources with various actions. The main barrier is the lack of a systemic understanding of upcycling. Further challenges for businesses in adopting such policies or attempt such activities have also been noted since it is a challenge to attribute value to waste and second-hand commodities. The 'bolsa de residuos' is a platform that aims to facilitate the exchange of waste produced from one company that may be utilised by another as secondary raw material.

188 Ibid. p.38-4/174. **European Commission** EC Final report - Regulatory barriers for the Circular Economy. Retrieved at <https://ec.europa.eu/docsroom/documents/19742?locale=en> [last accessed 15/10/2020]

Greece has also harmonised its legislation to the most recent targets of the Waste Framework Directive and has drafted a national waste strategy plan with CE principles. Ambitious incentives also include VAT exemption, CSR expenses to be deducted by 130%, and R&D investments to be deducted by 200% from the taxable annual income (if profitable). Greece incorporated requirements of recycling in construction wastes in new permits and other EU funded programmes such as ‘Saving at Home (Exoikonomw kat’oikon)’ lately adopted. Main obstacles in both pilot cities (Piraeus and Thessaloniki) are the density of the population and the lack of engagement of the society, so awareness campaigns are needed. There is a significant loss of materials from illegal bugging out the recycling bins purposed for metals, e-waste and carton papers. The extensive shadow economy makes the logistics of treating these materials, quite risky and unpredictable as to the expected quantities. There is an e-waste platform in Greece for information on the output but not on the input of raw materials for producers. There is no platform for the exploitation of secondary raw materials nor a framework setting criteria to promote CE. At a national and regional level, the number of state personnel involved in environmental and waste management audits and the number of performed audits cannot be characterised as satisfactory. A new piece of law is expected, during 2020, to bridge this crucial gap by authorising registered scientists and engineers from the private sector to perform the necessary audits on behalf of the Greek state. Moreover, lately was launched a national online startup register, named ‘Elevate Greece’, for new companies characterised by eligibility criteria such as innovation and scalability, seeking talents and financing. Both these initiatives could boost the sustainable performance of the Greek ecosystem and provide a stable ground for achieving the quantitative EU targets of the circular economy.

In general, it was evidenced that:

Municipalities are managed by many departments and public entities, applying different governance strategies, plans and resources, where a so-called ‘silo thinking’ of different priorities, hamper the circular integration. The transition to a circular economy could benefit from introducing open governance tools and platforms that facilitate the interactive exchange of views between different stakeholders, such as citizens, businesses (commerce and industry), media, academia, and civil society (NGOs) (Dimitriou A. 2020, D2.5, p. 125-126). The circular economy presents remarkable benefits, provided that several challenges are addressed, in general at an EU or regional level:

- there is a lack of particular incentives for companies a) to use secondary raw materials for the production of their products and b) to design products with longer life-cycle or upcycling uses;
- there are insufficient waste management and collection processes for secondary raw materials such as plastics, textiles and building materials;
- there is an information and data gap in the real-time availability of secondary raw materials and a mismatch between the raw materials available for circular economy use and the makers in need of such materials;
- makerspaces at the forefront of the circular economy movement lack a proper legal framework for licensing a DIY makerspace, as well as the needed funding and leadership for their operation, hampered by legal, governance and tax complications and regulatory uncertainty;
- consumers may be cautious regarding quality and lifetime maintenance of circular economy products and not adequately informed about their benefits in the economy and the environment;
- there is a notable complexity in the EU chemicals, product safety and waste legislation and possible misalignment of its goals and provisions, raising questions about the feasibility of regulatory compliance and the management of respective liability risks by secondary raw material users and makers;
- there is a lack of a framework for the continued and organised support or incentivisation schemes for partnerships among the Member states and their municipalities, fostering collaboration between all stakeholders in the maker movement.

9.2 Drivers and barriers to a collaborative digital economy

Digital economy tools can facilitate the collaborative movement in many practical ways, most indicatively, by way of matching product providers with product users through a common digital platform, or by way of offering collaborative access to a digital material databank, sharing knowledge and skills for makers. For each of these digital forms of collaboration, key drivers and barriers were identified.

Digital platforms (based on blockchain technology or not) can link product providers (individuals or companies that dispose of items no longer useful for their activities) with product re-users/re-producers (using wasted products to make new/upcycled ones) and the latter with end-consumers of the upcycled products. The respective matching is crucial to the strengthening of the collaborative economy: firstly, it facilitates access to product material; secondly, it encourages circularity of products that have reached the end of their first life-cycle (as it gives initial producers outlet for handing over such material) and thirdly, gives access to new clients of the upcycled products. What is more, the collaborative access to digital data enables the sharing of skills, knowledge, tools and resources (designing out waste) enhancing the circular economy possibilities for production.

The findings of deliverable D2.4 confirm that the use of digital platforms requires an upskilling or re-skilling of the circular economy participants in digitalisation and a digital accessibility and inclusion strategy, especially concerning disadvantaged, marginalised and vulnerable social groups. The responses also highlighted the importance of legal and tax certainty about particular aspects of the platform economy, and most indicatively: labour law considerations, remuneration of the respective activities, tax and regulatory framework of tokenisation schemes and platform (blockchain or other) transactions and their cost, enforceability of smart contracts and agreements settling problems of territoriality and applicable law.

