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# Smart sustainable cities: synergies between circular economy, innovative policies, and European projects

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**Abstract:** Metropolitan cities trying to respond to a locally-embedded global challenge: to implement a sustainable use of natural resources in order to avoid potential dramatic environmental scenarios. Metropolitan Cities could become a front-runner city in this field, if it demonstrates to be able to support its existing adaptive and transformative governance capacities. The goals and results achieved in the on-going Metropolitan City EU funded projects are described as "soft" policy tools for describing the thesis argued in the paper. Circular Economy, Green Economy (Green growth) and Bio economy have a common finalistic aspect: find a common ground for both economic, environmental and social goals. The Metropolitan Strategic Plan could represent a significant model for other Public Bodies. Indeed, this case study aims at demonstrating how strategic lines of intervention in trans-sectorial policies may be identified, such as for instance those related to the development of Circular Economy. The borders of Metropolitan cities functional urban area bound all the paper findings. The political recommendations stated represent an inspiring case study on how economic development can materialize in vision-oriented and strategically planned interventions.

**Keywords:** Smart sustainable cities; Circular Economy; ecology innovation; metropolitan governance; adaptive management; social nudge; training

## Introduction and methodological explanations

In the Italian Metropolitan Cities context, the concept of "Smart Sustainable City" is dynamic and involves technological mechanisms and legal figures with apolitical and technical interpretative possibilities or political solutions (Bria and Morozov 2018; Antoniazzi 2019). To transform a metropolitan government into a Sustainable and Smart City entails the implementation of a strategy based on: 1. the availability of several specific funding and resources; 2. the level of effective autonomy and the relevance of the local authorities' competences; 3. specific organizational and technical skills (training); 4. the ability to promote conscious behavioural changes in the population through public dissemination campaigns (green social nudge).

These wide fuzzy definitions and the presence of a huge number of possible strategies to achieve this goal makes the use of simple categories of Urban Planning often unsuitable. With the aim to overcoming this obstacle, this article does not intend to find a direct nexus with the existing literature (Yang et al. 2019; Al-Nasrawi et al. 2015). Indeed, our focus is not on what Smart Sustainable Cities are from a statistical and econometric point of view, rather on what the Metropolitan Cities can do to implement concrete policies. In this paper, we adopt the definition of "smart" developed by Sam Allwinkle and Peter Cruickshank, i.e., a desired outcome rather than an instrumental concept (Allwinkle and Cruickshank 2011).

The outcome that a Metropolitan city should achieve is to actively participate in facilitating the territorial, economic and social development fostered by the European Union, especially in accordance to the Smart Sustainable City model. As well, it wants to take advantage of modern technologies to foster appropriate communication strategies.

We will demonstrate that an effective and efficient model for this new type of service is: 1. the promotion of cultural ecology (Schibel 2020) for the implementation of Nature-Based Solutions, i.e., «solutions to societal challenges that are inspired and supported by nature, which are cost-effective, provide simultaneous environmental, social and economic benefits, and help build resilience» (European Commission 2016; European Parliament 2017; Sanyé-Mengual et al. 2018; Zwierzchowska et al. 2019; SOER 2020); 2. the promotion of Circular Economy principles on city government climate actions, «Integration-Innovation-Inclusion and Participation» (Ellen MacArthur Foundation - ARUP 2019 p. 8, p. 12, p. 16).

We will argue that the behavioral nudge should be part of policy maker's main toolkit (Foster 2017 p. 6). At this regard, we will describe some of the most important "soft" policy tools (Michalek et al. 2016) in order for other cities and regions to replicate this best-practice in their context, i.e., the use of co-financed European projects to support the growth of internal competences and the promotion of public information campaigns of "green" social nudge (Foster 2017; Schubert 2016).

Considering the various existing definitions of Smart Cities, we want to promote a city model to provide the conditions for a healthy and happy community even in the difficult conditions of today's global, environmental, economic and social scenarios (Albino et al. 2015 p. 6).

