



# From **Urban Renovation** to **Circular Regeneration**

*Circular economy as an urban  
regeneration strategy in fragile contexts:  
A case study on the  
Quartiers Nord of Marseille*



## **From Urban Renovation to Circular Regeneration**

Master degree thesis

Politecnico di Milano

Scuola di Architettura Urbanistica Ingegneria delle Costruzioni

Urban Planning & Policy Design

A.Y. 2019-2020

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# Abstract

The present thesis explores three current complex research topics, finding a common ground amongst them in the context of the northern neighborhoods (Quartiers Nord) of Marseille. The social, economic and spatial fragilities pervasive across this territory, have encouraged the institutional instances, from local, regional and even national level, to seek for a solution to this issue. The usual response has been urban renovation. An approach based on the demolition, rehabilitation and reconstruction of the most vulnerable neighborhoods. Nonetheless, in the current global context of increasing inequalities, social segregation, rapid urbanization and environmental crisis, the urban renovation approach has proven ineffective in actually transforming these territories into more resilient, inclusive and participative places. Here is where the third research topic -circular economy- brings new possibilities to the foreground. This topic is what this research work proposes as a new lens to envision and question current practices and also to imagine a different type of future.

Keywords: *socio-technical transition, fragility, urban renovation, circular economy, circular regeneration, resource valorization, social innovation, citizen engagement, system-thinking*

The title of the thesis 'From Urban Renovation to Circular Regeneration' asserts the need to activate and develop a transition process that will enable the appropriation of a new paradigm. The achievement of this vision is intrinsically connected to the territorial and social conditions, or more precisely, the capacity of the territory and its people to redefine itself.

The research question is formulated as follows: How can we embed and nurture a circular economic model into the Quartiers Nord in order to transition to a resilient, inclusive, and participative future?

To answer the research question the thesis methodology firstly examines the theory of multi-level socio-technical transitions and applies it to the context of the Northern neighborhoods. Secondly, it focuses on learning from existing practices in France that already follow an alternative approach to traditional urban renovation methods. Thirdly, it envisions a circular regeneration framework based on applying circular economy principles to the cycle of the built environment. Lastly, the circular regeneration framework is developed thoroughly to understand how it could be applied to the Northern neighborhoods.

The spatialization of the framework as a system nurtured by interconnected territorial nodes allows us to reinterpret the territory and conceptualize the different stages and mechanisms that can activate, develop and strengthen the circular regeneration process. The way the framework is presented emphasizes the role the different resources -spaces, materials and flows, and people-play throughout the process.

This thesis implies the circular regeneration framework can be designed and formulated to open-up new possibilities, however, the final outcome will depend on the interest, capacity and engagement of the local inhabitants to valorize the existing, but sometimes invisible, resources.



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**From Urban Renovation to Circular Regeneration:  
A Transition Perspective**



## Chapter 1. From Urban Renovation to Circular Regeneration

In his song *A Cidade* (the city), Brazilian songwriter Chico Science claims: "The city does not stop, the city only grows./The one above goes up and the one below goes down."<sup>1</sup> This pessimistic vision of the evolution of cities expresses the idea of an urban metabolism that feeds with human beings, material resources and spaces to generate more resources consumption and more social inequalities. Cities indeed have been expanding since the first industrial revolution, growing from 33% of the world population in 1960 to 55% in 2019.<sup>2</sup> Although this can be considered as the triumph of cities by Gleaser<sup>3</sup>, others such as Harvey<sup>4</sup> raise the issue of growing inequalities in urban environments. In particular, the polarisation of the urban realm identified by the School of Los Angeles as a major trend by the end of the 20th century, leads policy makers to seek solutions to fight spatial segregation. In France, a major policy pursuing this goal is the urban requalification of post-war working-class neighbourhoods, that are regarded as repelling for middle-class dwellers because of their lack of accessibility and decayed private and public realms. Urban renovation has become a flagship policy for urban planners to address urban spatial segregation at the national level. Piloted by the National Agency of Urban Renovation (Agence Nationale de la Rénovation Urbaine, further referred to as ANRU), urban renovation projects are contested for their emphasis on the *tabula rasa* method of demolition and reconstruction. Indeed, in addition to a questionable impact on inhabitants, who may feel erased by the demolition, the environmental impact of the procedure is high. In contexts that are already socially and economically fragile, how can urban renovation reconnect with the ambition to improve in the long term the socio economic condition of citizens while transitioning to a more sustainable process of urban space production ? This question calls to imagine new urban metabolisms that allow for a more socially and environmentally respectful approach to urban renovation. This thesis proposes to explore the possibilities offered by circular economy as a change of paradigm with respect to what is considered as resource or waste in the urban metabolism. While materials and spaces are regarded as wasted, abandoned or decayed, circular-economy approach suggests to consider them as potential resources for a positive transformation of the urban environment. Circular economy is an empowering perspective that opens up new possibilities for the regeneration of neighbourhoods. This thesis takes the example of the *quartiers nord*, the northern neighbourhoods of Marseille, to build a framework and transition from a policy of urban renovation to one of circular regeneration.

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1 Chico Science & Nação Zumbi. (1994). *A Cidade* [Song]. On *Da Lama ao Caos*. Estúdio Nas Nuvens.

2 World Bank Group. (2020). Population urbaine (% du total). Retrieved November 23, 2020 from <https://donnees.banquemondiale.org/indicateur/SP.URB.TOTL.IN.ZS>

3 Gleaser, E. (2011). *The Triumph of the City*. Penguin.

4 Harvey, D. (2008). *The Right to the City*. In R. T. LeGates & F. Stout (Eds.) *The City Reader* (6th edition). (pp. 270-278). Routledge

# 1.1 The northern neighbourhoods: a fragile context

## 1.1.1 A brief history of the northern neighbourhoods

The development of Marseille in the industrial and post-industrial periods can be divided in 3 phases that help understand the economic, social and spatial features of the northern neighbourhoods. These neighbourhoods, often called the “Northern neighbourhoods” (Quartiers Nord), have mostly developed after the Second World War to host working-class French and immigrant populations as well as people repatriated from Algeria in the aftermath of the war ended in 1962.<sup>5</sup>

### *Industrial development*

The industrial era in Marseille started around 1830 with the opportunities offered by trade with the French colonies and the processing of goods in the hinterland of the port, with a specialisation in sugar, oleaginous and metal.<sup>6</sup> Until the 1950s, the city experienced continued demographic growth. Industries of sugar, oleaginous and metal expanded and contributed to urbanising the hinterland of the port in the North. This industrial era started declining around 1950 although the demographic growth of the city, continuing until 1975 in the aftermath of the war of Algeria, hid the phenomenon for a few more decades. This history helps understand the urban fabric of the northern neighbourhoods which are a patchwork of industries, brownfields, historical centres of former villages and social housing complexes.

### *From transit camps to social housing complexes*

As Peraldi et al. (2015) and Témime (1985)<sup>7</sup> explain, affordable housing buildings were constructed for the working class in the northern neighbourhoods, near industries and the port, since the beginning of the 20th century. But from the 1st World War, colonial workers, coming to replace French labour force mobilised for the war, started being parked in camps built in the northern half of the city. The slums later hosted other colonial immigrants and finally refugees from Algeria. Therefore, social housing construction started being built with the purpose of replacing the slums with formal housing. Logirem, a social landlord still operating in Marseille, was created in 1959 and constructed mostly housing for single colonial workers,

<sup>5</sup> Peraldi, M., Duport, C. & Samson, M. (2015). *Sociologie de Marseille*. Paris: La Découverte.

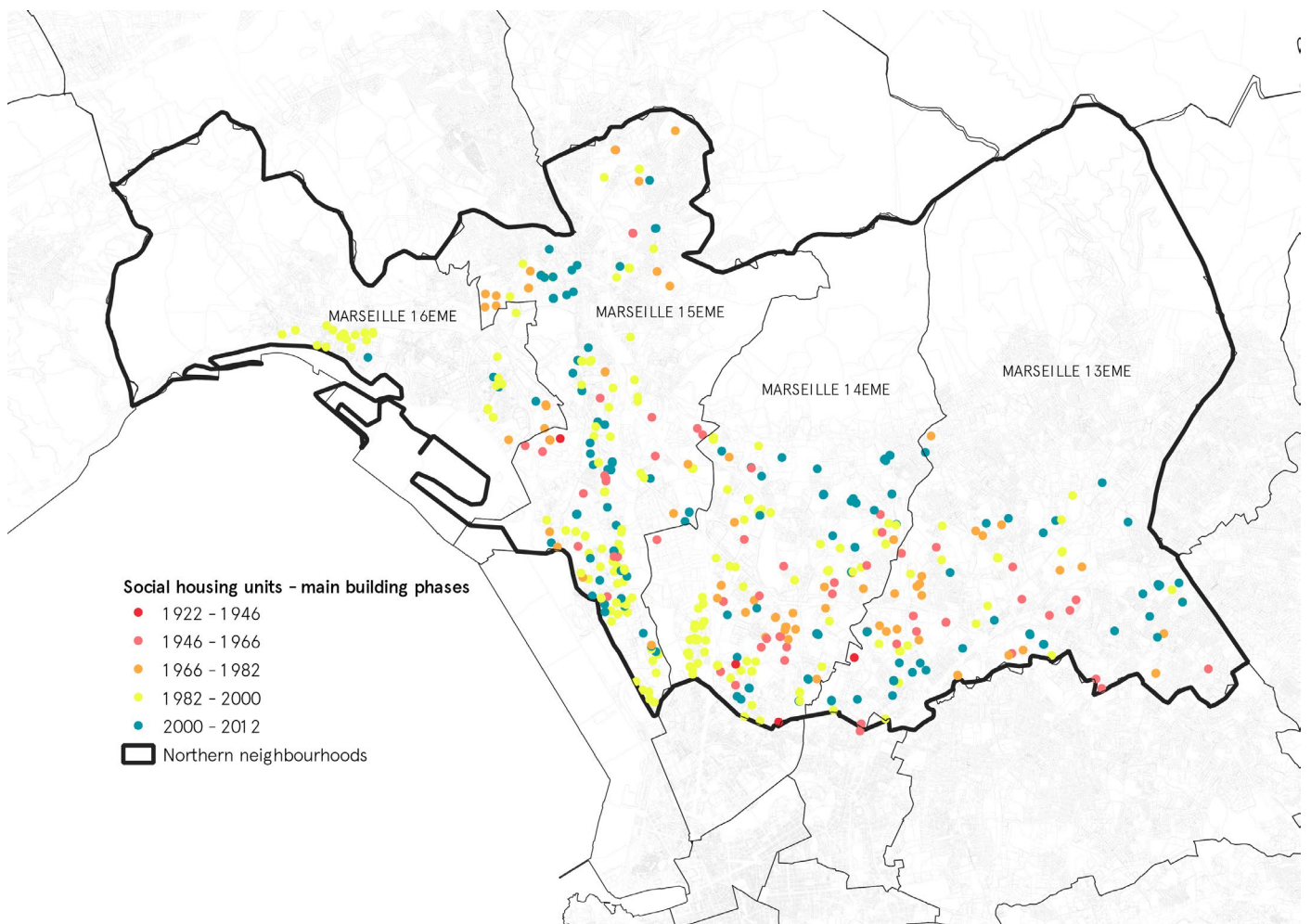
<sup>6</sup> Daumalin, X. & Raveux, O. (2001). *Marseille (1831-1865). Une révolution industrielle entre Europe du Nord et Méditerranée*.

<sup>7</sup> Témime E., (1985). *Marseille, ville de migrations*.



Figure 1. Social Housing complexes in the Northern neighborhoods by building phase

# Chapter 1. From Urban Renovation to Circular Regeneration



## 1.1 The northern neighbourhoods: a fragile context

before building houses for families.

The maps in the previous page illustrate the major periods of social housing construction in the north of Marseille based on mapping by Allfree (2015).<sup>8</sup>

### 1.1.2 A vulnerable population

The population of Marseille is vulnerable in terms of social and economic conditions. According to 2015 data presented by the urbanism agency of the agglomeration of Marseille (hereinafter AGAM)<sup>9</sup>, in the 14th and 15th districts of the city, poverty rates exceed 40%, to be compared with 28% at the city level, whereas the city rate is 18%, and the median living standards are in the bottom 10 among municipalities of the metropole. The northern districts are the area in Marseille that concentrates the majority of neighbourhoods labeled Priority Neighbourhood of the City (Quartier Prioritaire de la Ville, hereinafter QPV), a label that is attributed to poorer neighbourhoods in France based on the social and economic data of their inhabitants.

According to a mapping by AGAM of a vulnerability index based on 7 indicators<sup>10</sup>, the northern neighbourhoods had the highest vulnerability level in the metropole in 2012. The following paragraphs present a calculation of these indicators in 2016 based on INSEE data from 2016.<sup>11</sup>

<sup>8</sup> Allfree, J. (2015). Atlas du parc locatif social : 7ème édition, déc. 2015.

(9). AGAM. Retrieved July 5, 2020 from [http://doc.agam.org/index.php?lvl=notice\\_display&id=12612#](http://doc.agam.org/index.php?lvl=notice_display&id=12612#)

<sup>9</sup> AGAM. (n.d.). Tableaux de bord économie. Spot Agences. <https://spot.agam.org/pentaho/api/repos/%3Apublic%3Aeco%3Asynthese2.wcdf/generatedContent>

<sup>10</sup> Fibla, S. & Soulier, A. (2017). Fragilité socio-économique : un indice pour mesurer la précarité. Retrieved June 11, 2020 from [http://doc.agam.org/index.php?lvl=notice\\_display&id=17766](http://doc.agam.org/index.php?lvl=notice_display&id=17766)

<sup>11</sup> INSEE. (2019). Activité des résidents en 2016. [Excel]. Retrieved May 13, 2020 from <https://www.insee.fr/fr/statistiques/fichier/4228426/base-ic-activite-residents-2016.zip>

INSEE. (2019). Couples - Familles - Ménages en 2016. [Excel]. Retrieved May 13, 2020 from <https://www.insee.fr/fr/statistiques/fichier/4228428/base-ic-couples-familles-menages-2016.zip>

INSEE. (2019). Diplômes - Formations en 2016. [Excel]. Retrieved May 13, 2020 from <https://www.insee.fr/fr/statistiques/fichier/4171395/base-cc-dipl-formation-2016-xls.zip>