More particularly, the D2.4 Pop-Machina research findings evidence that the digitalisation of the collaborative economy is challenged both at a national and local level, given that:

- the digital transformation of collaborative resources is still nascent: many data regarding such resources are not digitalised or standardised or available to all interested parties;
- there is a lack of necessary digital skills and e-literacy in underprivileged groups of citizens (women, migrants, minorities, seniors and undereducated youth);
- there are civic, private and public sectors' concerns regarding privacy and security of data use;
- there can be technical difficulties concerning interoperability between systems and data exchange;
- there is a lack of a uniform legal and tax framework about digital products and services, hampering incentives for investment in the digital collaborative economy;
- there is a cost involved in the digital transformation of the collaborative economy, which is not easy to finance without state intervention either in the form of direct state investment or via crowd-funding and P2P modern financing legislative and tax measures.

Regarding the cities' use of digitalisation tools as a means of enhancing the collaborative economy, there is still potential for improvement. Overall, the cities have declared some maturity in technological progress. Blockchain technologies, gamification and tokenisation, are on the rise. Nevertheless, those tools exist outside a specific tax and regulatory framework. Experience with incentivisation and tokenisation programmes lacks in terms of tax incentive schemes. In particular:

Santander declared that crypto coins are valid and well-established means of payment and investing; also, its blockchain experience is limited, some blockchain projects are already in place. However, there is no prior experience in Santander Municipality incentivising the users with credits and tokens either through a platform or otherwise.

Kaunas presented itself as having advanced maturity in terms of blockchain rewarding and transactional tools. It considers the tax limitations on smart contracts of a user-friendly open-source platform dependent on general business models. At a city level, Kaunas explains that the lack of infrastructure to incentivise users with tokens, is a barrier and that therefore their use in trade and other

financial facilities is limited. On the other hand, and despite the lack of regulation of tokens, the Bank of Lithuania is active in promoting blockchain tokenisation and aims to increase its transparency and accountability.

Istanbul stated that blockchain rewarding and transactional tools are used. Stakeholders explained that there are no tax incentives to collaborative economy projects, but also no restrictions on behalf of the Municipality in incentivising platform users with credits and tokens. Istanbul further explained that, although Blockchain as a Service (BaaS) and Open Source Systems (OSS) exist, they are not widely used. Also, there is no e-waste platform in order to compare the resources input to the waste output of every manufacturer/retailer in Istanbul.

Thessaloniki is considered more evolved concerning technological maturity. It explained that open-source platforms follow the general legal framework and that there is no specific legislation for tokenisation. Only one institution in Thessaloniki provides BaaS and OSS, although the city has pre-existing scientific, research and technical expertise to implement blockchain solutions.

Piraeus confirmed that there is no legal framework for tokenisation through digital platforms. ICT infrastructure to implement blockchain is needed per case. It stated that there are no BaaS and online platforms to trade and share knowledge and secondary resources in Piraeus.

Leuven's government has an active policy to promote circular economy initiatives. Stakeholders considered likely that there are transparency barriers for open-source industrial symbiosis. Tokenisation and crowdfunding through digital platforms are allowed at a national level. There is a digital infrastructure to implement blockchain in some cities, while BaaS and (OSS) online platforms are on the rise.

Venlo municipality lacked blockchain experts, but there are already in place e-waste platforms to effectively compare the resources input to the waste output of every manufacturer/retailer.

To conclude, a successful collaborative economy strategy must include concrete actions at local, national and EU level that incentivise the use of digital tools, addressing the various (legislative, tax, technical, information gaps) digitalisation challenges, with an inclusive strategy for underprivileged social groups.

10. Limitations

D2.4 Framework conditions addressed several challenges in governance as generally expected from a practitioner's perspective. The pilot cities clarify the Community Engagement Plans, material flows and BaaS goals later in the project. Due to COVID-19, there were unforeseen time delays since regional 'warm-up' activities and stakeholders' events (needed to map the local makers' insights), were postponed and not organised as planned at the early stages of the project. Moreover, the delivery date of WP2 tasks' extension, limited the direct feedback on framework conditions. WP2 consortium tasks T2.1., 2.2 and 2.5 were duly granted delivery extensions. Therefore, the openly-accessible survey results (contained in D2.1, D2.2, and D.2.5) were available around August 2020, instead of Feb. 2020. Therefore, our applied research capacity was time-restricted and content limited, to the feedback from the Grant Agreement, our primary perception-based cross-case analysis and the said empirical research results obtained from other tasks from August to mid-October 2020 (M17). Furthermore, T.2.4 was not involved in the deployment progress of pilot makerspaces (dealt in-depth at WP5) that identifies the Pop-Machina (2019-2023) vision applied in practice, and the actually engaged stakeholders, and material flows, users and makerspaces of CMCs. Those would better clarify at Pop-Machina D5.2 delivered in January 2021 (M20).

11. Policy recommendations

Urban growth depends on operational and tax incentives, facilitating circularity. The Pop-Machina project proactively developed this study to advocate on the replicability of makerspaces (repair cafes, living labs, online city portals) with governance structures that empower prosumers initiatives (e.g., consumers associations), and makers movements to:

- exercise collectively regulatory influence at UN, OECD and EU level to reverse the ‘Cradle2Grave’ linear approach with the ‘Cradle to Cradle’_circular concept;
- support upcycling, eco-design or Extended Producer’s Responsibility (EPR) schemes (durability, availability of quality used spare parts, design for disassembly, repair or reuse);
- raise awareness on circular ways to offset urban plastics waste that cities make and discard;
- join synergies that promote the UN SDGs, engaging multidisciplinary academic researchers on sustainable consumption & production;
- raise awareness over sectoral business sustainability risks engaging lead users and maker champions against the manufacturers’ linear demands (to continually produce using virgin raw materials, based on collective EPR);
- engage with local environmental/waste clean-up activist movements, showcasing local waste open-disposal data, and advising on prevention circular practices;
- engage clusters of prosumers, machine and equipment manufacturers and Waste Reception Facilities to support the circular economy model.