## 1. The Metropolitan cities as an innovative laboratory of proactive collaboration

### *1.1. Governance and the Government: Evolutive comparison*

According to Lowi «A policy must have something to do with government and governmental agency long-term intentions, and with public commitment to be pursued with incentives and sanctions »(Lowi 1975, p. 270). Starting from this definition, it is possible to describe a policy as a set of law and legislation, principles and guidelines and associated tools, and strategies designed and applied mainly by government bodies, but also by innovative companies, entrepreneurial associations, research bodies and training centre, to direct and address actions for the achievement of collective objectives in the long term (ECO-SCP-MED 2014, p. 18; Mazzucato 2018, p. 23).

The "green" social nudge created through European projects can be described by these previous definitions as an expression of a public commitment to the achievement of long-term intentions (Table 1). These forms of nudges aim at promoting environmentally responsible behaviours as «interventions that steer people in particular directions but that also allow them to go their own way… an intervention must not impose significant material incentives» (Sunstein 2015), which target reflective decision-making processes based on the underlying intuitive and automatic stimuli and complete information, as persuasion through information provision, moral suasion and educational campaigns (Hansen and Jespersen 2013).

We intend the green social nudge (social nudges relating to the green context) as «interventions addressing the psychological factors that prevent and facilitate behavioural change as intra-institutional and inter-institutional modifications» (Foster 2017, pp. 12-13). We boost these interventions by maintaining five conditions: « 1. a common agenda 2. shared measurement systems 3. mutually reinforcing activities 4. continuous communication 5. backbone support organisations» (Foster 2017, p. 23).

This use of behavioural science in government and policy can lead to effective and ethically non-controversial results achieved surpassing its traditional individualistic approach. It also connects it to the policies of an entity capable of representing communities that are also very different from each other. The main challenge represented by this green social nudge is to push towards more aware behaviours on the consequences that individual actions can have towards the whole community. In this way, the green social nudge can overcome both the traditional setting of these practices on the simple concept of "bias", and their configuration as a "psychic tax" with no revenue (Glaeser 2006).

Within the context of the Smart Sustainable City this green social nudge is also enhanced by the digitalization and the countless possibilities that data sharing can offer for knowledge dissemination and the exchange of information among citizens, administrations and stakeholders (Bria and Morozov 2018, p. 103; Foster 2017 p. 22). Thanks to the support of new disciplines, such as Industrial-organizational psychology, this context can bring out a further link between the European projects and the nudge. As a matter of fact, the problem-solving approach typical of the European mission oriented research and innovation (Mazzucato 2018) is able to make clear distinctions between two aspects often addressed by behavioural sciences: the distinction between lack of motivation and lack of material means (Foster 2017, pp. 24-25), upskilling policy makers in applying behavioural science and create

a common understanding of what this science can and cannot do (WCG – OECD , 2018 p. 3).

Even if it is not possible to substantiate this thesis with long-term data (it is however possible to follow its development through the data reported by the platform http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/), this setting is, however, compliant with the literature produced by the OECD (Foster 2017; WCG – OECD , 2018) aimed to define what the contributions of behavioural science to the implementation of European funds and internal organization can be, as a complement of external activities carried out by very complex administrations.

The consequences are easy to see in the latest economic and social data of the same ERR (Bank of Italy 2019). Further findings consist of the mentions as best performing region in the most recent country report realized by the European Commission (Country Report Italy 2020).

An interesting example today is the approach adopted by the Metropolitan City of Bologna (MCBO) for the realization of public interests related to the Circular Economy (CE) and Sustainable Development. The approach considers CE as a 'two-winged butterfly' (Ellen MacArthur Foundation 2019). In this field, *vertical* and *horizontal subsidiarity* (Attili 2016) have developed in a governance of natural resources sustainable consumption.

This governance also led to the implementation of programs and projects to prevent climate change through the realization of Nature Based Solution (NBS), and improve air quality (BLUEAP) (Table 1).

Strategic planning activities have usually separately dealt these aspects, even if they are interdependent (D'Amato et al. 2017). With an innovative and smart approach (Relos3 2019), MCBO has decided to combine them in a single vision through an urban regenerative economy model applied to the management of its European projects (Cavallo and Stacchini 2015; Cavallo et al. 2017; Relos3 2019). The application was carried out also in the implementation and the choice of European programmes in which to take part and of which consortia to join as partner (Cavallo et al. 2017).