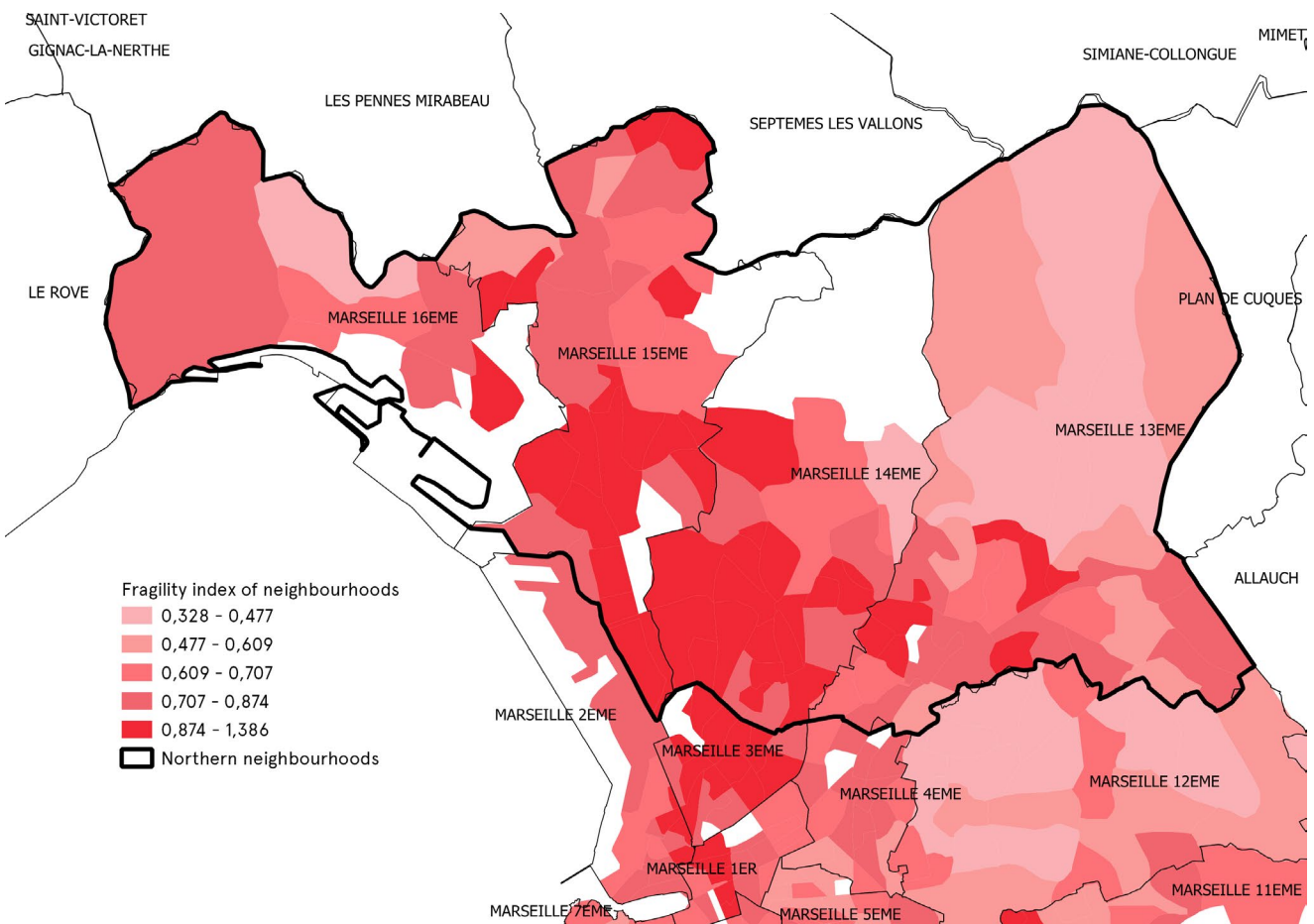
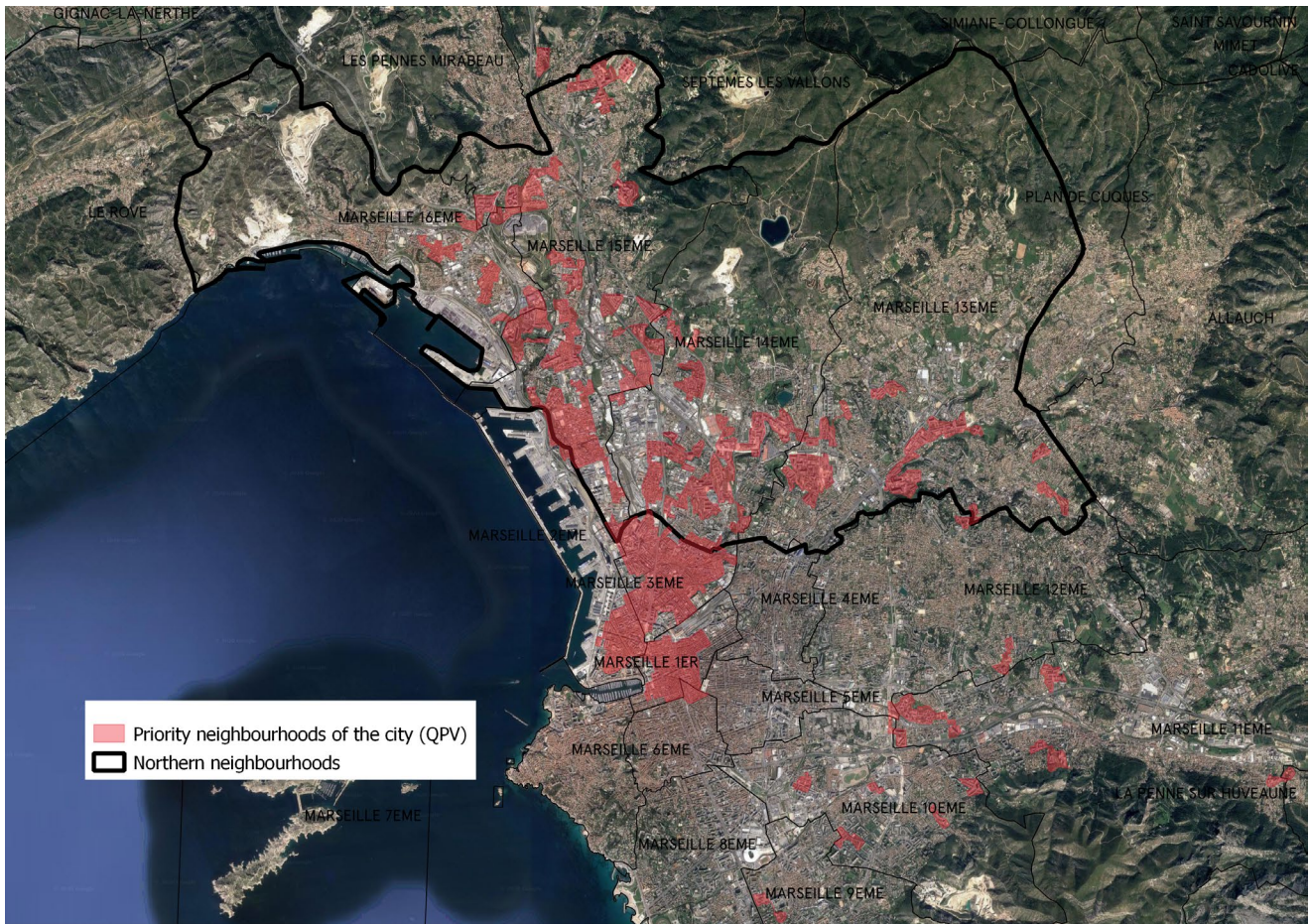
INSEE. (2020). Bénéficiaires des prestations légales versées par les CAF au 31/12/2016. [Excel]. Retrieved May 13, 2020 from [https://www.insee.fr/fr/statistiques/fichier/3532623/beneficiaires\\_CAF\\_31-12-2016.xls](https://www.insee.fr/fr/statistiques/fichier/3532623/beneficiaires_CAF_31-12-2016.xls)

INSEE. (2019). Revenus et pauvreté des ménages en 2016. [Excel]. Retrieved May 13, 2020 from <https://www.insee.fr/fr/statistiques/fichier/4190004/filosofi-revenu-pauvrete-menage-2016.zip>

Figure 2. Priority Neighborhoods of Marseille. →

Figure 3: Vulnerability Index in Northern Neighborhoods. →

# Chapter 1. From Urban Renovation to Circular Regeneration



# 1.1 The northern neighbourhoods: a fragile context

## Labour: unemployment and precarious jobs

The area is faced with high unemployment, reaching 24% of the population living in the 13th, 14th, 15th and 16th districts. The rate of precarious jobs is also higher than the city and metropolitan levels.

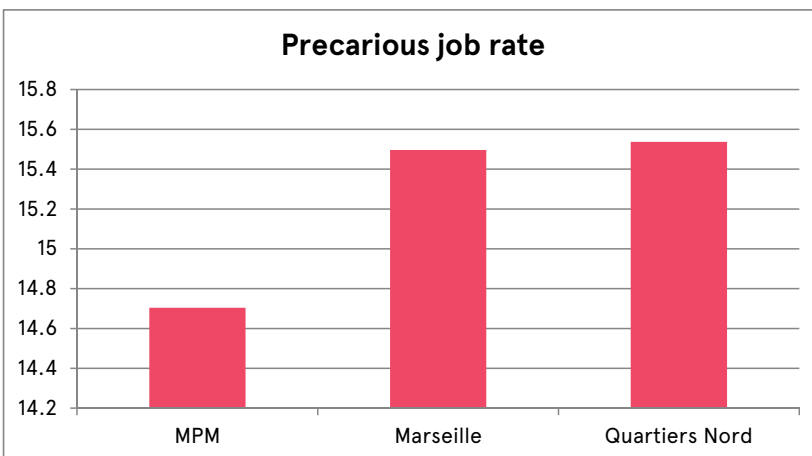
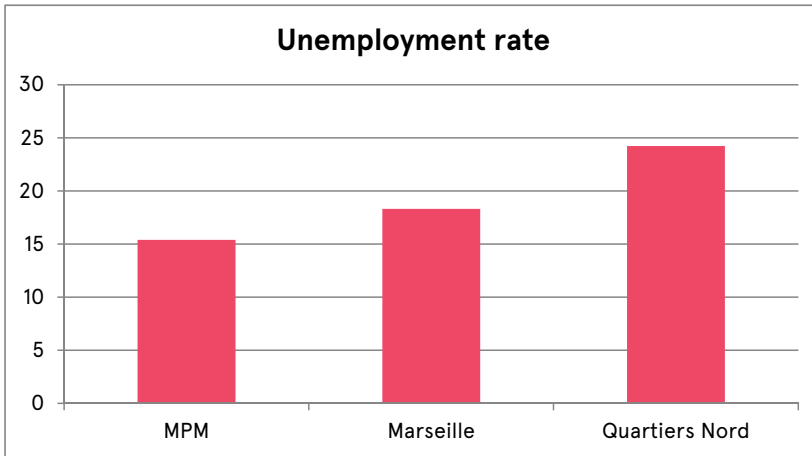


Figure 4. Comparison of unemployment rate and precarious job rate between northern neighborhood, Marseille and the Métropole AMP Source: INSEE



Figure 5. Unemployment rate in Northern neighborhoods.

## Education: no diploma and school drop-out

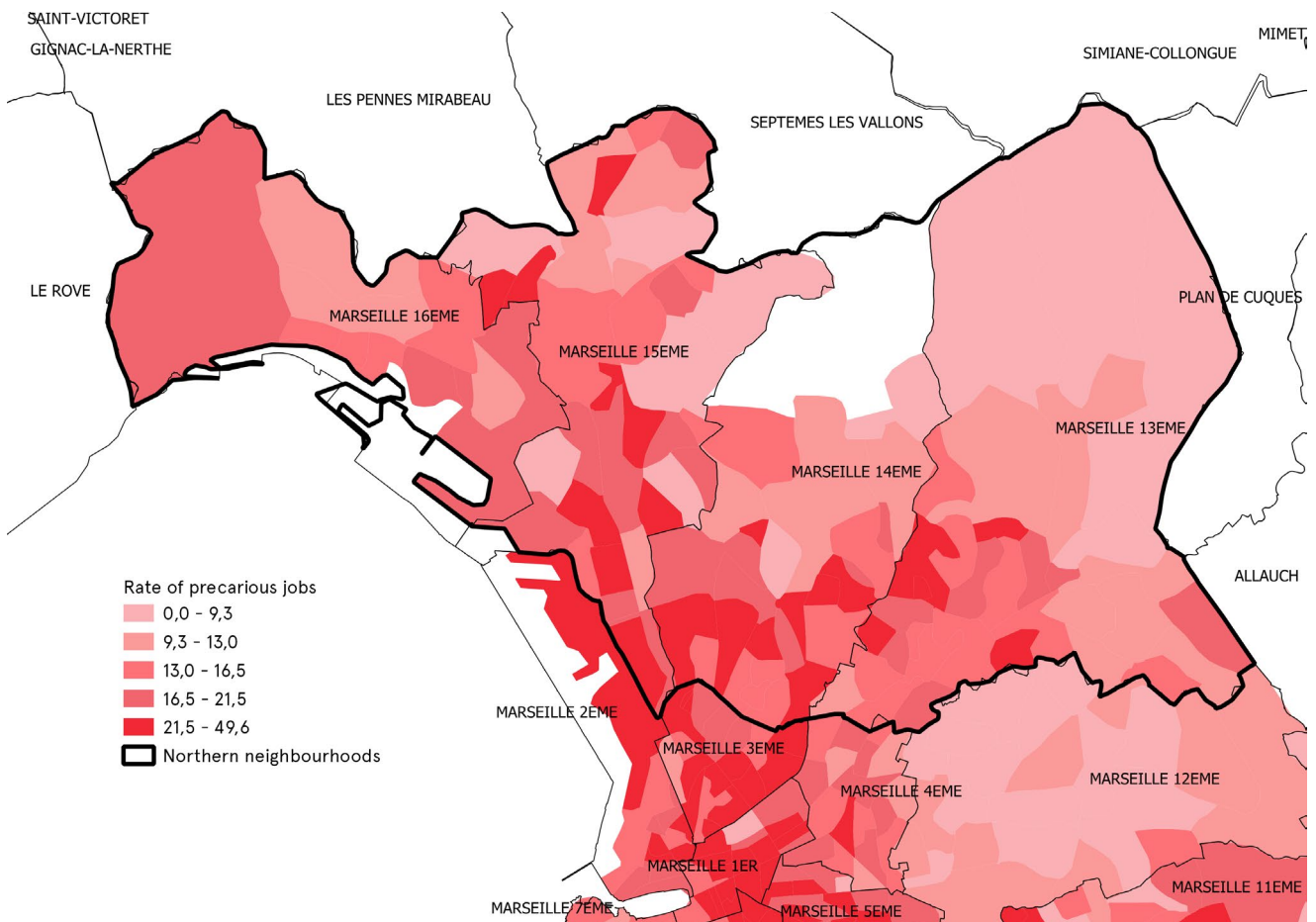
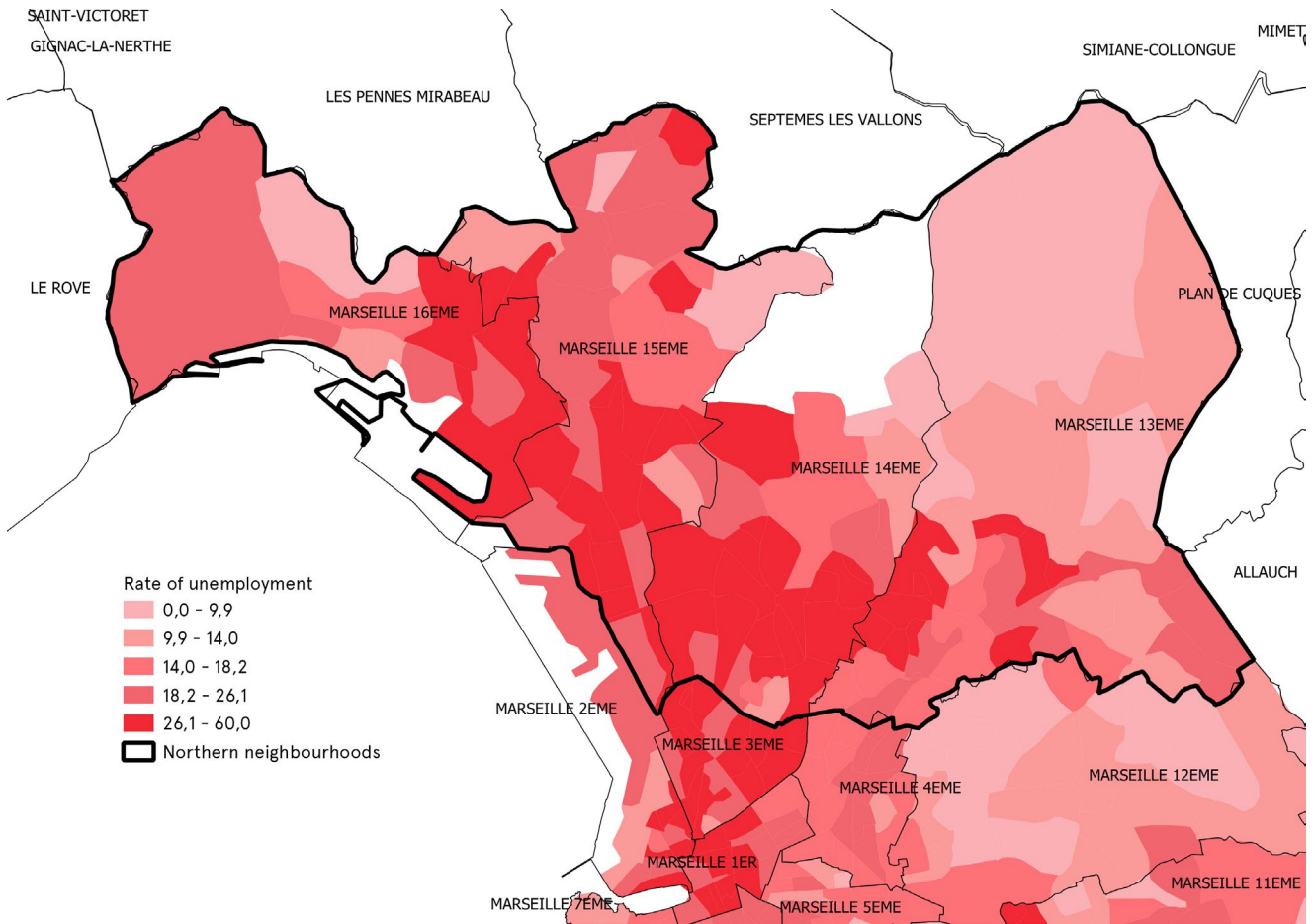
School drop-out can be both a cause and a consequence of unemployment. In a Priority Neighbourhood of the City (Quartier Prioritaire de la Ville, hereinafter QPV), a label that is attributed to poorer neighbourhoods in France based on the social and economic data of their inhabitants, a child of the PACA region is twice as likely as a child living elsewhere in the region to drop out from school, with an average rate of school drop-out of 23% in the region in 2018 according to INSEE<sup>12</sup>. Among the factors that explain the phenomenon in the general case, the Cnesco identifies the professional situation of parents but also territorial features such as the lack of diverse

12 Adaoust, S., & Rouaud, P. (2018, June). Dans les quartiers de la politique de la ville, deux fois plus de jeunes ont quitté l'école et sont sans diplôme. Retrieved October 25, 2020, from <https://www.insee.fr/fr/statistiques/3557087>



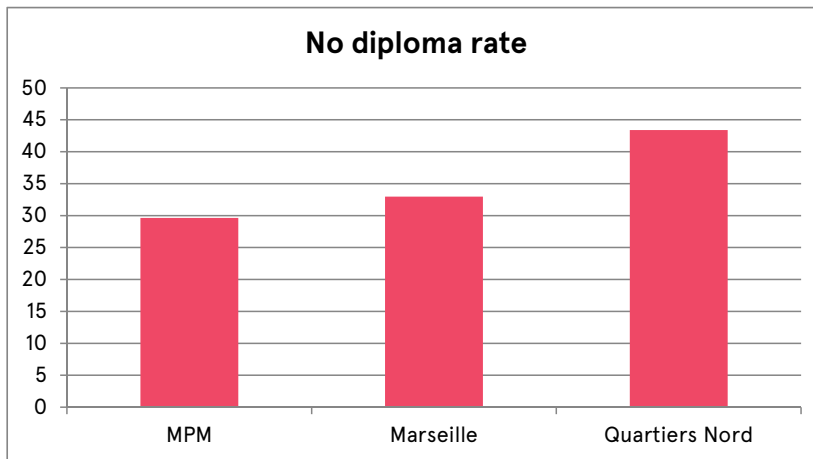
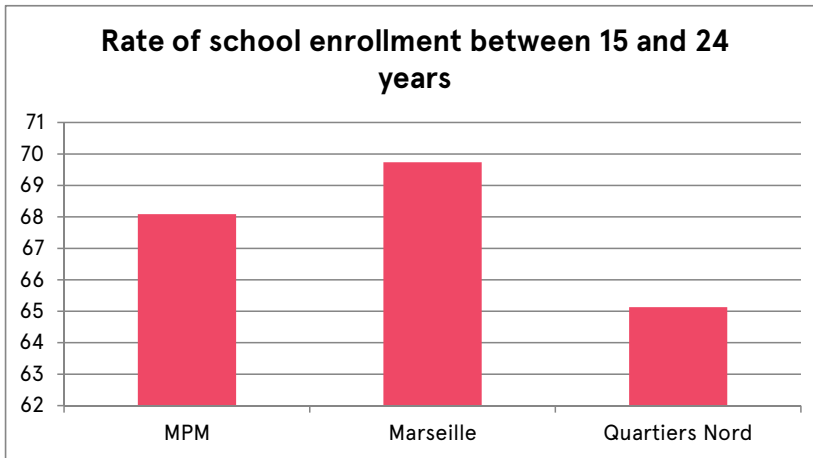
Figure 6. Precarious job rate in Northern neighborhoods.