To address the challenges of the circular collaborative economy, we recommend the public sector to:

- set uniform minimum specifications for obtaining a makerspace licence under OHS standards;
- set scalability standards for Green Public Procurement, ¹⁸⁹ as well as standards for the replacement of Single-Use Plastics (SUP) and other upcycled products;
- introduce, at municipal, national and EU level, a particular set of incentives for companies a) to use secondary raw materials for the production of their products and b) to make products which are designed for longer life-cycle, reuse or upcycling. Such incentives can take the form of municipal tokens, tax benefits or extended producer responsibility policies;
- re-model and improve waste management and collection processes for secondary raw materials, with a view to the creation of new secondary markets;
- upload real-time, cyber-risk free and GDPR secured information -on the collection and data-sharing obligations- concerning the available secondary raw materials. Through the establishment of digital tools, such as platforms and smart contracts, such data can match the upcycling supply and demand;
- invite funding schemes and training academies at the forefront of the circular economy movement. Also, issue guidelines clarifying the operation licences of makerspaces and circular economy establishments to address legal and tax complications and regulatory uncertainty;
- implement action plans that raise awareness to consumers about the safety, quality and lifetime maintenance of circular products, through various channels to reach citizens of every age and educational status;

189 **Communication COM (2008) 400/EU** on the Green Public Procurement (GPP) [https://ec.europa.eu/environment/gpp/what_en.htm#:~:text=Green%20Public%20Procurement%20\(GPP\)%20is,goods%2C%20services%20and%20works%20with](https://ec.europa.eu/environment/gpp/what_en.htm#:~:text=Green%20Public%20Procurement%20(GPP)%20is,goods%2C%20services%20and%20works%20with) [last accessed 15/10/2020]

- address the complexity in the EU chemicals, product safety and waste legislation and possible misalignment of goals and provisions through codification efforts;
- simplify regulatory compliance and facilitate the management of respective liability risks by secondary raw material users and makers;
- introduce a permanent framework for the continued and organised support or incentivisation schemes by state and municipal partnerships, for the fostering of collaboration between stakeholders in the maker movement.

Also, the above transition challenges, presuppose to:

- foster the digital transformation of collaborative resources through blockchain platforms and smart contract models;
- combat the lack of access to the high-speed internet, ICT infrastructure and e-literacy in some underprivileged groups of citizens (women, migrants, minorities, seniors and undereducated youth and seniors) as inhibitory factors in the promotion of circular products and services through the internet;
- abolish barriers to digital services such as content geo-blocking, for collaborative economy products and services;
- disseminate information about IPRs and privacy protection at EU level and the effects of GDPR on privacy and security of data use;
- address possible technical difficulties about interoperability standards between systems and data exchange in collaborative schemes;
- clarify the respective legal and tax framework relating to digital economy products and services to foster incentives for investment in the collaborative economy;
- adopt financing tools that incentivise crowdfunding and other P2P modern financing tools, through appropriate legislative and tax measures.

12. Conclusions

D2.4 research findings focused on how end-users and stakeholders align with the legal requirements of CCP and how policy planners can overcome integrational barriers, fostering upscaling enablers. This report identified the legal, tax and governance framework conditions that, when favourable, provide fertile ground for circular activities of grassroots makers. Therefore, at the starting stage of Pop-Machina, framework conditions were mapped, through feedback from pilot cities and then a qualitative comparative analysis followed. The interviews of municipal experts and national strategy decision-makers, tested the background knowledge, attitude, and perceptions of those that should become leaders in promoting the circular collaborative concepts. Other Tasks at WP 2, 3 & 5 gradually provide related research feedback through surveys useful to understand in depth the framework conditions. The ideal legal, tax and governance systems incentivise social entrepreneurs to appreciate the hidden value of used products and wasted raw materials, to join makerspaces and online platforms, get the necessary training and start circular businesses. The expansion of grassroots initiatives depends on transparency and open source governance, coupled with closer interactive cooperation among local authorities' executives and citizens in sustainable urban planning.

The volumes of waste, shortage of landfill sites, and improper treatment of waste are worse in some pilot cities. Therefore, circular economy incentives can be provided at a national or EU level to confront urgent waste challenges. This publication addressed as many of the European framework challenges as possible, with the limitation that pilot cities are still working on their deployment plans, which are scheduled for the forthcoming months. A more extensive European network of maker communities would advance the pilot cities' extrovert exchange of best practices and scalability of upcycling. EU's latest Action Plan on Circular Economy addressed farsighted issues, such as circular product design and Extended Producer Responsibility (EPR) (Monier et al, 2014), aiming a policy shift to imposing the cost of the negative externalities of EoL on the producer. This mandate pressurises manufacturers (retailers and traders) to design products that can be easily dismantled, recycled, or reused by makers. The new EC policy shift may be an opportunity for circular makers to create synergies and offer upscaled upcycling products and services, as subcontractors to large manufacturers. Civil society and taxpayers should be better informed of the EPR and PAYT responsibilities.