Referring to the scientific findings collected by some reliable and recent studies (Ellen MacArthur Foundation 2019), this regenerative economy model is a declension of CE that focuses on increasing resources and energy use efficiency and reducing polluting emissions in the cities (Montenegro Navarro and Jonker 2018). In order to achieve sustainability through "adaptation to climate change", the "potential for sustainability" is empowered with "a deep understanding of ecosystem processes and their dynamics is needed, through a conscious use of ecosystem properties as a management tool" (Fusco Girard and Nocca 2019 p. 39).

We believe that a holistic approach is necessary to make cities more sustainable. Societal challenges related to climate change and resource depletion allow this approach to find its optimal allocation within urban contexts (Caperna et al. 2017). In this process, the implementation of NBS can play an important role (Escobedo et al. 2019). In this way, the integration of CE concept with the concept of NBS can increase the benefits for urban areas, as they can provide ecosystem services that can produce benefits for the urban biosphere.

### *1.2. MCBO Regenerative Economy Model*

The main objectives of these synergies are the achievement of progress in the field of territorial resilience (MTP 2020), the spread of clean tech and industrial symbiosis. The objectives identified are able to bring win/win solutions between the results of the projects carried out within the fields:

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| *Regenerative economy model*: | 1. **Green economy** (NBS; Bio-Products; Conservation of Natural Resources);<br>2. **Social innovation** (Fair Social Relations; Sharing Economy; Local Communities Engagement);<br>3. **Circular economy** (Efficiency and Recycling Design and Production Systems). |

Thus CE represent the "paradigm leap" capable of making us make enormous progress, not only from the economic and environmental point of view, but also in the socio-environmental issues (Raucci and Tarquinio 2020 p. 2). In the last century, the theory of systems has made evident the limits of a scientific thought entirely based on the development of efficiency based only on linear processes, which derive from hard sciences and physics. Biology has provided philosophy with the awareness of interdependencies, the concept of regulatory feedback, the ability to design circular processes and not just linear ones. These processes explain the operation of complex systems much better (Cavallo 2019).

More than 114 definitions of CE can be found in the scientific literature (Kirchherr et al. 2017). They may be distinguished mainly because of their ability to introduce indicators capable of measuring their effects. Moreover, it exists the definition: "policies that are consistent with a CE, often using different terminology" (Preston 2012 p. 5). In order to operationalize sustainable development principles, we base CE model on the principle that in nature everything can become a "resource" for "restructuring the industrial systems to support ecosystems through the adoption of methods to maximize the efficient use of resources by recycling and minimizing emissions and waste" (Fusco Girard and Nocca 2019 p. 2).

In this way, the terms could be referred to how resource flows can be closed. MCBO intends to promote a CE model for its "territorialization". In this process for increasing the benefits for its urban areas, MCBO is achieving an integration between the concepts of CE and NBS (Table 1). For this purpose, we stressed the link between NBS and Green economy (green growth) by placing them within the CE concept. In this way, enhancing a mutual positive feedback, CE is used as an "umbrella" definition to reconcile economic growth and environment. This process is fuelled by NBS, for example by ecological adaptation and resilience (D'Amato et al. 2017 p. 719).

Thanks to the management of the MCBO EU projects, S.O. 2.5 has led to achieve synergies between its actions and the MSP 2.0 initiatives for the promotion of new businesses towards EC strategic themes, entrepreneurship of culture and new tourism, digital, care and social services, the taste industry and the local economy.

Moreover, as activity in its EU projects, MCBO intends to carry out accurate studies focusing on the socioeconomic impacts of NBS in the Bologna and metropolitan area, with a particular focus on Urban and Peri-Urban Agriculture and the use of Urban Green as a factor in the revitalization of spaces. In order to pursue this goal, NBS are conceived in addition to techno-knowledge solutions (Table 1).