# Chapter 1. From Urban Renovation to Circular Regeneration



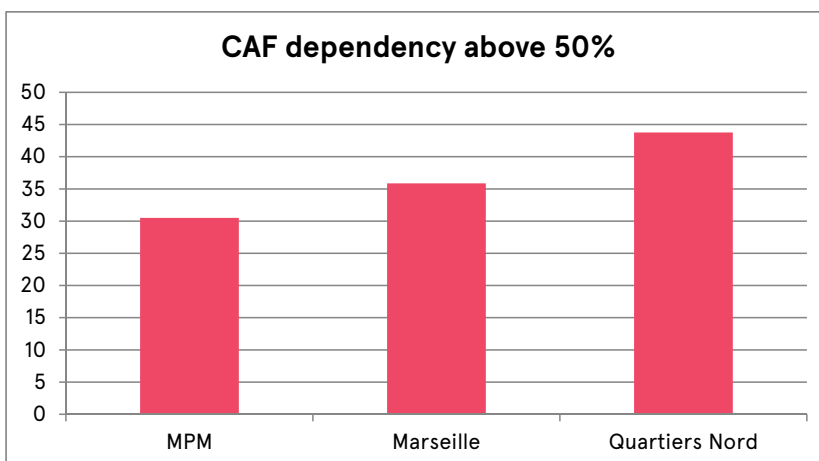
## 1.1 The northern neighbourhoods: a fragile context

training opportunities and the attractiveness of low-skilled jobs.<sup>13</sup> In the northern neighbourhoods, this phenomenon is accompanied by a low rate of diploma among inhabitants.



Revenue: dependency on cash benefits

The revenues are very low compared to the rest of the city and the metropole, as seen previously. This causes a high rate of dependency on cash transfers from the state support to families such as the *Caisse des Allocations Familiales* (hereinafter CAF). In the northern neighbourhoods, more than 40% of the families depend on CAF transfer for over 50% of their revenue.



13 Cnesco. (2017, November). Facteurs de décrochage scolaire. Retrieved September 25, 2020, from <http://www.cnesco.fr/fr/decrochage-scolaire/facteurs/>



Figure 7. Comparison of school enrollment rate and no-diploma rate between Northern neighborhoods, Marseille and the Métropole AMP



Figure 8. School enrollment between 15 and 24 years in Northern neighborhoods.



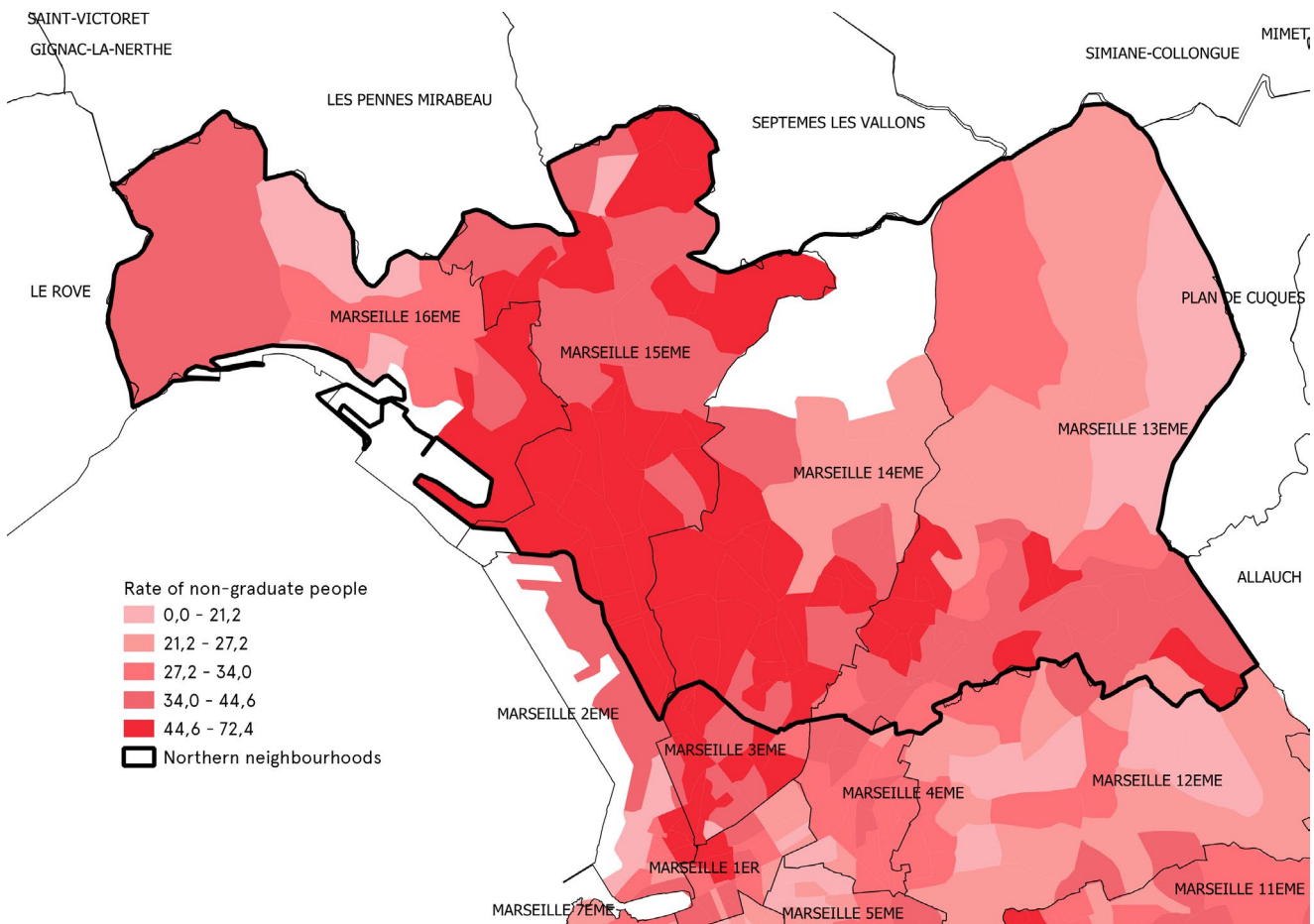
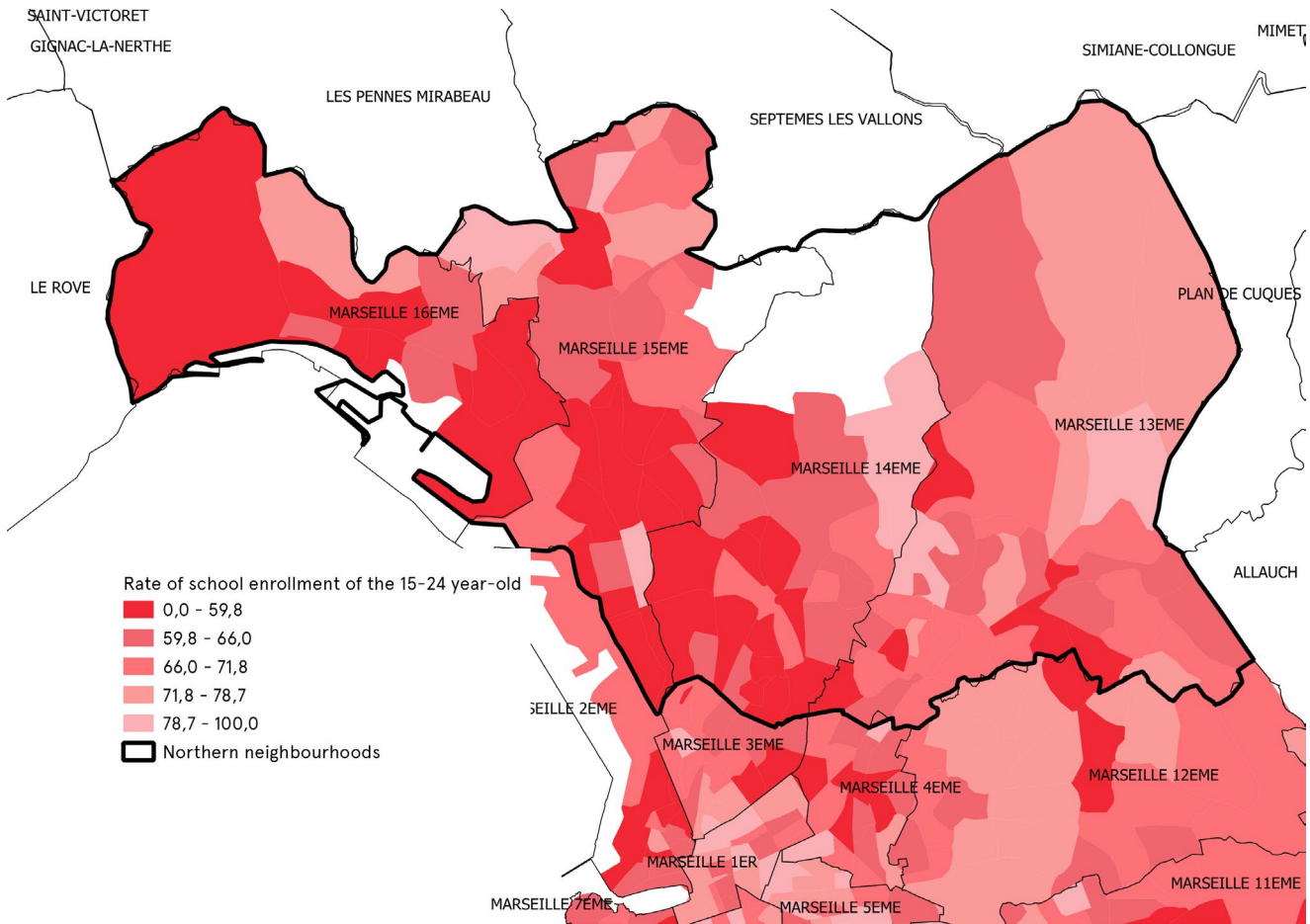
Figure 10. Comparison of CAF dependency above 50% between Northern neighborhoods, Marseille and the Métropole AMP.



Figure 9. No diploma rate in Northern neighborhoods.



# Chapter 1. From Urban Renovation to Circular Regeneration



## 1.1 The northern neighbourhoods: a fragile context

*Household: single families and large families*

Finally, single families and large families are overrepresented in the area. Their rate is counted as an indicator of vulnerability since their members are more likely to face difficulties to find and maintain a job or to find adequate housing.

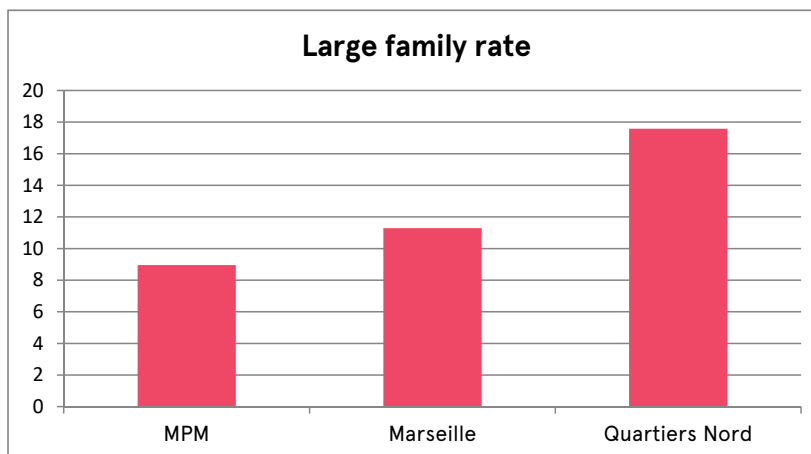
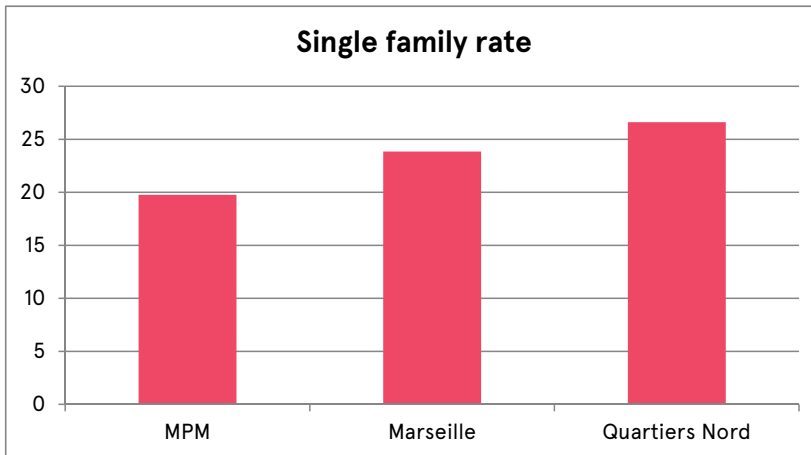


Figure 12. Comparison of single family rate and large family rate between Northern neighborhoods, Marseille and the Métropole AMP.