Nevertheless, to advance upcycling, consumers must understand the paramount importance of circular treatment for specific waste streams and the entrepreneurship advantages of digital collaboration and innovation ecosystems. The new business models of the CCP in shared makerspaces or online platforms could flourish if upcycling operations and open innovation are fairly and horizontally governed at EU level. Pop-Machina presents practical ways for consumers even for vulnerable groups, to become prosumers and to acquire circular maker skills, by joining open-access makerspaces and makers' academies and accelerators. Platform economy and reliable digital systems could enable companies to engage customers to act as prosumers in product development; engage makers to cooperate to upscale their production, share ideas and design prototypes through 3D printing. Closing the skills gap of circular makers requires the creation of a digitally connected workforce with access to secondary raw materials, to innovative ideas and designs. Civil society must appreciate the potential of grassroots circularity growth and contribute to the expansion of repair cafes, living labs, makerspaces, and circular helpdesks in every neighbourhood.

The Pop-Machina project showcased that the development of an integrated social collaboration platform can sustain considerable practical socio-economic and urban metabolism value, for the

European Union -as the funding body-, for the municipalities, but also researchers' future work. Further, this perception-based research identified socio-economic parameters that foster urban upcycling ecosystems beyond Pop-Machina project (to multiply the pilot cities' applied experience). Critical issues of future reference consist the main barriers addressed, such as a) current e-waste platforms effectively comparing the resources input to the waste output of every manufacturer/retailer b) Upcycling use of 3D printing technology with or without prior IP and patent rights or 'licenses to repair' c) Shorter average time needed for a makerspace to get urban licenses to operate as a technical training centre, mainly trainers' credentials, emergency exits, adequate restrooms, fire precautions. Future research can elaborate further on the training of makers as entrepreneurs through the collaborative sharing of know-how and best practices. Finally, using the findings of this report, makers engaged in Pop-Machina pilot cities could contribute to the policy discussion at a European and national level, being aware of both the European and regional regulations and framework conditions.

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appendix 1 KPIs management plan T2.4_last updated on April 4th, 2020

KPI-10. Socio-economic contexts analysed and optimised based on project outcomes: 7
KPI-12. Legislative, governance and taxation contexts analysed and optimised based on the project outcomes: 7

Key performance indicators (KPIs) and target values assigned to T2.4 are the following:

KPI-10. Socioeconomic contexts analysed and optimised based on project outcomes: 7

As specified by the Grant Agreement, this KPI also concerns T2.1; T2.2; T2.5; T5.2; T5.3; T5.4; T6.1; T6.2; T6.3; T6.4. T2.4 will partially complete this KPI in two ways. First, D2.4 includes baseline socioeconomic sub-indicators for each pilot city, such as skills, infrastructure, knowledge, diversity and inclusion, society and collaboration indicators. Second, T2.4 reveals the enablers and barriers in each pilot country, as the basis, time-limited to fall 2020, for the policy discussion stage at the end of the Pop-Machina project, over the expansion of pilot makerspaces and makers movement in Europe.

KPI-12. Legislative, governance and taxation contexts analysed and optimised based on the project outcomes: 7

As specified by the Grant Agreement, this KPI also concerns T2.1; T2.2; T2.5; T5.2; T5.3; T5.4; T6.1; T6.2; T6.3; T6.4, and in particular **T2.2; T2.5; T5.2; T5.4; T6.4**. T2.4 Project Milestone on KPI 12, will be completed by October 2020 in two ways: First, D2.4 includes legal, tax and governance indicators for each pilot city, mapping the framework conditions at a baseline level. Second, it identifies which national and EU laws affect and drive the circular business potential of the pilot communities and their circular collaborative ecosystem.

Details on KPIs approach and timeline

T2.4 identifies and compares and assesses through a Qualitative Comparative Analysis (QCA) the baseline findings in each of the seven pilot cities (Istanbul, Kaunas, Leuven, Piraeus, Santander, Thessaloniki, Venlo). KPI 10 addressed the socioeconomic contexts of the urban maker communities, based on a literature review. Through a (PBA) perception-based analysis, the background knowledge also tested major concepts of legal, tax and blockchain circular collaborative conditions (KPI 12). At this starting stage of Pop-Machina Project, T2.4 tested the degree of primary and basic knowledge of municipal expert practitioners, considering as leaders in promoting the Pop-Machina ideals. The aim was to specify and measure, the initial perceptions, attitude and spontaneous knowledge over the existing legislation and infrastructure (basics) in each pilot city, to be subsequently benchmarked against the mentioned background framework conditions of involved cities and countries. The knowledge progress can be later presented at the policy discussion phase to advance better governance and community engagement practices. KPIs address the socio-economic impact (infrastructure, digital skills, social and labour market inclusion) adaptability to technical, blockchain, legal, policy challenges as well as governance¹⁹⁰ (ministerial executive capacity, urban licencing, taxation policies). The timeline was rescheduled, according to the approved extension planning (to M17 instead of M9). D2.4 on framework conditions internally progressed in four stages within a period from June 2019 - October 2020 (M1 - M17), following to feedback from pilot cities and their

¹⁹⁰SGI Sustainable Governance Indicators https://www.sgi-network.org/docs/2018/basics/SGI2018_Overview.pdf[accessed 12/2/2020].

Deployment Plans. Pop-Machina D2.4 contributes to collect comparable empirical evidence to understand better the motives, perceptions and needs of different communities in each of the pilot cities. T2.4 briefly maps the maker ecosystem and local manufacturing challenges, environmental priorities and the national legal and tax framework and the maker system’s capacity maturity and readiness, through a perception-based analysis.