The tools that will be used for these measurements are the result of the collaboration between European institutions and international organizations (European Court of Auditors 2019; Eurostat 2019). Nevertheless, it is already possible to see how Bologna's urban governance is in complete harmony with the most recent advances in the field of NBS. In fact, even renowned academic institutions such as the Swedish University of Agricultural Sciences – SLU are today significantly expanding the boundaries of this concept, proposing

the use of the term Nature Based Actions for directly demonstrating the use NBS to address Climate Change (SLU 2019; United Nations Global Compact 2019).

Compared to the plans already approved, the MASD does not overlap. On the contrary, it is a "framework document" that aims to provide meaning and references for metropolitan policies, also by identifying local monitoring tools for the environmental policies of the territories. This process has created a priority objective for MCBO: to create a sustainable and resilient, attractive territory in which environmental protection, the beauty of urban and natural places, work and innovation can find a unified and driving synthesis.

In addition to indicating the need to "territorialize" sustainable development, MASD added value was to propose methods for measuring the progress actually made in that direction and to deepen the territorial dimensions and the relationships that actually characterize its governance both at regional and national level (MTP 2020). In 2019, an encouraging driver in this sense was the data collected by the National Center for Statistical Studies - ICity Rank, which places Bologna as the first Italian Metropolitan City in the field of "Environmental protection" (ICity Rank 2019).

## 3. United Nation Sustainable Development Goals and MCBO On-going EU project

### *3.1. MCBO Ongoing European Projects*

The transformation of Bologna into a Smart Sustainable City aims to advance the ambition of this new urban configuration towards a change in user behaviour and thus ensure prospective improvements in terms of flexibility, security and sustainability. To do this, access to data and information has been considered as a new social right (Resolution 2016 art. 11).

This ambition finds a concrete scope in European projects because MCBO long-term vision sees their added value precisely in the capacity to «circulate best practice and information on projects and plans, and to design benchmark on Sustainable Consumption and Production Policies [and transfer] the experience and best practice ... in decision makers, private sector and stakeholders [with] seminars, training, workshop, publicity, awareness campaigns» (ECO-SCP-MED 2014, p. 145).

Although the technological infrastructure is still evolving, MCBO is still creating the cultural prerequisites for this change by training and educating with its action the actors who will soon experience this new urban scenario.

During all the public administrative activity mentioned above, MCBO has developed different types of partnerships and different forms of relations (bilateral and multilateral). These networks of relationships have been the "legs" thanks to which it has been possible to walk along the paths traced by MCBO desire to become an active player for the realization of international Climate actions commitments. A distinction between bilateral and multilateral relations can be made by differentiating these two concepts based on their respective "work plans". With the first one, we will indicate all the relationships between Bodies, endowed with the same legal personality (public, economic or not; private; territorial, state or local; economic; research promotion; and so on), able to create an exclusive relationship between them. With the second one, we will represent the whole range of

activities between Bodies with a heterodox legal connotation, united by their tendency to form structured (more or less institutional) networks of relations.

Given their complexity, the MCBO European projects are an element able to unite these two work plans. In them it is possible to find not only common competences but also a useful criterion to highlight the relationship between MCBO urban governance and the achievement of international Climate actions, as summarized by the SDG.

**Table 1**. SDG – MCBO EU Projects.

| SDG | MCBO EU Projects |
|---|---|
| **"SDG 7" Clean and accessible energy** | **Belt - Boost Energy Label Take Up** (Horizon 2020 - Grant Agreement 847043) The project is aimed at disseminating information to consumers and public administrations on the new European energy label legislation and actions for the dissemination of green public energy procurement. |
| **"SDG 12" Responsible consumption and production** | **CESME - Circular Economy For SMEs** (Interreg Europe) The CESME project addresses SME inclusion in the circular economy, by interregional meetings identifying good practices aiming to examine how best regional and local authorities and business development agencies can improve relevant policy instruments and design support packages to assist SMEs to enter the circular economy (CE).<br><br>**RELOS3 - From Regional to Local: Successful Deployment of The Smart Specialization Strategies (**Interreg Europe**)** RELOS3 focuses on implementing regional Smart Specialisation Strategies (RIS3) in a local context by actively involving local authorities, innovation actors and companies. The local level is often overlooked; however, it is crucial to involve also this level in innovation strategies. Most partners have a local ecosystem connected to industrial systems, advanced manufacturing, applied industrial design and ICT.<br><br>**SinCE AFC – Enhancing the entrepreneurship of SMEs in circular economy of the Agri-Food Chain** (Interreg Europe) The general objective of the project is to improve policies on regional innovation strategies by facilitating horizontal mechanisms that support and promote entrepreneurship of SMEs in the agro-food sector, through the exploitation of the opportunities of the CE (management and horizontal financial mechanisms). |
| **"SDG 13"** | **SESAME – Soutenir l'Entrepreneuriat des Savoir-faire en Agriculture dans les Metropoles (**Erasmus+**)** |