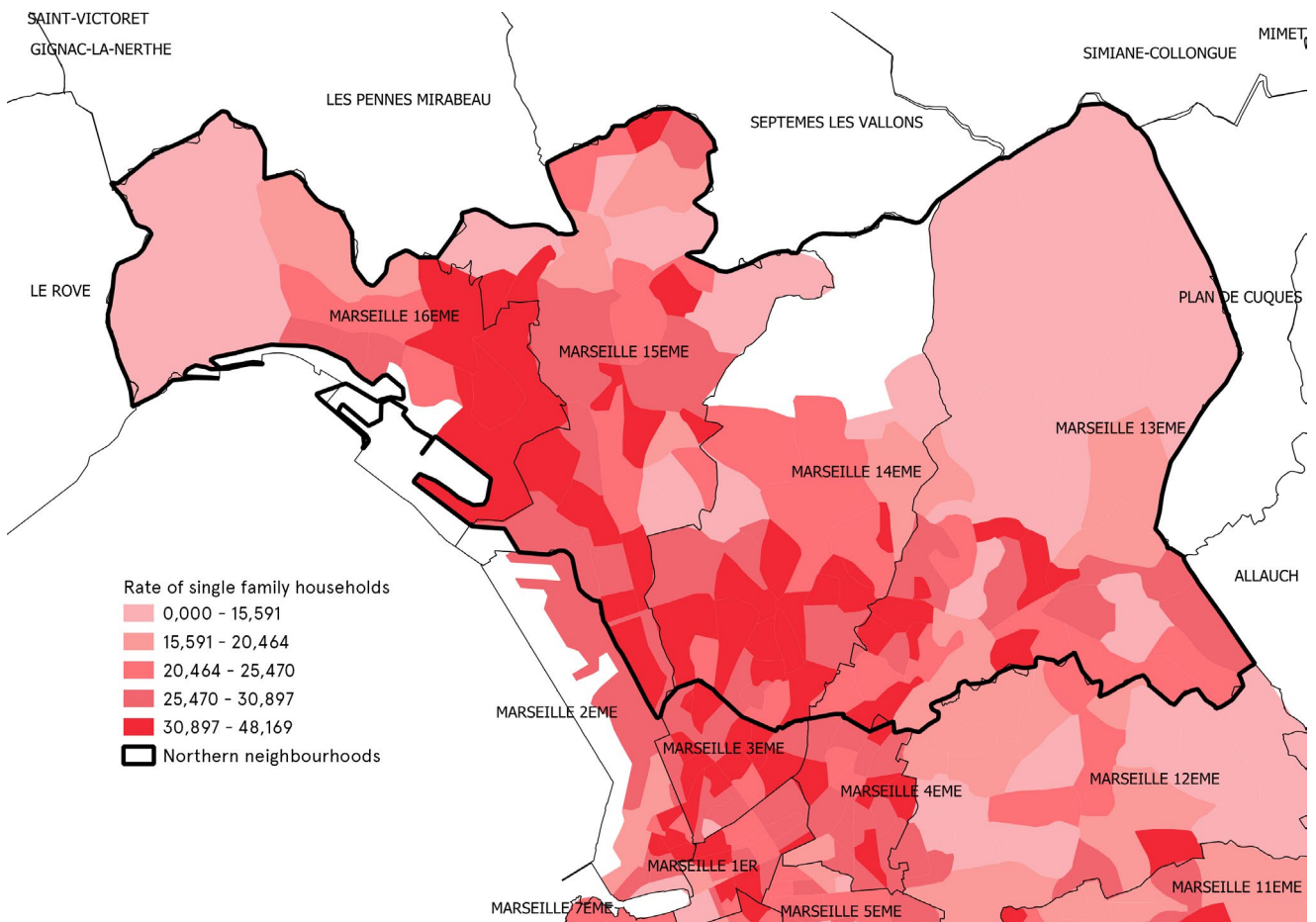
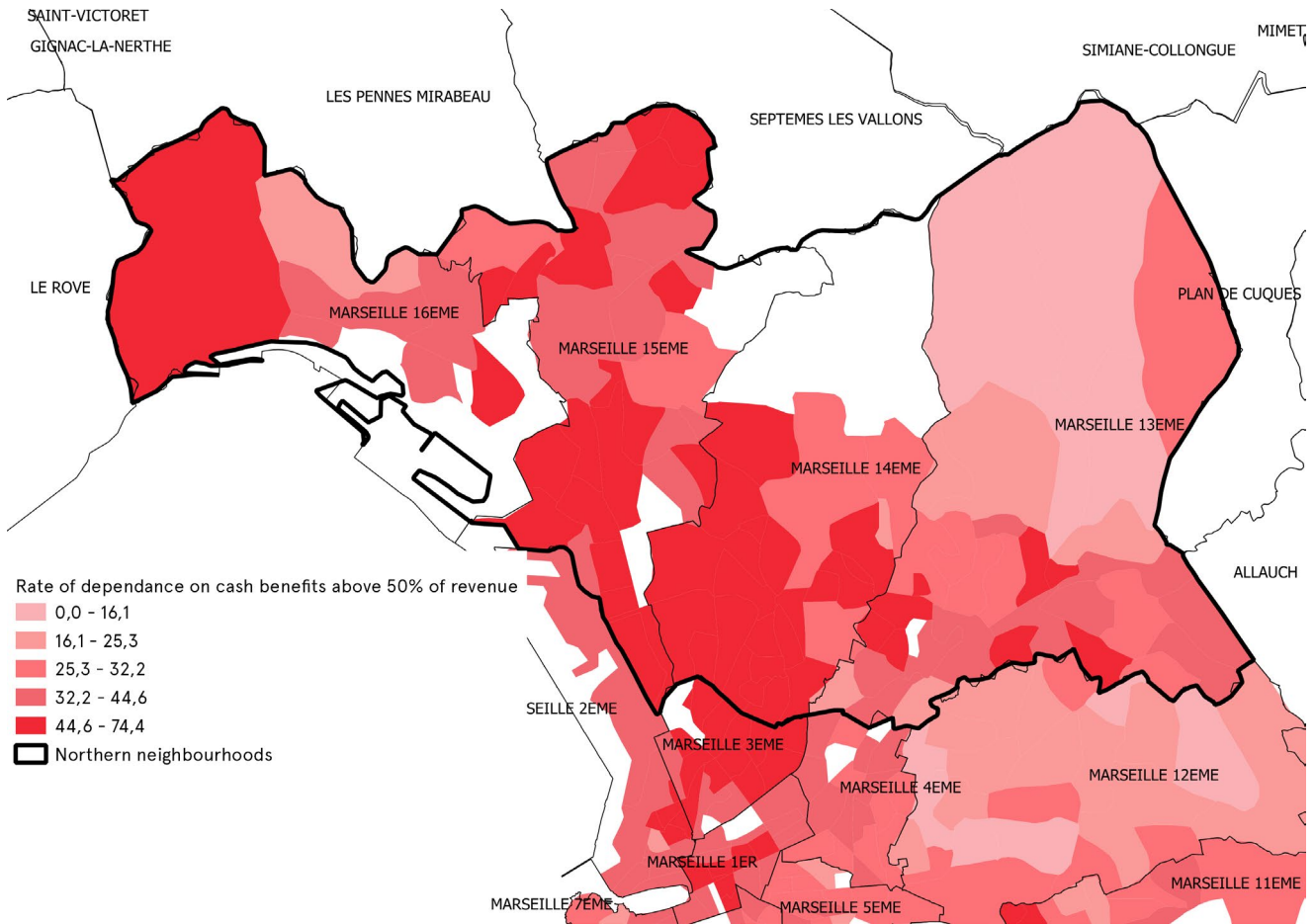


Figure 11. CAF dependency rate above 50% in Northern neighborhoods.



Figure 13. Single family rate in Northern neighborhoods.

# Chapter 1. From Urban Renovation to Circular Regeneration



## 1.1 The northern neighbourhoods: a fragile context

### 1.1.3 Spaces: spatial fragmentation and housing crisis

As the Contrat de Ville testifies<sup>14</sup>, the northern neighbourhoods are a composition of urban fabrics that do not manage to have a spatial cohesion. The disconnection between the neighbourhoods and the city centre is caused by a lower offer in public transports and a lower car ownership. In addition to this, the Contrat identifies psychological barriers to mobility from the part of inhabitants, who are less likely than others to move far from their homes. The disconnection between the port and the city dates back at least to 1966, when the port becomes a state-owned entity instead of a local institution (Roncayolo, 2014).<sup>15</sup> Finally, the disconnection between natural landscapes penalises the attractiveness of an area that borders many natural resources with rich landscapes.

The region of Provinces-Alpes-Côtes-d'Azur (referred to as PACA) has one of the highest scores of potentially unworthy private housing real-estate (Parc Privé Potentiellement Indigne, hereinafter PPPI), which refers to housing that has been built before 1970, was known to be mediocre or decayed, has not been renovated and is currently occupied by low-income households (DREAL, 2018); the department of Bouches-du-Rhône represents 46% of this real estate, and the situation of the PPPI in the 16 municipalities of Marseille have been classified as "serious" by the CEREMA (2015). According to the 2019 report by the Committee for housing of deprived people (Haut Comité pour le Logement des Personnes Défavorisées), the situation in Marseille concerns 40 000 housing units, amounting to 100 000 people.<sup>16</sup> In November 2018, the crumbling of two buildings in the Aubagne street, in the city centre, caused the City of Marseille to dislodge 3 000 people during the next year because their houses were declared unsafe.<sup>17</sup> In this context, the importance of providing quality social housing as an alternative to substandard private housing and to renovate the housing real estate of fragile neighbourhoods appear as crucial.

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14 Politique de la Ville Métropole Territoire Marseille Provence. (2015). Contrat de Ville intercommunal 2015 - 2020. Retrieved October 25, 2020, from [http://www.polvillemarseille.fr/page.htm?\\_ref=726](http://www.polvillemarseille.fr/page.htm?_ref=726)

15 Roncayolo, M. 2014. Ville. In *L'imaginaire de Marseille : Port, ville, pôle*. Lyon : ENS Éditions. doi :10.4000/books.enseditions.398

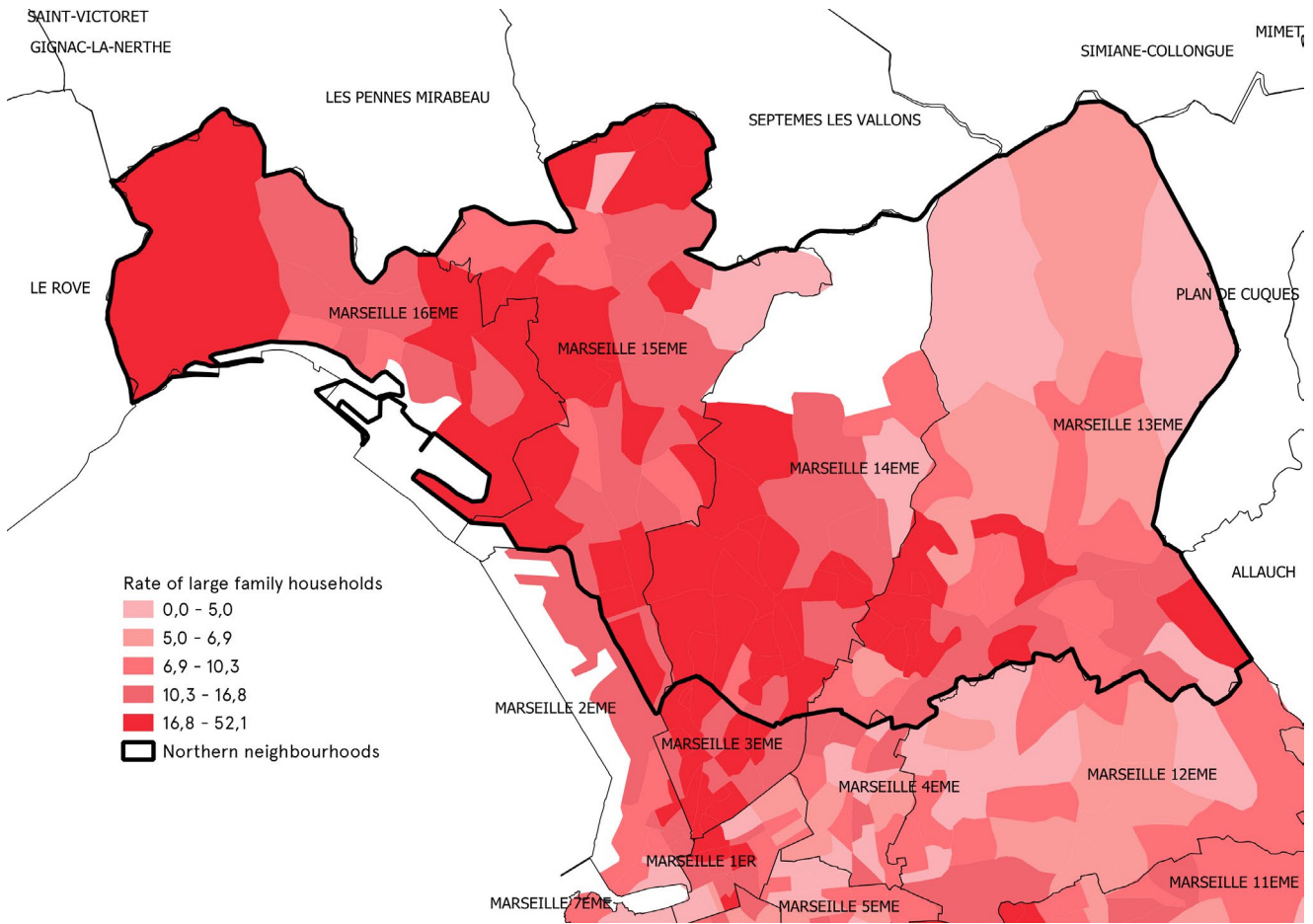
16 PACA. (2018). DREAL Provence-Alpes-Côte d'Azur - Atlas régional de l'Habitat 2018 (Rep. No. PARTIE 2 État des lieux de l'habitat en PACA - Le parc privé). Retrieved 2020, from [http://www.paca.developpement-durable.gouv.fr/IMG/pdf/atlas\\_habitat\\_fiche\\_2-15.pdf](http://www.paca.developpement-durable.gouv.fr/IMG/pdf/atlas_habitat_fiche_2-15.pdf)

17 Sénat. (2019). Mesures contre le logement insalubre un an après le drame de Marseille. Retrieved October 25, 2020, from <https://www.senat.fr/questions/base/2019/qSEQ19111026S.html>



Figure 14. Large family rate in Northern neighborhoods.

# Chapter 1. From Urban Renovation to Circular Regeneration



## 1.2 Urban renovation: definition, focus, issues

### 1.2.1 What is urban renovation?

Urban renovation is a term loaded with social and political contention (Epstein, 2013). In France, it appeared in the 19th century and its last formulation dates back to 2003, when Jean-Louis Borloo, then Minister of the City, called for the creation of the National Urban Renovation Plan (Plan National de Rénovation Urbaine, referred to as PNRU). The National Agency of Urban Renovation (Agence Nationale de la Rénovation Urbaine, further referred to as ANRU) pilots the program, on a critique of the neighbourhoods built after the Second World War, accused of producing socio-spatial segregation (Desage, 2015). As presented on the Agency's website (2020), the aim is to "deeply transform these neighbourhoods by intervening on housing, but also by opening them up and fostering social mix". The PNRU launched the renovation of 600 neighbourhoods with a funding of 12 billion euros. The method focuses on the transformation of the built-up environment, with a result of 160 000 social housing units demolished, 140 000 constructed, 80 000 housing units constructed for home-buying and 340 000 social housing units renovated. In 2020, the new PNRU, referred to as NPNRU (Nouveau PNRU) is launched.

In Marseille, urban renovation covers three main perimeters (Berry-Chikhaoui & Deboulet, 2007). In the city centre, the focus is the rehabilitation of the historical urban tissue through the Programmed Operation for the Improvement of Housing (Opération Programmée d'Amélioration de l'Habitat, hereinafter OPAH), whereas the program Euroméditerranée, launched in 1995, aims at transforming the area linking the hyper-centre and the port area at the north until the neighbourhood of Les Crottes into a central business district accompanied by mix-use residential neighbourhoods. Finally, the PNRU has covered mostly the northern districts (arrondissements) of the city, from the 13th to the 15th. This thesis focuses on urban renovation projects piloted by the ANRU, that encompass PNRU and NPNRU projects.

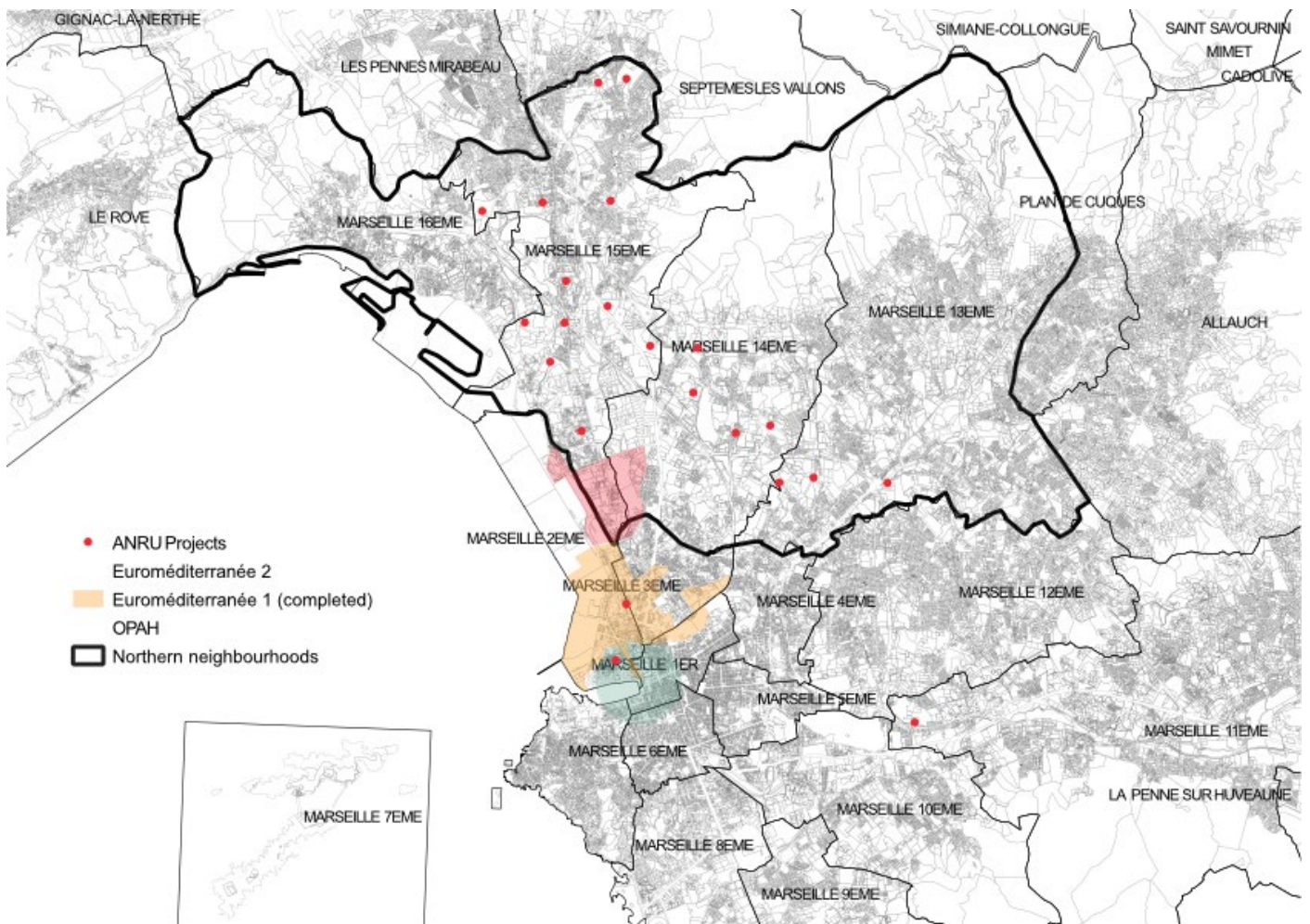
#### *Why focus on urban renovation?*

For urban planners and architects, urban renovation is nevertheless an important frame to intervene on deprived neighbourhoods and address societal challenges. At the very least, it can be legitimized based on the right of citizens to have a decent housing, endorsed in France by the Decree of March 5th, 2007 on enforceable right to housing (droit au logement opposable, hereinafter DALO). As a policy, urban renovation is enshrined in the concept of urban regeneration,



Figure 15. Urban renovation projects in Northern Neighborhoods and City Center of Marseille.