Separate lists of questions were initially sent to pilot cities on Oct.7th, 2019 with a final deadline (after consecutive extensions) set for May 2020 >M12. The selection of the interviewees was at the discretion of the Pilot Cities (and Support Partners). The minimum expected from each municipality was unstudied and spontaneous interview answers from twelve municipal experts (three for each of the four sets of questions). Similarly, three interview answers from national decision-makers to gauge their baseline knowledge of Pop-Machina concepts.

Tasks of Pilot Cities extended accordingly; therefore, Milestones of D2.4 spanned as follows:

D2.4	Report on framework conditions (Final)	PU	10/2020 (M17)
S1	European Regulatory framework conditions Discussion Draft v.1	CO	02/2020 (M9)
S2	National regulatory frameworks for Belgium, Greece, Lithuania, Spain and Turkey	CO	05/2020 (M12)
S3	Legal, Tax & Governance Barriers & Enablers for each pilot city	CO	08/2020 (M15)

Detailed Analysis of T2.4 KPI methodology

Task T.2.4 could identify the key performance indicators (KPIs) of Pop-Machina’s framework conditions; however, the development of Pop-Machina’s systemic methodology for evaluation and impact assessment falls within the scope of WP7 to **co-design the monitoring, evaluation and optimisation system** starting in November 2020 >M18. Moreover, CommonLawgic is not participating in the deployment plans and other dissemination Tasks, as explained at the Limitations section here below. Also, the collection and reporting of metrics and the streamlined data analysis are centralised at the municipalities, in order to keep a clear audit trail, transparency and data integrity.

Therefore, the scope of task T2.4 cannot involve the development of Pop-Machina’s systemic methodology for evaluation and impact assessment; it only addresses fundamental enablers and barriers of CCP. It is based on generic information about the vision of pilot cities and on partially assessed regulatory impact indicators based on data until mid-October 2020 >M17.

Limitations regarding KPIs 10 & 12

KPIs of urban metabolism, socioeconomic conditions, and legislative/governmental/taxation policies, critical dimensions of consideration are the following:

- pilot cities’ limited power to timely collect answers on questionnaires due to Covid-19;
- pilot cities’ limited power due to COVID-19 to engage adequate makers, sensors to digital social (DS) activities by the end of September 2020> M16;
- subjectivity impedes generalisation of applied outcomes against standard rules.

Certain further limitations should be noted:

- T2.4 Task Leader (CommonLawgic-LAW) is not included as a Support Partner in relevant deployment Tasks (3.1) (5.1 and 5.2) (7.1) and (T.8.5) on Policy Discussion and, therefore, has limited and indirect access to statistical feedback needed to validate applied quantitative research;
- the consortium’s familiarisation with legal barriers and enablers will clarify after several workshops of pilots, that are delayed due to COVID- 19. T.2.4 research is related to the T2.1., T2.2., T2.5,

T3.3, T3.4, WP4 and T7.1 research outcomes, at least in a preliminary form. However, the time proximity of D2.1, D2.2, D2.5 delivery date (August 2020) as well as the setting of other deliverables deadlines, impedes the thorough cross-checking;

- T2.4 depends on a qualitative hypothesis for baseline metrics on governance, legal, OHS, tax barriers >M16;
- T2.4 is not directly involved in WP5 progress and has no direct knowledge of planned makerspaces, Community Engagement Plans, IP barriers, and BaaS goals of each pilot city;
- T2.4 is based on the generic feedback from other Tasks' results (T2.1., T2.2, T.2.3., T2.5, T5.1, 5.2., T8.3), without having applied knowledge and immediate access to the workshops.

appendix 2 Questionnaires (1-5)

To be answered, mentioning the relevant legal framework, implementation problems and enablers or barriers on the progress of the circular collaborative economy. The questions are developed to be answered descriptively, providing information on issues that the respondents are familiar with. Please avoid the vaguely perceived 'yes-no' duality; an 'n/a' response will be considered a 'no,' i.e. denial of the interviewee to respond, and focus will be attributed to the rest of the questions' answered. A response rate of 80% of total answers per interviewee is needed. According to GDPR, the answers can be anonymous. The interviewee will be advised by e-mail on the project's results and belong to Pop-Machina Network of Interest if contact details and capacity are mentioned. At the end of the Questionnaire, please tick if you agree to publicly disclose your personal details with a (YES) on (No).

(1) NAME OF INTERVIEWEE:

(2) PROFESSIONAL CAPACITY:

(3) E-mail:

AGREE TO DISCLOSE the above (1), (2), (3)

YES NO

1. Questionnaire for municipal policy makers

1. Are DIY Makerspaces allowed in your city in the form of occupation of unused buildings?
2. Are there health and safety hazards at the expropriation of unused buildings as envisioned by the DIY makers' movement?
3. Are there licensing, health and safety provisions for the operation of Fab Labs as open-access spaces?
4. Do state actors (ministries, municipalities) cooperate with the private sector on the circular economy?
5. Does a governmental mechanism oversee implementation from industries and entrepreneurs?
6. Are the concepts of Reverse Logistics and Extended Producer's Responsibility through taking back/leasing related to upcycling?
7. What is the usual employment status of those working/cooperating within a Makers' Fab Lab?
8. Should makers' fab lab obtain a license to operate safeguarding healthy and decent working conditions for makers?
9. Are there social security and Insurance Risks identified when working in a makerspace?
10. Are there health and safety considerations for sensitive population categories (older people/pregnant woman)?
11. Are there relevant risks for a Maker while upcycling, such as manual handling during collection and sorting, potential exposure to dangerous objects, hazardous chemicals that may become concentrated during processing, biohazards, toxic or flammable gases?
12. Are all risks communicated in multiple languages or by specialised trainers of disabled people?
13. Does your city offer tax incentives on the waste exchange?
14. Can the municipality incentivise the users with credits and tokens?
15. Can the municipality allow makers to openly sell their circular assets and provide them space and tax breaks?
16. Are there regional funding opportunities for joining upcycling?
17. What are your proposals for better legal and tax practices as drivers of the makers' movement?