| | |
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| **Climate action**<br><br>**"SDG 15" Life on Land** | The main objective of the project is to promote the deployment of Agricultural Projects in Urban and Peri-Urban Areas of the partner countries through developing innovative training adapted to key players in the sector, taking into account the skills-based approach and the digital transition challenges.<br><br>**GRESS– GREen Startup Support** (Interreg Europe)<br>The objective of GRESS is to improve policies for SMEs' competitiveness by strengthening capacities to trigger and support the development of sustainable and competitive start-ups and spin-offs within the Green Economy.<br><br>**Connecting Nature – COproductioN with NaturE for City Transitioning, INnovation and Governance** (Horizon 2020)<br>The Project stems from the strong growth of interest and investment at EU level on smart solutions "designed" to increasing the number of natural elements into urban areas (Nature Based Solutions). These innovative solutions contribute to improving city environments and have important impacts on sustainable job creation, as well as improving the health and well-being of citizens.<br><br>**VEG GAP – VEGetation for urban Green Air quality Plans** (LIFE18 - PRE IT 003)<br>With a specific platform and innovative tools, the project wants to understand urban greenery in a way that is superior to that which can be achieved by means of a simple census. The general objective is to analyse it from a constructive point of view, as an element to help socialization, assessing the best solutions for its future economic sustainability and a more efficient use of its "ecosystem services". |

Reference: MCBO European project website

*3.2. Conclusion*

Our general conclusion is that the Metropolitan City of Bologna is an interesting representative of the transition to Smart Sustainable City model, as, even if it still lacks some necessary technological infrastructure, it is actively working to achieve this result by empowering human capital. MCBO is trying to enable this change through: the interdisciplinary training of its employees; the creation of knowledge networks with other cities; awareness-raising of the population on the issues of ecological culture **(Schibel 2020)**. These considerations arise from the assumption that it is not possible to aprioristically establish direct causal relationships between the effectiveness of political actions and the realization of technological infrastructures. We consider technology in urban transformation processes a necessary but not sufficient condition.

We have argued that the representativeness of MCBO as front runner city in this transition comes from its ability to decline Circular Economy principles on city government climate actions, «Integration-Innovation-Inclusion and Participation» (Ellen MacArthur Foundation - ARUP 2019 p. 8, p. 12, p. 16) within its local legislative and political context. We have also argued that a careful study of legal framework evolutionary aspects and of its

interconnections with supranational systems (such as that of the European Union) and the fields of sociology, politics and behavioural sciences can improve this ability.

Finally, we argued that, in general terms, Metropolitan cities achieved this result through soft policy tools tailored to its individuals and its population. Rather than using a "one-size-fits-all" approach, the Metropolitan cities governance focused on collaboration in the definition of top-down and bottom-up strategies and policies, as well on the use of soft policy tools made possible by European funding, through which the European Union institutions give wide freedom in the implementation of project ideas for the pursuit of common objectives (even with seminars, training, workshop, publicity, awareness campaigns).

In this essay, the extensive study devoted to the political specificities of the metropolitan city must not lead the reader to believe that this has little chance to represent a useful instrument to be replicated in contexts and systems very different from the Italian one.

On the contrary, the attention given to the strategic details and the reconstruction of the policies evolution meant to be a policy recommendation to those who want to reach an ambitious goal such as the realization of a Smart Sustainable City. This means to consider every aspect of the local urban reality in details in order to intercept and exploit every possibility of growth.

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