# Chapter 1. From Urban Renovation to Circular Regeneration



## 1.2 Urban renovation: definition, focus, issues

which is a comprehensive approach to people's wellbeing in modern cities. Urban regeneration is defined by Roberts (2000, p.17 ) as a "comprehensive and integrated vision and action which seeks to resolve urban problems and bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change or offers opportunities for improvement".

*What are the issues raised by urban renovation ?*

Rehabilitation operations have been criticized at different levels for an emphasis on real-estate valorisation rather than on inhabitants wellbeing and social justice. In the case of the PNRU, Epstein (2013) points out several methodological issues on the national-scale program:

- Governance – Centralisation: An excessively centralised governance of the programs caused by the imbalance in the role of the ANRU and that of local authorities, resulting in a limited awareness of the local context and stakes;
- Scale – City: The communal scale at which the projects take place, which impedes deconcentrating poverty when an intercommunal level would be more relevant;
- Focus – Built-up: The overstated importance of transforming the built environment with respect to the social context, in particular in the approach of the ANRU;
- Method – Non-participation: The lack of participation by inhabitants into the projects – rather, the author describes an instrumental accompanying of dwellers by institutional actors in order to prevent the emergence of conflicts and structured opposition.

In addition to this reserved balance on the success of the PNRU, the practice by ANRU of demolition and reconstruction as a central process can be criticized for its high environmental cost of the method by demolition-reconstruction promoted by the ANRU. In 2017, the sector of construction and public works (Bâtiment et Travaux Publics, BTP) produced 70% of the waste mass in France (ADEME, 2020).



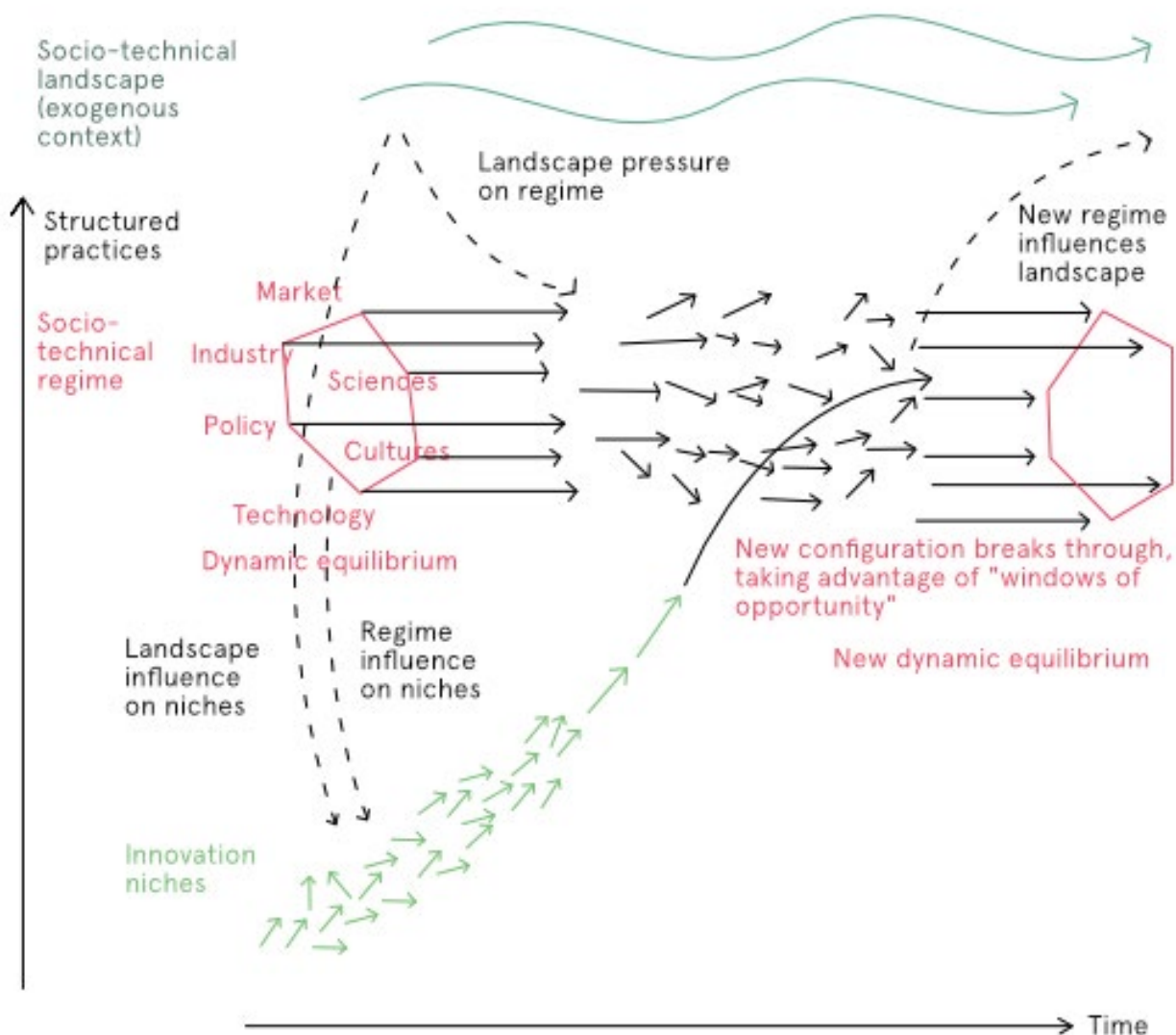
Figure 16. Multi-level transitions. Adapted from Typology of sociotechnical transition pathways, by F. W. Geels, J. Schot, 2007, <https://doi.org/10.1016/j.respol.2007.01.003>.



# Chapter 1. From Urban Renovation to Circular Regeneration

## 1.2.2 What is changing? The transition perspective

This thesis attempts to consider urban renovation in Marseille as a field of intervention on the urban realm by a network of actors, based on a set of assumptions that are being challenged and with practices that are being questioned; urban renovation is a policy that takes place in a landscape which is evolving at the physical, social, economic, technical and institutional levels, thus creating pressure on urban-renovation actors and methods. The challenges and potential transformations of urban renovation will be explained hereafter in the transition-perspective framework.



As Geels and Schot explain (2007), structured human activities constitute and carry a set of values and practices that define the socio-technical regime of a society at a given moment. A socio-technical regime is embedded in social and technical conditions that cannot be changed by the actors of the regime and that are

## 1.2 Urban renovation: definition, focus, issues

called the socio-technical landscape. Landscape pressures are phenomena that challenge the sociotechnical regime but to which the regime actors can only adapt, without a possibility to influence the landscape immediately. Simultaneously, innovations are produced in less structured networks of actors that are niches of innovation. A new dynamic stability is reached when the socio-technical regime is realigned in a way that minimizes the landscape pressure and integrates the innovations that were strong enough to disrupt the status-quo.<sup>18</sup>

In this framework, urban renovation is a socio-technical regime that can be described through its values, goals, regulations, actors, practices, scales and spaces. Urban renovation relies on the assumption that post-war public-housing neighbourhoods are an urban context which does not provide equal opportunities to its inhabitants because of poverty concentration, decayed built-up environment, low accessibility and low access to urban services (Epstein, 2017, ANRU, 2020). Among the values that found urban renovation are equality of opportunities for citizens, the right to a decent dwelling and social mix being regarded as a condition of citizens wellbeing. The goals that emerge from these values are the rehabilitation of housing – either through renovation of the existing real estate or through demolition and reconstruction – and the improvement of social mix in the neighbourhoods.

The regulation framing urban renovation has several scales and scopes. One is the national regulation imposed by ANRU to finance projects submitted by municipalities. Second, urban renovation interacts with local urban plans and policies. For example, in some areas with a fragile economy, businesses employing local inhabitants benefit from tax reductions; these areas are called Zones Franches Urbaines (hereinafter ZFU). Besides, ANRU funds are basically meant for areas labelled QPV. Third, urban renovation deals in great part with social housing policies that have a national and a local frame. For instance, every municipality has to comply with the decree of March 13th, 2000 on solidarity and urban renovation (Solidarité et Renouvellement Urbain, hereinafter SRU), which imposes a minimal quota of social-housing provision based on the dimension of the city. It also has to abide by environmental norms on new constructions, that impose a minimal level of energy efficiency.

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18 F. W. Geels, J. Schot. (2007) Typology of sociotechnical transition pathways. *Research Policy*, Volume 36, Issue 3 (pp. 399-417). ISSN 0048-7333. <https://doi.org/10.1016/j.respol.2007.01.003>.

# Chapter 1. From Urban Renovation to Circular Regeneration

## *The landscape pressure: environmental crisis*

In the sociotechnical landscape of urban renovation in Marseille, this thesis will focus on three elements that exert pressure on urban renovation actors: (i) people: the socio-economic and urban fragility of the neighbourhoods being renovated, (ii) institutions: the metropolisation of Marseille with the construction of the Aix-Marseille-Provence métropole (hereinafter AMP), and (iii) the global environmental crisis and the institutional responses to it.

While the socioeconomic fragility of the northern neighbourhoods has been detailed previously, the institutional response to the climate emergency, as far as the building sector is concerned, is further examined in a following paragraph. Let us simply highlight that since January 2020, the reuse of 70% of construction waste is mandatory by a 2008 European directive.<sup>19</sup>

In the context of the environmental crisis, the management of resources to reduce material and spatial resources consumption appear on the agenda of national and international institutions. They can be divided into laws, plans and fundings, at the european, national and local scales.

## *Windows of opportunity: metropolisation and institutional change*

At the national scale, the first change is the transition from PNRU to NPNRU. After launching the NPNRU in 2014, the ANRU is now piloting both PNRU and NPNRU projects. According to the Agency, the three major changes between the two programs are:

- The change of scale from municipality to agglomeration for the local promoter of the projects;
- A two-stepped contract with a prefiguration stage and an operational convention stage, to improve the relevance of the project scoping;
- An increased focus on citizen participation and co-design, with “project houses” in the neighbourhoods where inhabitants can find information, and citizen councils established in every neighbourhood to foster dialogue between dwellers and actors.

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<sup>19</sup> European Commission. (2016). *Protocole européen de traitement des déchets de construction et de démolition*. Retrieved November 10, 2020 from <https://ec.europa.eu/docsroom/documents/31521/attachments/1/translations/fr/renditions/pdf>

## 1.2 Urban renovation: definition, focus, issues

These evolutions clearly address the main critical issues raised on the PNRU, but with the first projects started in 2020, it is early to evaluate their efficiency.

Urban renovation interacts with a local institutional context that is under recomposition. In 2016, the metropole of Aix-Marseille-Provence was created under the pressure of the state and became in charge of housing policies, including the elaboration of the Local Housing Plan (Plan Local de l'Habitat, hereinafter PLH), social housing policy and fight against unworthy housing. In addition to these missions, urban renovation coordination has been transferred from the city level to the metropolitan one. The former city institution Marseille Rénovation Urbaine has been integrated in the AMP as Mission Renouvellement Urbain (referred to as MRU).

In the new metropolitan scale, the northern neighbourhoods of Marseille are no longer a periphery, but rather a strategic area between metropolitan-scale facilities like the industrial port of Fos-Marseille (Grand Port Maritime de Marseille) and the technological cluster of Château-Gombert. It is also adjacent to the departmental park of Massif de l'Etoile, and is on the way from Marseille to Aix-en-Provence, and to the northern part of the metropole. This change of perspective appears in the strategic documents of the metropole ( ) and sheds a new light on the future of the northern districts.

## **1.3 Toward circular regeneration**

### **1.3.1 What is a circular economy?**

In their literature review, Suárez-Eiroa et al. (2019) identify seven explicit definitions of circular economy. Some define it as an economic model, while others consider it as an economic system including planning (upstream), and reprocessing (downstream), while circular economy is also defined as a development model. While some definitions attribute to circular economy such goals as “human wellbeing” (Murray et al., 2017, as cited in Suárez-Eiroa et al., 2019), it is useful for this thesis to select a definition that includes the nature, goals, principles and practices of circular economy in terms that are as little ambiguous as possible. We therefore choose the formulation coined by Geissoerfer et al. (2017), as cited in Suárez-Eiroa et al. (2019): “We define Circular Economy as a regenerative system in which resource input and waste, emission, and energy leakage are minimised by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling.” If the widespread association of circular economy with reuse and recycling is clear, here it is only a means to achieve the crucial reduction of waste output, but also of material and energy input. Therefore, the concept is quite close to the scope that Arnsperger and Bourg (2016) provide: an authentically circular economy should also be a “perma-circular” one (p. 115), in the sense that it should be framed in a broad economic, social and cultural attempt to reduce the resource consumption and waste production of human activities.

### **1.3.2 A different perspective for urban renovation**

Circular economy thus appears far away from the assumptions of current French urban renovation policies, which focuses on the necessity to transform and bring resources into deprived neighbourhoods, rather than on the reuse and valorisation of existing resources that may have been invisible so far. Nevertheless, one of the growing focuses of the circular economy is precisely the construction sector because it generates most of the waste mass in France. In the current context of demographic pressure on large European cities, building is both a necessity for citizens and a threat to the environment. Circular economy appears as an interesting perspective to reconcile both issues. It is even an interesting metaphor of the urban impact on natural resources, and the term of urban metabolism can be a frame for the concern with evaluating and optimizing the material and energy flows between cities and their environments (Broto et al. 2012). If urban renovation can be framed within the broader policy of urban regeneration, then a

### 1.3 Toward circular regeneration

metaphorical link appears between circular economy and urban renovation as regenerative processes. This perspective leads to a radically different approach to urban renovation; just like cities, neighbourhoods consume and release flows of materials and energy according to their own metabolism, which is capable of regeneration. Therefore, urban renovation should be an attempt to improve the metabolism of fragile neighbourhoods to bring about long-lasting improvements to the living conditions of its people. This point of view shifts the concern with the lack of resources, embedded in the term deprived, to the misuse or underuse of resources, and the possibility to transition to more resilient urban realms.

#### 1.3.3 An emerging institutional framework for circular economy

In the context of environmental emergency, the management of resources to reduce material and spatial resources consumption appear on the agenda of national and international institutions. They can be divided into laws, plans and fundings, at the European, national and local scales.

The European Green Deal (hereinafter EGD) contains both the proposal of a regulation and an action plan to reach carbon neutrality by 2050, with a 55%-carbon emission reduction by 2030. In the building and renovation sector, the EGD identifies circular economy as a priority for design and building, along with energy performance for new and renovated buildings. One block of the EGD is the new Circular Economy Action Plan adopted on 2020 March, 11th, which targets material reuse for building and renovation, increasing of building lifecycle and the regeneration of underused spaces and brownfields.

At the French level, the Roadmap for circular economy (*Feuille de route pour l'économie circulaire*)<sup>20</sup> is rather a guide for implementing circular-economy policies, and identifies the construction sector as a priority sector in this respect. The 2020 Law against waste and in favour of circular economy (Loi anti-gaspillage et pour l'économie circulaire) does not introduce many changes at the moment because in the current sanitary situation, the state does not wish to put pressure on economic actors on construction.<sup>21</sup> Finally, at the local

20 Ministère de la Transition Écologique et Solidaire. (2020). Feuille de route de l'économie circulaire. Retrieved 5 May, 2020: <https://www.ecologie.gouv.fr/feuille-route-economie-circulaire-frec>

21 Kerbarh, S. & Panot, M. (2020). Rapport d'information déposé par la commission du développement durable et de l'aménagement du territoire. Assemblée Nationale. Retrieved October 13, 2020 from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&c->

## Chapter 1. From Urban Renovation to Circular Regeneration

level, the metropole of Marseille has adopted a strategy of Territoire Zéro Déchet. This is a policy framework that aims at valorising and coordination actions taken in the territory for the reduction and recycling of waste, but it is not a binding tool.

Policy Framework	Global	European	Supra-metropolitan	City/metropolitan
<b>Law</b>		<ul style="list-style-type: none"> <li>• The European Green Deal</li> <li>• Ecodesign framework</li> </ul>	<ul style="list-style-type: none"> <li>• La loi relative à la transition énergétique pour la croissance verte (LTECV) 17/08/2015</li> <li>• Loi anti-gaspillage et pour l'économie circulaire 10/02/2020</li> </ul>	<ul style="list-style-type: none"> <li>• Territoire Zéro déchet – Zéro gaspillage</li> </ul>
<b>Plan</b>	<ul style="list-style-type: none"> <li>• Sustainable Development Goals (SDG's)</li> </ul>	<ul style="list-style-type: none"> <li>• The European Green Deal</li> <li>• A new Circular Economy Action Plan</li> <li>• BioEconomy Action Plan</li> </ul>	<ul style="list-style-type: none"> <li>• La feuille de route pour l'économie circulaire (FREC)</li> <li>• Plan régional de prévention et gestion des déchets</li> </ul>	<ul style="list-style-type: none"> <li>• Plan Métropolitain de Prévention des Déchets Ménagers et Assimilés</li> </ul>
<b>Funding</b>		<ul style="list-style-type: none"> <li>• European Social Fund Plus</li> <li>• InvestEU</li> <li>• European Regional Development Fund</li> <li>• LIFE</li> <li>• Horizon Europe</li> </ul>	<ul style="list-style-type: none"> <li>• Fonds déchets (Ademe)</li> <li>• Fonds Économie Circulaire (Ademe)</li> </ul>	

d=&ved=2ahUKEwjVkrLV9J7tAhVByYUKHVrvAqwQFjAAegQIAx-AC&url=http%3A%2F%2Fwww.assemblee-nationale.fr%2F15%2Fpdf%2Frap-info%2Fi1871.pdf&usg=AOvVaw2uhdwaB8M1kF58kGjIHktd

## 1.4 Urban renovation, circular economy and fragility in a transition perspective

Here, urban renovation is an urban process with a specific governance with the goal of improving the living conditions of inhabitants of fragile neighbourhoods by intervening mostly on the built environment. Circular economy is an economic system with the goal of optimising the use of resources in its functioning. Therefore, a circular economy can be a strategy to achieve the goals of urban regeneration with a process and an outcome that are more sustainable in social and environmental terms. Furthermore, circular economy is not a linear process toward an end state but rather a dynamic balance of material and energy flows. In this understanding, it is not only the definition of a goal and the way to achieve it, but it encompasses a dynamic balance that can be reached for an improved resilience of the neighbourhood.