2. Questionnaire for legal experts

1. What is the most usual legal status of the makers' movement in your city?
2. Does your country have legislation of social economy/entrepreneurship schemes?
3. Are there regulatory incentives or penalties for not being circular, e.g. SUP Plastics Regulation?
4. Are the EU Regulations and Directives on Circular Economy and Social Economy adopted in your national law?
5. Is the national or regional legislature differentiated from the EU original legal provisions?
6. What are the Licenses needed for Fab Labs' safe operation as a DIY makerspace?
7. What is the average time needed for a maker space to get urban licenses to operate as a Technical Training Centre? E.g. Trainers' credentials, emergency exits, adequate restrooms, fire precautions, etc
8. Could mandatory 'Green Public Procurement' be considered State Subsidy?
9. Can upcycling makers use 3D printing technology without prior IP and Patent rights or 'license to repair'?
10. Can manufacturers patent rights block the reuse/upcycling or recycling of second market products and materials?
11. Are the concepts of Reverse logistics and Extended Producer's Responsibility through taking back/leasing related to Upcycling?
12. Are there supply chain barriers when informal makers perform upcycling and commercialise their ideas?
13. Can the reuse/upcycling of products be considered an unfair competitive practice?
14. Can patent rights be established on products/materials which have been used/upcycled on recycled? E.g. to the extent the recycling of a patented product (a) is used as material for another product (b) can a patent be established on such (b) product?
15. Is there national strategy/legislation on Social and Solidarity Economy (Social Economy concept is complementary to that of Circular Economy – at a European level, Regulation EC 1435/2003 was adopted, providing for the European Cooperative Society-);
16. Can upcycling assist the EU Regulation on 'Conflict minerals'? By collecting tin, tungsten, tantalum and gold (3TGs) used in mobile phones, cars, jewellery (but not from producers funding violence, human rights abuses or other crimes overseas)
17. Are there transparency barriers for open-source industrial symbiosis?
18. Is there a Shareholder/Real Beneficiary Registry in your country?
19. Is there a Real Estate Registry in your city?

3. Questionnaire for technical experts

1. What are the Licenses needed for Fab Labs' safe operation as a DIY makerspace?
2. What is the average time for a makerspace to get urban licenses to operate as a Technical Training Centre? E.g. Trainers' credentials, emergency exits, adequate restrooms, fire precautions, etc.?
3. Are there health and safety hazards at the expropriation of unused buildings as envisioned by the DIY makers' movement?
4. Are there licensing, health and safety provisions for the operation of Fab Labs as open-access spaces?
5. Should makers' fab lab obtain a license to operate safeguarding healthy and decent working conditions for makers?
6. Are there relevant risks for a Maker while upcycling, such as manual handling during collection and sorting, potential exposure to dangerous objects, hazardous chemicals concentrated during processing, biohazards, toxic or flammable gases?
7. Do the current e-waste platforms effectively compare the resources input to the waste output of every manufacturer/retailer?
8. Can upcycling use 3D printing technology without prior IP and Patent rights or 'license to repair'?

4. Questionnaire for blockchain experts

1. Are there traceability labelling requirements for the use and sale of recycled/upcycled/reused products?
2. Are there tax limitations on smart contracts of a user-friendly open-source platform?
3. Are there transparency barriers for open-source industrial symbiosis?
4. Is crowdfunding and tokenisation through digital platforms nationally allowed?
5. Can the Municipality incentivise the users with credits and tokens?
6. Can the Municipality allow makers to openly sell their circular assets and provide them space and tax breaks?
7. Does your city have the digital infrastructure to implement blockchain?
8. Is there a tokenisation/incentivisation system of waste management by industries?
9. Are Blockchain as a Service (BaaS) and (OSS) online platforms, a common and widely acceptable trade and knowledge sharing method in your city?

5. Questionnaire for decision-makers on national strategy

1. Do you find it challenging to attribute value to waste and second-hand commodities in order to nationally boost a secondary market of circular makers?
2. What secondary raw materials should be prioritised in the national circular economy? Pop-Machina has five categories at focus: plastics, food, critical raw materials, biomass as well as construction and demolition materials. Please name the most and least priority sectors.
3. Can the Ministerial authorities assist the expansion of the circular makers' movement with the establishment of makerspaces open to the public (equipped with 3D printers, laser cutters, etc.)?
4. What are the main drivers (e.g. Green public procurement) and barriers (e.g. taxation) for a progressive transition of entrepreneurs to Circular Economy, as a formal economic activity at the national and international marketplace? At least two key drivers and barriers could be named.
5. Are the manufacturers obliged to compare the input flow of materials to the output of waste on a digital platform, and do they have to apply industrial symbiosis?
6. What is the current status on developing an online platform and of citizens' familiarisation and capabilities in digital (of open-source material building platform) and circular skills (in urban mining)?
7. Are there governance priorities towards the seven pillars of the EU Circular Economy Action Plan (production, consumption, waste management, the market for secondary raw materials, specific priorities, innovation and investment, progress monitoring)? At least two priorities per aspect above could be mentioned.
8. Could the leading target group of circular policy planning be the vulnerable groups (women, immigrants, elderly workers), instead of students and startupper, by providing tax incentives to social cooperatives?
9. Can Do it Yourself (DIY) makerspaces be allowed in the form of occupation of unused buildings?
10. Please list indicative tax regulations of an online Blockchain platform for circular transactions using tokenisation and gamification?
11. What key-enablers could upscale and bridge the current gap of local circular makers on competition and tax issues against imports from giant manufacturers? (e.g. marketing campaigns?)
12. What national policies could be undertaken for the development of Circular Economy, upon 'e-literacy/digital literacy' (ability to use digital technology, communication platforms, collaborative networks for the exchange of information, designs and know-how)?
13. Will the government promote concepts like Reverse Logistics & Engineering, Extended Producer's Responsibility, taking back/leasing, sharing and other upcycling schemes?
14. Is there a central fast-track helpdesk on how to obtain urban licenses for a makerspace or set up a social enterprise?
15. What are your long-term proposals for better legal, tax and funding incentives as drivers of the local circular makers' ecosystem?

appendix 3 EU waste regulations

EU waste regulation	
Directive 2008/98/EC on waste Waste Framework Directive (WFD)	WFD sets the basic definitions related to waste management, of waste, recycling, recovery; explaining when waste ceases to be waste and becomes a secondary raw material (so-called end-of-waste criteria), and how to distinguish between waste and by-products. The Directive introduces the 'polluter pays principle' and the 'extended producer responsibility' (EPR); sets basic waste management principles: waste to be managed without endangering human health and harming the environment, without risk to water, air, soil, plants or animals, causing a nuisance through noise or odours.
2014/955/EU;	Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of Waste (LoW) European List of waste per sector, activity and hazardous property
Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste	Directive (EU) 2018/852 amends Directive 94/62/EC and contains updated measures designed to prevent the production of packaging waste, and promote the reuse, recycling and other forms of recovering of packaging waste, instead of its final disposal, thus contributing to the transition towards a circular economy. Targets: By 31 December 2025, at least 65% by weight of all packaging must be recycled. The recycling targets for each material are 50% of plastic, 25% of wood, 70% of ferrous metals, 50% of aluminium, 70% of glass, and 75% of paper and cardboard. By 31 December 2030, at least 70% of the packaging must be recycled. Essential requirements: EU countries will limit the weight and volume of packaging to a minimum in order to meet the required level of safety, hygiene and acceptability for consumers; to reduce the content of hazardous substances and materials in the packaging material and its components; to design reusable or recoverable packaging. Packaging recovery systems: EU countries should ensure that systems are set up to provide for the return and collection of used packaging and packaging waste, as well as the reuse or recovery including recycling of the packaging waste collected. Producer responsibility: By 2025, EU countries should ensure that producer responsibility schemes are established for all packaging. Producer responsibility schemes will need to comply with some minimum requirements established under the Waste Framework Directive (2008/98/EC) and help incentivise packaging to be designed, produced and commercialised allowing reuse or recovery and minimal impact on the environment.
Directive 94/62/EC/20.12 December 1994	European Parliament and Council Directive 94/62/EC on packaging and packaging waste, aims to contribute to the quality of the environment; human health; protecting resources; ensure the functioning of the internal market and restrictions on competition in the EU.

OCCUPATIONAL SAFETY HEALTH (OSH)	
OSH Framework Directive 89/391/EEC Terminology and guidelines	<p>OSH Framework Directive 89/391/EEC but also with directives focusing on specific aspects of safety and health at work, depending on activities, employees, and materials in use. It may be achieved by the implementation of safety and health measures based on risk assessment concepts of OSH:</p> <ul style="list-style-type: none"> - Hazard is a source of potential harm in terms of human injury or ill health, or a combination of these (BSI, 2007), i.e., anything present in the workplace that has the potential to cause an injury to workers, either a work accident or an occupational disease, such as chemicals, electricity and manual handling of heavyweights. - Risk is the combination of the likelihood of an occurrence of a hazardous event or exposure and the severity of the injury or ill health that can be caused by the event or exposure (BSI, 2007). Risk assessment is the process of examining risks to workers' safety and health from workplace hazards and a systematic evaluation of all aspects of work that considers what could cause injury or harm (1st step: Identification and analysis of hazards) if the hazards could be eliminated and, if not, (2nd step: Assessment of risk), preventive or protective measures in place to control the risks (3rd step: Adoption of corrective measures to control risks) (EU-OSHA, 2008) (ILO, 2014). - Safety is the condition of being protected from harm or other non-desirable outcomes. Safety can also refer to the control of recognised hazards in order to achieve an acceptable level of risk. Therefore, safety is a value judgment regarding the level of risk for an employee of being injured, in any case, not acceptable. - Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. Concerning work, it indicates not merely the absence of disease or infirmity; it also includes the physical and mental elements affecting health, which are directly related to safety and hygiene at work (ILO, 1981). - Occupational disease (OS) (or ill-health) is a disease contracted as a result of an exposure over some time to risk factors (chemical, physical or biological agents) from work activity (ILO, 1998). This chronic ailment occurs as a result of work or occupational activity, prevalent in a given body of workers than in the general population or other worker populations. Common OS are skin diseases, musculoskeletal disorders (e.g., carpal tunnel syndrome), respiratory diseases (e.g., asbestosis or occupational asthma), and occupational cancer. - Work accident (or occupational accident) is a discrete occurrence in the course of work (even if the accident happens off the company's premises, or if third parties cause it), which leads to physical or mental harm (European Commission, 2001).

appendix 4 European Law Institute (2019) Model rules on online platforms. EU regulations