In a multi-level transition perspective, circular economy is a realignment of the regime of production of cities with a landscape of fragile populations and environmental crisis. This thesis aims at proposing a transition path from the current practices of urban renovation in the northern neighbourhoods of Marseille to a sustainable neighbourhood able to provide high-quality living conditions to its inhabitants and to continuously adapt to the emerging environmental pressures and social innovations.

The research question can be formulated as follows:

***How can we embed and nurture a circular economic model into the Quartiers Nord in order to transition to a resilient, inclusive, and participative future?***



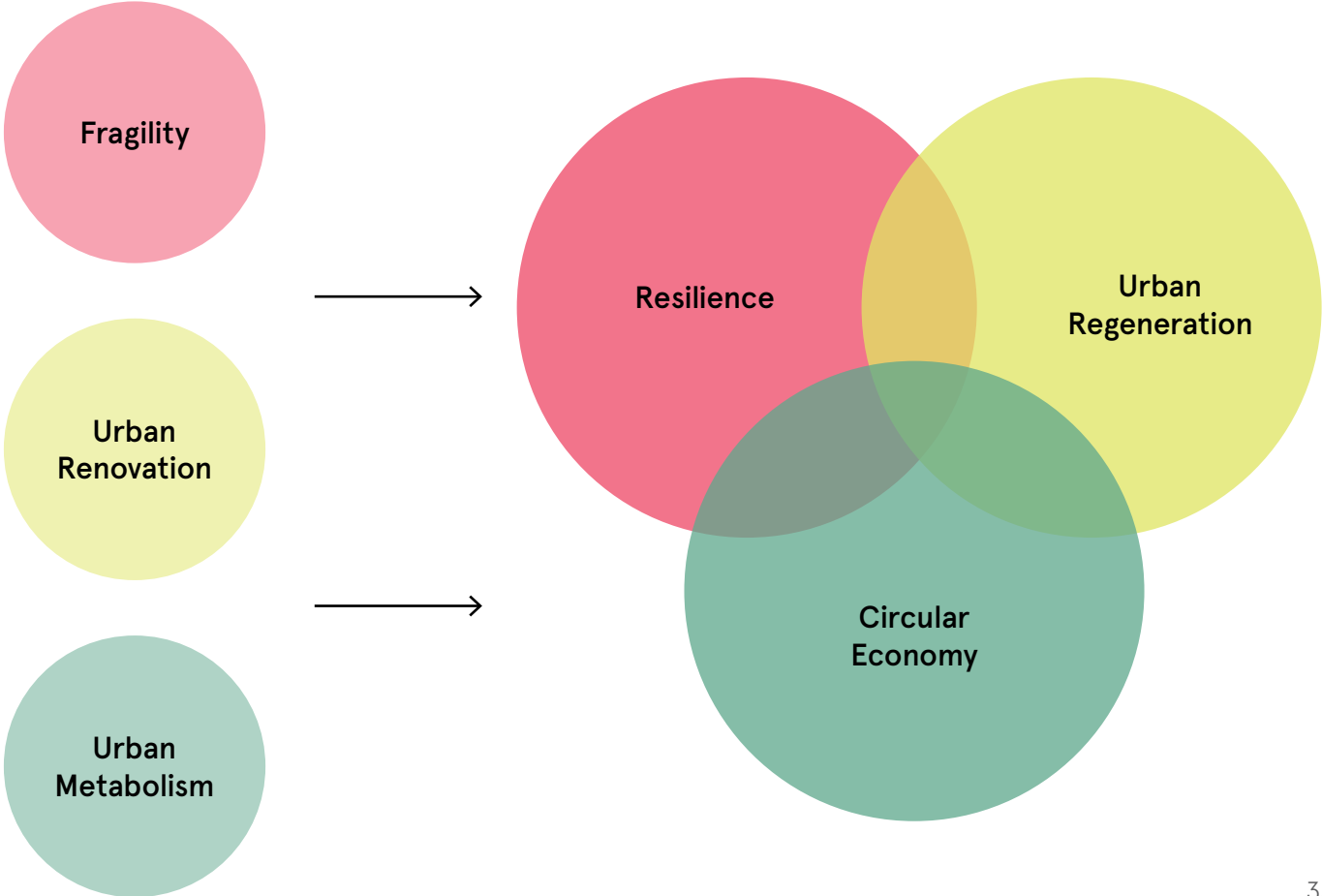
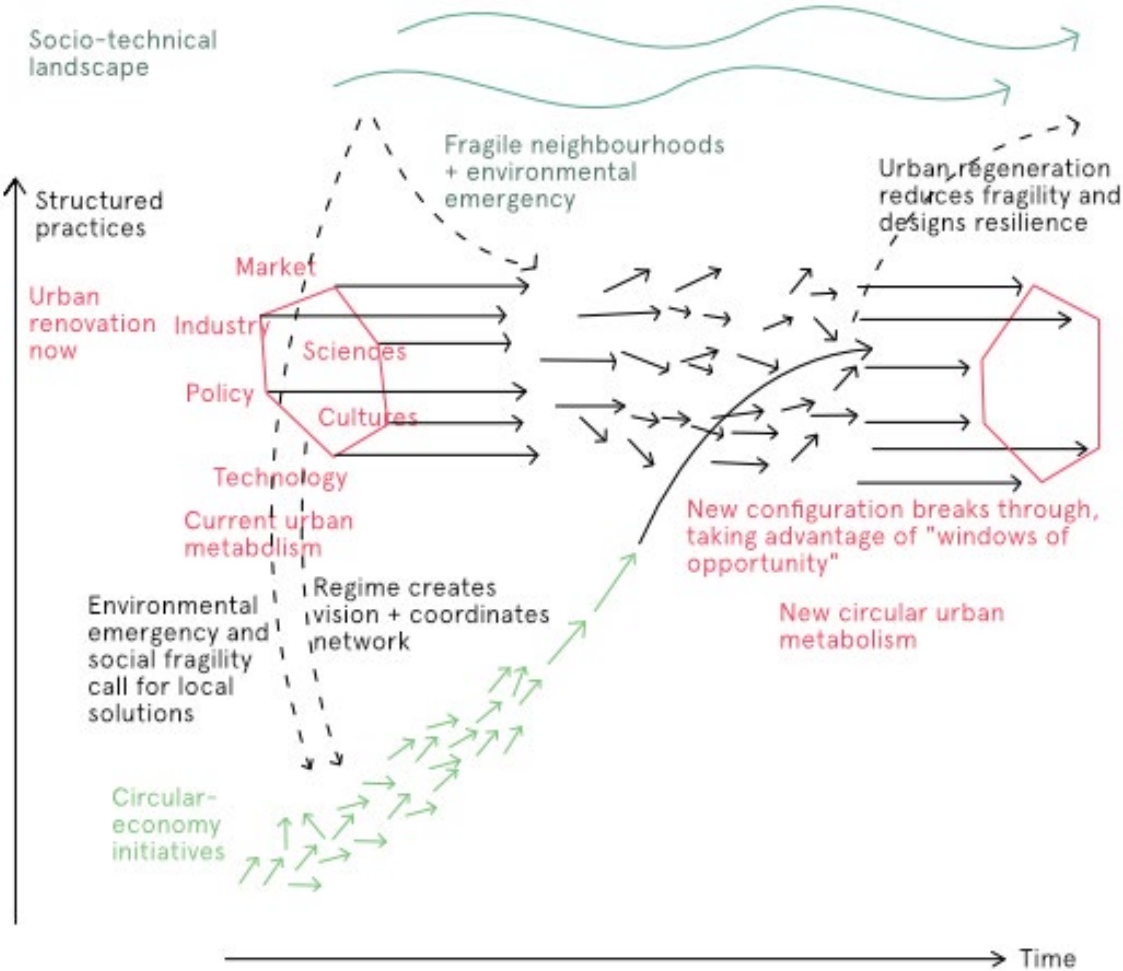
Figure 17. Applied multi-level transition perspective. Based on Typology of sociotechnical transition pathways, by F. W. Geels, J. Schot, 2007, <https://doi.org/10.1016/j.respol.2007.01.003>.



Figure 18. From Urban Renovation to Circular Regeneration. Socio-technical transition.



# Chapter 1. From Urban Renovation to Circular Regeneration





2

**Learning from Other Practices:  
Different Interpretations of Circularity**

## Chapter 2. Learning from other practices

This section seeks to explore combinations of the themes tackled, namely urban renovation, circular economy and socioeconomic fragility. The selection of case studies is therefore made according to the following criteria: (i) the projects should happen on the French territory, (ii) there should be enough documentation, (iii) they should explicitly deal with urban renovation, (iv) they should adopt circular economy through the reduction of waste or the reuse of materials, (v) they should address social protection and enhancing of social ties, (vi) the case studies illustrate a diversity of approaches between institution-led and bottom-up change.

Three projects have been selected. The first, titled *Métabolisme Urbain* (Urban metabolism), is a network of circular economy for the building sector in the region of Paris. The second is the renovation of a neighbourhood, *Chemin Vert*, in the northern littoral city of Boulogne-sur-Mer, with the architectural firm *Construire*, directed by Patrick Bouchain. A semi-directive interview was conducted with Sophie Ricard, the architect from *Construire* who was in charge of the project. The last case study is the *Coco Velten* space, a temporary occupation of the previous offices of the Road Directorate in the 1st district of Marseille as a transitory phase in the renovation of the block. A semi-directive interview was carried out with Océane Vilbert, a coordinator from the cooperative *Plateau Urbain* who works in the project, and a field visit was done in the *Coco Velten* space in July 2020.

The projects descriptions encompass territory, actors, goals and principles, whereas the multilevel transition perspective is used as a common framework to compare the way in which each project tries to operate a transition toward resilience.

## 2.1 Plaine Commune, Métabolisme Urbain

### *Territory*

Plaine Commune is the agglomeration of 9 cities of the north-eastern periphery of Paris, in the department of Seine-Saint-Denis. The territory is concerned by important urban transformation projects. In addition to the projects framed by the (N)PNRU, the outer ring of Paris will be transformed by the Grand Paris metropolitan transport project which intends to densify the neighbourhoods of new stations, and it will host the Olympic Village of the 2024 games. It is part of the Seine-Saint-Denis department, which, like the northern neighbourhoods of Marseille, is faced with serious socioeconomic and urban fragilities, as well as it has borne a negative image at the regional and national scale. With two territories of comparable sizes – 47 km<sup>2</sup> for Plaine Commune and 75 km<sup>2</sup> for the added surfaces from the 13th to the 16th districts of Marseille – both have industrial histories that have left brownfields in the urban space. Moreover, territorial policies of economic regeneration exist in both areas; the Economic Activity Zone (Zone d'Activité Economique, hereinafter ZAE) of Mermoz aims at increasing the attractiveness of Plaine Commune for firms.

### *Actors*

Colle (2019) and Bastin (2019) trace back the genesis of the network Métabolisme Urbain to the elaboration of the Regional Plan for the Prevention and Management of construction waste (Plan Régional de Prévention et Gestion des déchets issus des chantiers du BTP, hereinafter PREDEC), adopted in 2015, which raises awareness that in the context of intense urban transformation, the territory will be faced with tensions regarding the availability of construction material and the areas of waste disposal. This concern combines with the attempt to develop and preserve economic and industrial tissue in the territory. The intercommunality mobilizes and coordinates elected representatives, firms dealing with construction and waste management, as well as experts of construction waste reuse, such as architect association Bellastock. The project is also supported by the national structure of ADEME, the national bank for territorial development Caisse des Dépôts, and the region Ile-de-France (Plaine Commune, 2020). Bellastock has been mandated by Plaine Commune to coordinate the project from 2017 to 2020 (Plaine Commune, 2020).

### *Goals and principles*

The goals of *Métabolisme Urbain* as declared by *Plaine Commune* (2020) are the following: “to reduce the consumption of new construction material [...] to reduce the quantity of waste generated by construction works [...] to reduce truck traffic [related to construction works] [...] to change perspective on waste [...] to support local employment”.

Bellastock (2020) identifies five main actions that structure the project:

1. Experiment material inter-works reuse through 30 key projects across the territory [...].
2. Develop platforms for waste selection, storage and valorisation [...].
3. Accompany the development of the local waste reuse sector [...].
4. Develop a digital tool to make the reservoir visible and keep track of the positive externalities generated by the circular economy approach [...].
5. Accompany competence-building of local actors, from project owners to firms [...]. (Bellastock, 2020).

## 2.2 Boulogne-sur-Mer, Ensemble à Boulogne-sur-Mer: toward a perma-circular economy?

### *Territory*

Boulogne-sur-Mer is a city on the western littoral of France, in the department Pas-de-Calais, in the region of Hauts-de-France. The French institute of statistical analyses, INSEE (2016), examines the socio economic profile of QPVs in the departments of Nord and Pas-de-Calais. The study outlines a typology with 7 profiles, based on poverty indicators and demographic composition of the populations. The neighbourhood Chemin Vert – Beaurepaire – Malborough, where the project takes place, belongs in the G-class, which is characterized by:

- Poverty: very low incomes, high inequalities and heavy dependence on social-security benefits;
- Unemployment: high unemployment and long-term unemployment rates;
- Renters: prevailing renting and social-housing renting population;
- Youth: younger population on average;
- Mono-parentality: overrepresentation of single-parent households;
- Foreign population: higher rates of foreign and extra-EU populations.
- The neighbourhoods of this category accumulate difficulties and are faced with “multidimensional poverty” (INSEE, 2016, p. 22).

The project focuses on the streets Delacroix and Molinet, to streets on the margins of Transition, a part of Chemin Vert undergoing urban renovation within the PNRU<sup>1</sup>. As Sophie Ricard explains<sup>2</sup>, the residents of the two streets are mostly composed of many retired fishermen on the one hand, and travellers on the other hand, who cohabit with difficulty. The housing of this micro-neighbourhood is owned by the social landlord Office HLM Habitat du Littoral.

“In these houses, isolated from the rest of the neighbourhood, the most precarious people have been isolated, as if to isolate the problem.”<sup>3</sup>

Moreover, as Sophie Ricard explains, the houses have been appropriated by the inhabitants, who have behaved more as owners

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1 Ville de Boulogne-sur-Mer. (n.d.). Transition, un quartier en plein essor. Retrieved October 5, 2020 from <https://www.ville-boulogne-sur-mer.fr/votre-mairie/grands-projets/la-renovation-urbaine/le-quartier-de-transition/148-transition-un-quartier-en-plein-essor>

2 S. Ricard, personal communication, 11 October, 2020

3 S. Ricard, personal communication, 11 October, 2020

than renters due to the little maintenance done by the Office. Therefore, the renters have conducted their own rehabilitations and adaptations of the real estate as they intended without authorisations, so there is no record of the operations of maintenance operations. Finally, in this situation of appropriation by the renters, the real occupants may have changed but no track has been kept of it, so as the mayor explained to Sophie Ricard, “we don’t even know who lives where!”.<sup>4</sup>

### *Actors*

As Sophie Ricard puts it “It all begins with a mayor who has willpower and know-how to save the houses from demolition”.<sup>5</sup> Indeed, the mayor is the president of the Office HLM Habitat du Littoral. When he understands that a convention with ANRU will necessarily entail demolitions, he obtains from the board of the Office to step back from the convention process and decides to finance the operation from its own funds, with an estimated cost of € 2.3M. A bid is issued in 2010 for an architecture office to conduct the project, and the agency Construire answers with the proposal of an architect’s permanence instead of a masterplan. Therefore, the actors involved are simply the city, the Office HLM Habitat du Littoral and the agency Construire.

### *Goals & principles*

Based on the words of Sophie Ricard and on an article by Edith Hallauer on the project,<sup>6</sup> the idea is to take a stand against the prevailing approach of tabula rasa used in urban renovation projects that regard social housing complexes in France. The goal of the project “Ensemble à Boulogne-sur-Mer” is to renovate the street of Chemin Vert through housing estate rehabilitation based on the diagnosis by the inhabitants and by applying the requalification program expressed by the inhabitants.

The project relies on two principles. One is that the project should be conducted by an architect who dwells in the neighbourhood for the duration of the project. The underlying idea is that the space should be chosen by those who live in it. Participation is a way to improve the wellbeing of citizens but also to achieve an efficient

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4 S. Ricard, personal communication, 11 October, 2020

5 S. Ricard, personal communication, 11 October, 2020

6 Hallauer, E. (2015) « Habiter en construisant, construire en habitant : la « permanence architecturale », outil de développement urbain ? », Métropoles, 17. DOI : <https://doi.org/10.4000/metropoles.5185>

## 2.2 Boulogne-sur-Mer, Ensemble à Boulogne-sur-Mer: toward a perma-circular economy?

use of the practical knowledge by those who are experts in its occupation. The second is the reversibility of the built environment as a way to recognize those who have influenced it, meaning that rehabilitating instead of demolishing is a social concern before being an environmental one. So the spaces should be flexible to adapt to the needs and aspirations of its inhabitants.

The methodology is therefore to let the architect dwell in the neighbourhood for the 2 years of the project. As she narrates it, Sophie Ricard conducted several participative activities in the public and private spaces, such as the rehabilitation,<sup>7</sup> and as a neighbour she gained the confidence of the inhabitants through reciprocal services.<sup>8</sup> Based on this mutual relationship, she conducted the diagnosis of the housing estate and co-designed with each household the exterior and interior rehabilitation operations that they wanted.



Figure 1. House requalification principles before & after. Retrieved from Construire, by Ricard, S., 2020, <http://construire-architectes.over-blog.com/archive/2013-03/>

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7 Construire. (2013). Ensemble à Boulogne-sur-Mer: fiche projet mars 2013. Retrieved October 5, 2020 from <http://construire-architectes.over-blog.com/archive/2013-03/>

8 Eymard, S. [Sébastien EYMARD]. (2014, August 23). La maison de Sophie Sequence 1. [Video]. YouTube. Retrieved October 20, 2020 from <https://www.youtube.com/watch?v=FZC6BPmmFmw>





## 2.3 Coco Velten: circular space and temporary urbanism

### *Territory*

The city centre is inhabited by a fragile population. Its socioeconomic fragility index in 2016 as calculated previously is 0.922, among the top 25% most fragile neighbourhoods in the city. In 2016, its unemployment rate (32%) and precarious-job rate (36%) are also among the top 25% in the city. Moreover, the area (yellow rectangle on the map) concentrates substandard housing units that are being evacuated for security reasons<sup>9</sup> (black dots on the map) since the crumbling of 2 buildings in Aubagne Street in 2019, in the southern vicinity of Belsunce.

Nevertheless, the city centre has been transforming through various renovation programs. Euroméditerranée 1, designed in 1995 and the Real-Estate Renovation Perimeter of Belsunce (Périmètre de Rénovation Urbaine, hereinafter PRI, perimeter declared of heritage interest where the owners have the obligation to renovate the buildings and can benefit from State support to do so) designed in 1997<sup>10</sup> initiated the recognition of the heritage value of the area. Since then, the cours Belsunce started being transformed with the renovation of the library Alcazar in 2004, and the Joint Development Zone (Zone d'Aménagement Concerté, hereinafter ZAC) of St-Charles aims at valorising St-Charles train station and St-Charles university campus. The area is now part of the PNRU Centre Nord in the pole Belsunce-Velten-Korsec.

The block of Coco Velten is thus in the centre of a centre in renovation that tries to attract upper-middle class dwellers thanks to its accessibility and density of facilities despite the deprived social, economic and housing context. The block hosted the offices of the Road Directorate until 2016. After that date, it remained unused and now it is in the process of being bought by the city of Marseille from the State. From 2019 until the sale planned for 2021, the State lets the space for a transitory urbanism project, namely Coco Velten.

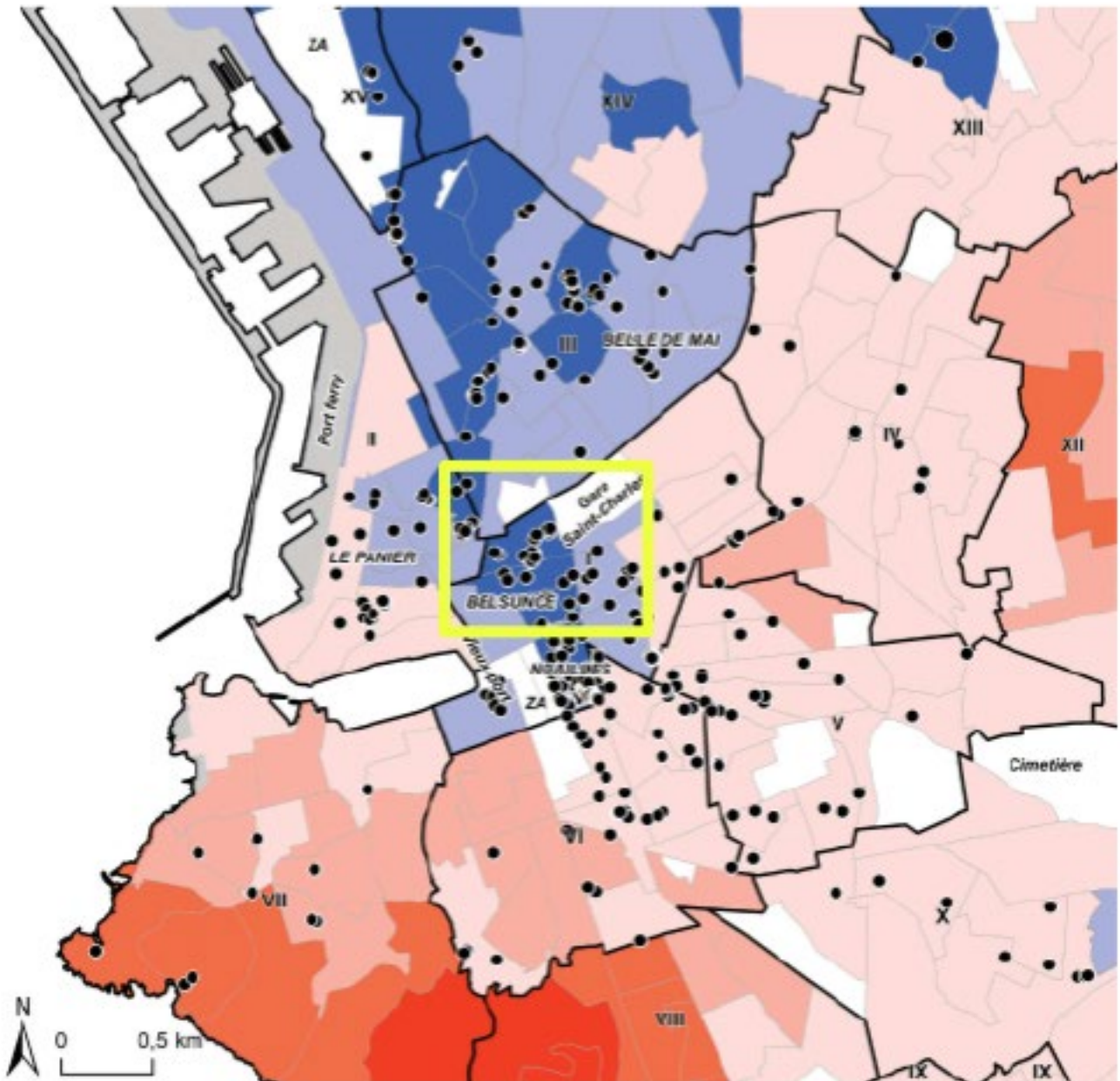
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9 Dario, J. & Dorier, E. (2020). Marseille 2018-2019 : De la crise du logement à la crise humanitaire. Dossier cartographique commenté, en appui au Rapport 2019 du Haut Comité au Logement des Personnes Défavorisées, (HCLPD). Aix Marseille Université, Laboratoire Population Environnement Développement. (58 p.) Retrieved November 2, 2020 from [http://www.hclpd.gouv.fr/IMG/pdf/cartographie\\_marseille.pdf](http://www.hclpd.gouv.fr/IMG/pdf/cartographie_marseille.pdf)

10 Burle J., (2001). Marseille et Naples : patrimoine et politiques urbaines en centre-ville'. In: Méditerranée (Vol. 96). Politique urbaines à Naples et à Marseille: regards croisés. (pp. 71-78). Retrieved from : [https://www.persee.fr/doc/medit\\_0025-8296\\_2001\\_num\\_96\\_1\\_3210](https://www.persee.fr/doc/medit_0025-8296_2001_num_96_1_3210)



Figure 2. Map of housing under order of evacuation for security reasons. Adapted from Marseille 2018-2019 : De la crise du logement à la crise humanitaire, by Dario, J. & Dorier, E., 2020, [http://www.hclpd.gouv.fr/IMG/pdf/cartographie\\_marseille.pdf](http://www.hclpd.gouv.fr/IMG/pdf/cartographie_marseille.pdf)



**Revenu médian déclaré par IRIS**  
(Données 2015, par UC euros)



● Arrêtés au 28 octobre 2019  
(Arrêtés d'interdictions d'occupation et d'évacuation, arrêtés de péril imminent et graves et imminents Ville de Marseille, 2018-2019)

## 2.3 Coco Velten: circular space and temporary urbanism

### Actors

Coco Velten is the temporary occupation of the former Road Directorate offices. The project has been initiated by the Region with an urban laboratory experiment called Lab Zero with a focus on the support against homelessness and residential precarity.<sup>11</sup> As Océane Vilbert explains<sup>12</sup>, the project that emerged is piloted by 3 entities with their own expertise: while Plateau Urbain and Yes We Camp have proved their experience in temporary urbanism, Groupe SOS Solidarités is focused on social support to vulnerable populations. Funding is provided by the City, the Region, the State as well as Euroméditerranée, but half the budget accounts for own resources of Coco Velten's activities.<sup>13</sup> The space is multifunctional so as to host local associations with social or cultural activities. Therefore, the number of actors that actually occupy the space is much greater than the number of pilot actors.

### Goals & principles

The goal of the project is to propose a temporary mixed use of the Road Directorate offices that allows to host people in situations of residential fragility. The mix of uses includes cultural and economic services for the residents of the neighbourhood.

The first principle applied is the light renovation of the space with reuse materials. The second is the sharing of space for multiple actors and activities. For instance, the ground floor is used as a catering space that fights food waste but it also hosts cultural events, while offices are rented for workers and associations and housing spaces are made available for people in residential emergency.<sup>14</sup> This mix of uses is open-ended, so the use of spaces can evolve along the project. This is enabled by a participative and adaptive governance model piloted by Yes We Camp, Plateau Urbain and Groupe SOS Solidarités, with bimestrial strategic meetings open to all the users of the space, called "cocos", trimestrial "Life Councils" to decide major issues concerning the cohabitation and then thematised meetings of different frequencies.

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11 Nicolini, M. (2019). Les tiers-lieux, des écosystèmes territoriaux de mise en liens : le rôle des tiers-lieux dans le renouvellement des modes de faire de la production urbaine, l'exemple de Coco Velten. [Master's thesis, Université Aix-Marseille]. Sciences de l'Homme et Société. 2019. Du-mas-02389807.

12 O. Vilbert, personal communication, 29 October, 2020.

13 O. Vilbert, personal communication, 29 October, 2020.

14 O. Vilbert, personal communication, 29 October, 2020.

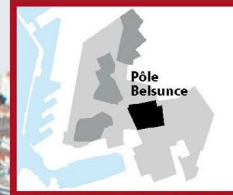


Figure 3. View of the PNRU Centre Nord, pole Belsunce-Velten-Korsec. Retrieved from Marseille Rénovation Urbaine, by MRU, 2020, <http://www.marseille-renovation-urbaine.fr/centre-nord/le-nouveau-visage-de-centre-nord-228.html>



Figure 4. Entrance of Coco Velten. Personal Field Visit (2020)

# LE PÔLE BELSUNCE-VELTEN-KORSEK SE TRANSFORME



A PROXIMITÉ DE LA PORTE D'AIX ET DE LA ZONE D'AMÉNAGEMENT CONCERTÉE SAINT-CHARLES PILOTÉE PAR EUROMÉDITERRANÉE, CE SECTEUR NÉCESSITE UNE INTERVENTION SUR DES ÉQUIPEMENTS PUBLICS ET SUR LE LOGEMENT, EN DIVERSIFIANT L'OFFRE AVEC DE L'ACCESSION AIDÉE À LA PROPRIÉTÉ.



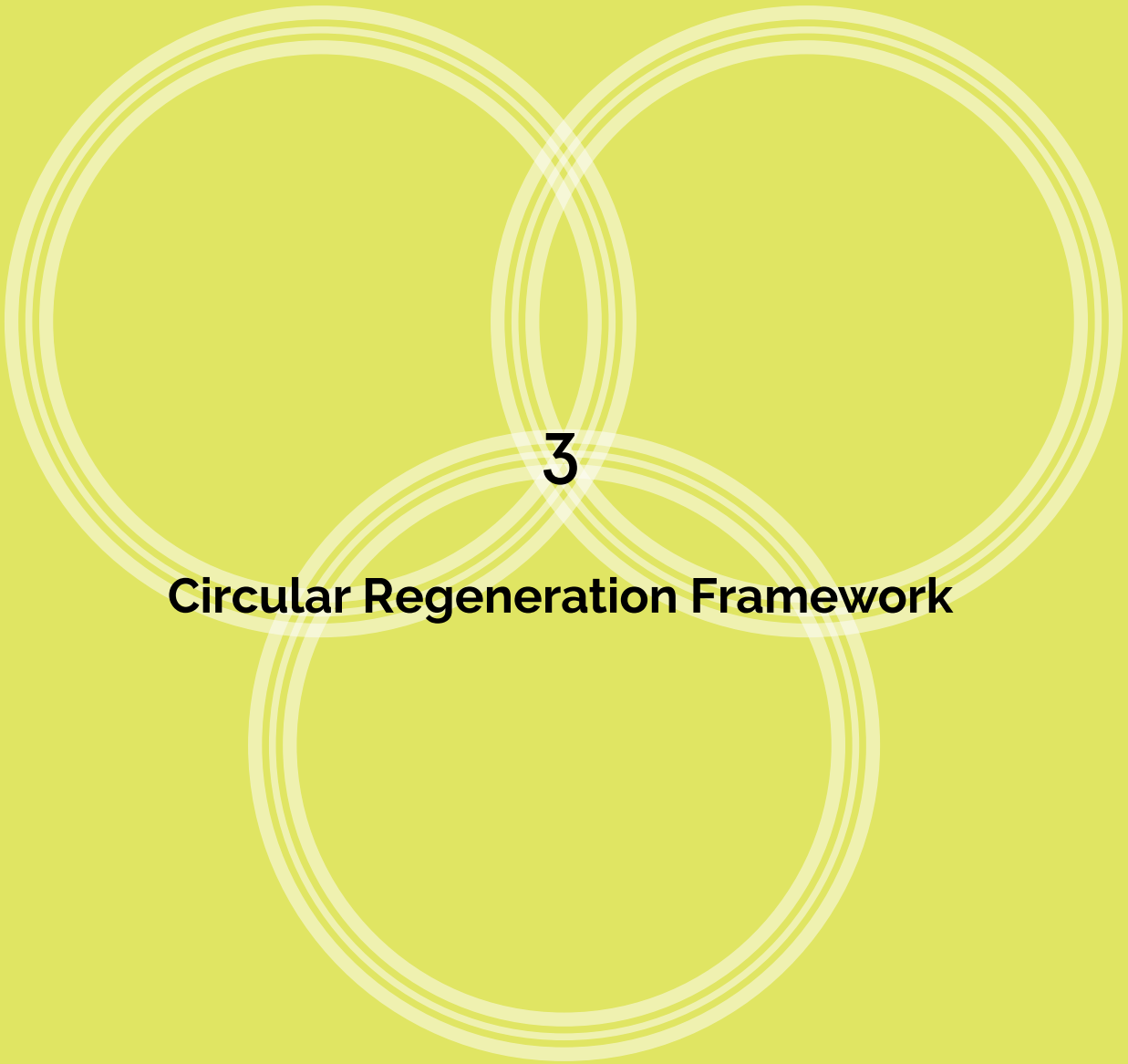
## 2.4 Comparative analysis: three approaches to transition in urban renovation

The table summarizes the description of the projects in the previous paragraph and compares the projects along the following criteria: (i) originality, (ii) outcome, (iii) approach to circular economy, urban renovation and fragility, (iv) path in a multilevel transition perspective, (v) take-aways.