EU sources can be retrieved at p. 10-11 https://www.europeanlawinstitute.eu/fileadmin/user_upload/p_eli/Publications/EU_Model_Rules_on_Online_Platforms.pdf [last accessed 15.10.2020]

EU Legislation

P2B Regulation (EU) 2019/1150

Regulation (EU) 2019/1150 of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services, *OJ L 186*, 11.7.2019, p 57–79

Directive (EU) 2019/771 on Contracts for the Sale of Goods

Directive (EU) 2019/771 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the sale of goods, amending Regulation (EU) 2017/2394 and Directive 2009/22/EC, and repealing Directive 1999/44/EC, *OJ L 136*, 22.5.2019, p 28–50

Digital Content Directive (EU) 2019/770

Directive (EU) 2019/770 of the European Parliament and of the Council of 20 May 2019 on certain aspects concerning contracts for the supply of digital content and digital services, *OJ L 136*, 22.5.2019, p 1–27

General Data Protection Regulation (EU) 2016/679

Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC, *OJ L 119*, 4.5.2016, p 1–88

Payment Services Directive (EU) 2015/2366

Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC, *OJ L 337*, 23.12.2015, p 35–127

Package Travel Directive (EU) 2015/2303

Directive (EU) 2015/2302 of the European Parliament and of the Council of 25 November 2015 on package travel and linked travel arrangements, amending Regulation (EC) No 2006/2004 and Directive 2011/83/EU of the European Parliament and of the Council and repealing Council Directive 90/314/EEC, *OJ L 326*, 11.12.2015, p 1–33

Consumer Rights Directive 2011/83/EU

Directive 2011/83/EU of the European Parliament and of the Council of 25 October 2011 on consumer rights, amending Council Directive 93/13/EEC and Directive 1999/44/EC of the European Parliament and of the Council and repealing Council Directive 85/577/EEC and Directive 97/7/EC of the European Parliament and of the Council, *OJ L 304*, 22.11.2011, p 64–88

Rome I Regulation (EC) 593/2008

Regulation (EC) No 593/2008 of the European Parliament and of the Council of 17 June 2008 on the law applicable to contractual obligations, *OJ L 177*, 4.7.2008, p 6–16

Rome II Regulation (EC) 864/2007

Regulation (EC) No 864/2007 of the European Parliament and of the Council of 11 July 2007 on the law applicable to non-contractual obligations, *OJ L 199*, 31.7.2007, p 40–49

Unfair Commercial Practices Directive 2005/29/EC

Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council, *OJ L 149, 11.6.2005, p 22–39*

E-Commerce Directive 2000/31/EC

Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market, *OJ L 178, 17.7.2000, p 1–16*

Consumer Sales Directive 1999/44/EC

Directive 1999/44/EC of the European Parliament and of the Council of 25 May 1999 on certain aspects of the sale of consumer goods and associated guarantees, *OJ L 171, 7.7.1999, p 12–16*

Unfair Contract Terms Directive 93/13/EEC

Council Directive 93/13/EEC of 5 April 1993 on unfair terms in consumer contracts, *OJ L 95, 21.4.1993, p 29–34*

Commercial Agents Directive 86/653/EEC

Council Directive 86/653/EEC of 18 December 1986 on the coordination of the laws of the Member States relating to self-employed commercial agents, *OJ L 382, 31.12.1986, p 17–21*

appendix 5 US IRS Publication 561 - Determining the value of charitable contributions

US Department of the Treasury, Internal Revenue Service (Rev. 2007) 'US IRS Publication 561- Determining the value of Charitable contributions'. Feb.2020 <https://www.irs.gov/pub/irs-pdf/p561.pdf> [last accessed 15/10/2020]

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Introduction

This publication is designed to help donors and appraisers determine the value of property (other than cash) that is given to qualified organizations. It also explains what kind of information you must have to support the charitable contribution deduction you claim on your return.

This publication does not discuss how to figure the amount of your deduction for charitable contributions or written records and substantiation required. See Publication 526, Charitable Contributions, for this information.

Comments and suggestions. We welcome your comments about this publication and your suggestions for future editions.

You can write to us at the following address:

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Washington, DC 20224

appendix 6 Sample table of contents on the national framework conditions

CommonLawgic provides open access to the Report about circular collaborative production in Greece at <<https://www.commonlawgic.org/category/articles/>>.

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About Pop-Machina

Pop-Machina aims to demonstrate the power and potential of the maker movement and collaborative production for the EU circular economy. We draw from a number of cut-edge technologies (factory-of-the-future, blockchain) and disciplines (urban planning, architecture) to provide the support necessary to overcome scaling issues; a typical drawback of collaborative production; to find the areas more in need of our intervention and to reconfigure unused spaces. We put forth an elaborate community engagement programme to network, incentivise and stimulate through maker faires and events existing and new maker communities in all our municipalities. We build upon the current informal curriculum for maker skills development by nurturing the social side and we put educators and makers together to exchange ideas on the training modalities. A particular focus on the skill development of women and vulnerable groups will aim to empower these (underrepresented) segments to partake actively in collaborative production. In every pilot area we will demonstrate business oriented collaborative production of feasible and sustainable concepts from secondary raw material or other sustainable inputs, based on the needs and preferences of the local stakeholders. A thorough impact assessment framework with increased scope (e.g. social) will be codesigned with stakeholders after short basic assessment trainings and will be used in the assessment of our pilot work. Based on the findings we will kick-start a series of policy events to discuss openly – without pushing our results – the tax and legal barriers that hamper collaborative production.

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