Comparative Analysis	Métabolisme urbain	Ensemble à Boulogne-sur-Mer	Coco Velten
<b>Study methodology</b>	Official documents Article by Agnès Bastin (2019) Thesis by Adrien Colle (2018)	Interview with Sophie Ricard (architect of the project) Document from agency Construire (2013)	Interview with Océane Vilbert from Plateau Urbain Site visit Official documents Thesis by Marie Nicolini (2019)
<b>Territory</b>	Plaine Commune agglomeration (Paris region)	Boulogne-sur-Mer	Marseille 1st district
<b>Actors</b>	Plaine Commune Bellastock (coordination & reuse experts) Other funds (CDC, ADEME)	City of Boulogne Habitat Littoral (social landlords) Construire (architecture)	City of Marseille French government (owners of building) Plateau Urbain, Yes We Camp, SOS Solidarités (project leadership)
<b>Goals &amp; principles</b>	Initiate a multi-actor transition to circular economy in renovation projects of Plaine Commune	Renovate a neighbourhood of Boulogne-sur-Mer without demolition	Temporary use of state-owned office building for cultural and social purposes
<b>Originality</b>	System thinking of circularity in renovation processes	Architect permanence on field to design a participative renovation project in a very fragile context	Temporary urbanism to reuse built-up for services to the neighbourhood and fragile populations
<b>Outcome</b>	Construction of a common vision and first steps of a territorial and industrial ecology	Renovation at low cost with inhabitants participation & professional insertion without demolition	Creation of synergy between local actors, experimentation of services for the neighbourhood and for deprived populations, regeneration of city block

## Chapter 2. Learning from other practices

<p><b>Approach to circular economy/Urban renovation/fragility</b></p>	<p>Circular economy as a model of territorial and industrial ecology for urban renovation</p>	<p>Perma-circularity: rehabilitation of built-up environment rather than demolition/reconstruction; renovation project as a tool for professional insertion and living-together</p>	<p>Transitory urbanism as a way to use vacant space and experiment new synergies between actors &amp; activities; experiment of land uses for a neighbourhood in renovation</p>
<p><b>Multilevel transition perspective path</b></p>	<p>Socio-technical regime (Plaine Commune) realigns with landscape pressure (lack of materials for renovation projects)</p>	<p>Niches of innovation (architects) see window of opportunity when the socio-technical regime (the city) feels landscape pressure (fragility of the neighbourhood) that impedes classical intervention of demolition/reconstruction</p>	<p>Socio-technical regime (City and State) opens a window of opportunity to niches of innovations (Plateau Urbain, YWC, SOS) because a resource is underused (low cost of experimentation).</p>
<p><b>Take-aways</b></p>	<p>System thinking: to start a territorial-scale transition, the first step is to build shared vision with the actors. Experts of circularity can coordinate pilot projects at a system level.</p>	<p>Building rehabilitation has a very high added human value; participative diagnosis of housing situation allows to reduce the costs and the resources consumption while creating a high social value (professional insertion &amp; togetherness).</p>	<p>Temporary urbanism can activate the local tissue of actors and federate inhabitants around a project; Experts of temporary urbanism can pilot the project for local actors.</p>



**Circular Regeneration Framework**



### 3.1 Limits to the linearity of urban renovation practices

As the case studies show circularity is an open-concept. There are many ways to interpret what circularity means or can be. While some may interpret circularity as the reuse of materials, others might find it in the reactivation of underused spaces. The thesis aims to create a framework that opens-up possibilities by valorizing the existing local resources.

In the current renovation practices of Marseille, more specifically in the NPNRU and former PNRU, we find a framework mainly based on the demolition of degraded buildings, the rehabilitation of some others, and the construction of new housing and public facilities. According to the latest report released by Marseille Rénovation Urbaine, by the end of 2019 during the PNRU, they had demolished nearly 2.700 dwellings, rehabilitated more than 5.700 dwellings, and built more than 3.300 new ones.<sup>1</sup> When analyzing the further advancements made by the NPNRU for each project individually in the northern districts of Marseille - according to the available information on the project sheets and the webpage of MRU<sup>2</sup>- the total number of demolished dwellings has been 3.534, with 1.043 still to be demolished, 3.357 rehabilitated dwellings, with 120 still to be rehabilitated and 3.266 new dwellings built inside and outside the renovation sites. The total building stock before the renovation programs began accounted for almost 13.000 dwellings. This means 35% has been or will be demolished, more than 25% has been rehabilitated and 25% is equivalent to new construction.<sup>3</sup>

Although these practices may help achieve the established goals of the program, such as improving the housing conditions to increase the comfort of the inhabitants and the attractiveness of the neighborhoods as well as diversifying the residential offer, there are some lost windows of opportunity that could truly enable a sustainable transition.

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1 Marseille Rénovation Urbaine. (2019, December 19). Les Quartiers de Marseille en Renouvellement Urbain (Rep.). Retrieved July 29, 2020, from Marseille Rénovation Urbaine website: <http://www.marseille-renovation-urbaine.fr/toutes-les-actualites/actualite-23/les-quartiers-de-marseille-en-renouvellement-urbain-472.html?cHash=5269b780cef8a73aeb72a0e8886be409>

2 Marseille Rénovation Urbaine. (2018, October 24). Localisation des projets. Retrieved November 13, 2020, from <http://www.marseille-renovation-urbaine.fr/17-quartiers-17-grands-projets/localisation-des-projets-262.html>

3 Find calculations at the end of the chapter.

### 3.1 Limits to the linearity of urban renovation practices

To begin with, there is a significant loss of resources during the demolition process. There is no clear strategy stated in the renovation reports seeking to valorize these resources. In France in 2016, 69% of all waste generated came from the building and public works sector (BTP)<sup>4</sup>, meaning 3400 kg of waste per inhabitant. In the case of Bouches-du-Rhône, the department where Marseille is located, in 2010 only demolition works accounted for 69% of all waste produced by the building sector, producing 848.405 tonnes of waste.<sup>5</sup> When trying to calculate how much demolition waste the current PNRU & NPNRU have produced in the projects located in the northern districts of Marseille, assuming a material intensity of 1844kg/sqm<sup>6</sup>, approximately 454.000 tons of materials have been lost in the process.<sup>7</sup> If the total population of the northern districts in 2016 was 246.763, the demolition activities account for 1.8 tons of waste per inhabitant.

Secondly, the rehabilitation and construction processes demand a considerable number of resources. The demolished buildings could have been considered as a source of resources by implementing instead a selective deconstruction process. In general, the building stock of the renovation projects dates back from after WWII when the prefabrication of concrete elements started to be systematically implemented in France as an answer to the housing crisis of the time.<sup>8</sup> These modular concrete elements could have been stocked and reused in the rehabilitation or new construction of dwellings, such could be the case too of doors, windows, and other elements that may only have needed some repairing.

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4 ADEME (Ed.). (2020, April). Déchets Chiffres-clés. L'essentiel 2019 (Rep.). Retrieved September 18, 2020, from <https://www.ademe.fr/dechets-chiffres-cles>

5 Conseil Régional PACA. (2016, July). Plan de Prévention et de Gestion des Déchets issus des chantiers du Bâtiment et des Travaux Publics des Bouches-du-Rhône (Rep.). Retrieved October 26, 2020, from [http://www.paca.developpement-durable.gouv.fr/IMG/pdf/plan\\_dechets\\_rapport\\_environmental\\_annexes\\_0716.pdf](http://www.paca.developpement-durable.gouv.fr/IMG/pdf/plan_dechets_rapport_environmental_annexes_0716.pdf)

6 Turan, I., Fernández, J. E., Reinhart, C., Ferrão, P., & Olivetti, E. (2017). From Sink to Stock: The Potential for Recycling Materials from the Existing Built Environment. Conference PLEA 2017, 2-3. Retrieved September 25, 2020, from [https://www.researchgate.net/publication/312375340\\_From\\_Sink\\_to\\_Stock\\_The\\_Potential\\_for\\_Recycling\\_Materials\\_from\\_the\\_Existing\\_Built\\_Environment](https://www.researchgate.net/publication/312375340_From_Sink_to_Stock_The_Potential_for_Recycling_Materials_from_the_Existing_Built_Environment)

7 Find calculations at the end of the chapter.

8 Legoullon, G. (2016). La construction des grands ensembles en France : émergence de nouvelles vulnérabilités environnementales. *Vertigo*, 16(3). doi:10.4000/vertigo.17984

→  
Figure 1. Demolition of a social housing complex in La Savine. Retrieved from Travaux Publics & Batiments du Midi, by Monge O., 2020, <https://www.tpbm-presse.com/marseille-grands-travaux-pour-la-petite-savine-3686.html>

## Chapter 3. Circular Regeneration Framework

More in general, it is a lost opportunity to develop a reuse and recycling industry that could provide much-needed jobs to the area, generate new value as well as reactivate abandoned and underused spaces. Besides, the environmental impact that the renovation projects have right now, could be transformed from a negative to a positive one. Significant material and energy savings could be achieved, reducing CO2 emissions and extending the life of buildings and their elements.

Furthermore, a limit inherent to the renovation approach is that it limits itself to the current physical condition of the built environment, once considered renewed the work is finished. But what about the way people use the built environment, the things that it enables the inhabitants to do and what it inhibits. Reducing our view of the built environment as a static result reduces the amount of possibilities to regenerate and transform it according to our needs and aspirations. The following circular vision of the built environment tries to grasp the dynamic processes taking place and highlights the potential actions and connections to achieve a circular regeneration system.

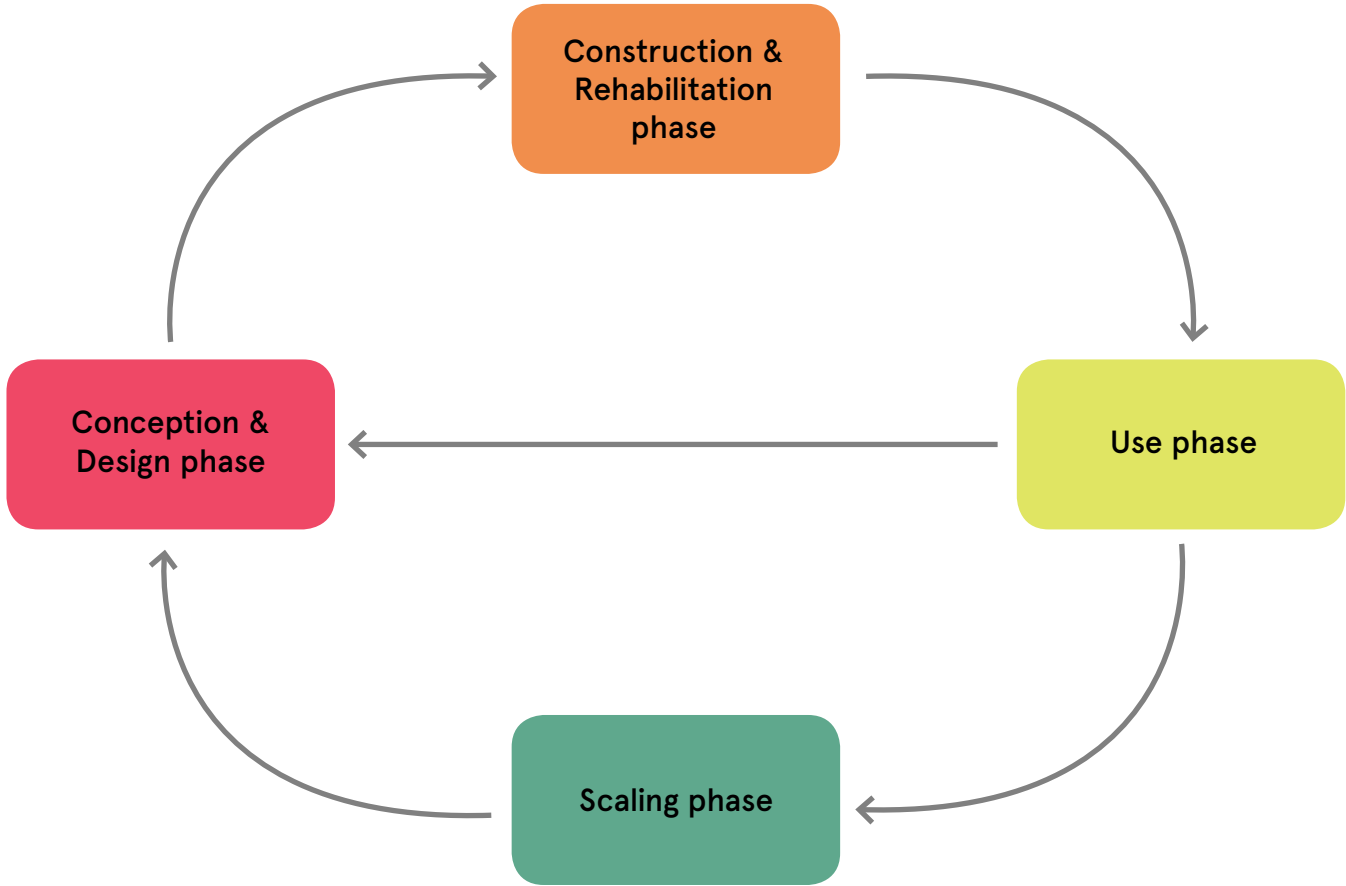


### 3.2 A circular vision of the built environment

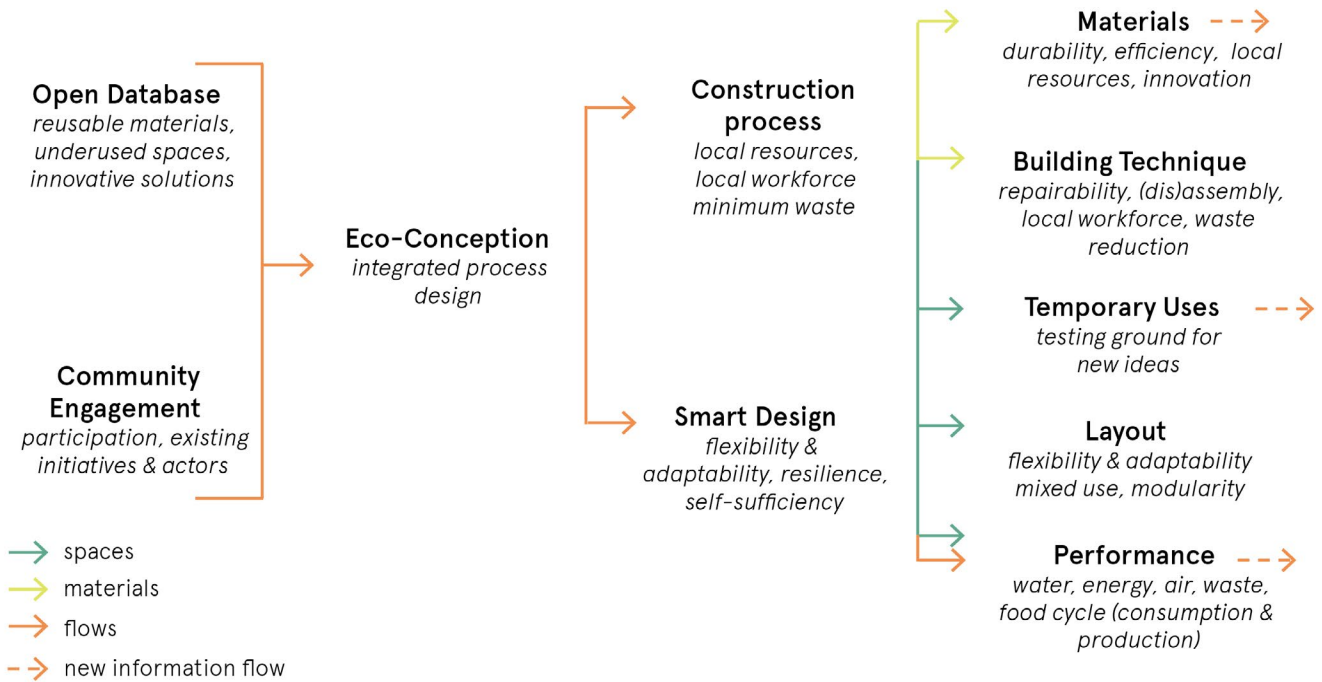
Just as nature works in cycles, the vision is based on what we call the cycle of the built environment. The cycle is defined by four main phases. The first phase, named as conception and design phase, refers to the start of the process, the ideas, inputs, and principles that will give shape or transform the built realm. Consider that this phase is key to the rest of the process as it may help facilitate or hinder the next phases. The second phase called construction and rehabilitation phase concerns the materialization of the conception and design phase. It sets out the processes that this materialization entails and how to valorize the existing resources found on-site. The following phase termed shortly use phase is about the actual practices that will be able to take place in the built environment. In here not only the spatial realm is of great importance, but also the temporal realm, some practices may consolidate, others may change overtime while others may regenerate spaces and allow new interpretations. Lastly, the scaling phase, refers rather to the built environment as a whole, in other words the ecosystem. The processes this phase envisions refer more to the relations between the parts, how they relate and feed each other as well as how to improve and expand the system. When new transformations are needed in order to improve the system the cycle can be restarted.

→  
Figure 3. Conception and Design phase

↓  
Figure 2. Built Environment Cycle



## ● Conception and Design phase



What inputs do we need to start conceiving how the regeneration of the built environment will take place? First of all we need information, defining the type of information we need is crucial to guarantee the next phases will work. There are two types of input that are key to start the process. The first input is an open database that needs to be developed where information on spaces, materials and best practices can be found. This may take time to build-up, but a participative approach could allow to speed-up the process. Firstly, we need to know the location, size, ownership and condition of underused, misused and vacant spaces. These spaces will be essential elements to activate the following phases. Secondly, the buildings that need to be regenerated should be regarded as material banks. Evaluating their material composition and examining the reusability of their materials will allow us to actually valorize them in the next stages. There may also be other materials available in the area that can be reused in the regeneration process, such as industrial waste or building material from other construction sites. Thirdly, knowing what has been done in other places concerning circularity can be of great help in order to visualize what the possibilities can be and learn from their experience. The second input is what we call community engagement. Firstly, we need to understand what the needs and aspirations of the inhabitants are, what they actually expect from the regeneration process. Valorizing their expertise and knowledge of the area will also increase their willingness to participate in the regeneration process. Secondly, we need to know if there are local seeds of innovation, existing circular initiatives that could help activate the process and share their experience. Thirdly, we need to understand how the inhabitants are organized, if they have associations and assemblies to manage their neighborhood or if

## 3.2 A circular vision of the built environment

there is already a mediator between the inhabitants and the planning institutions. They may become key local actors to engage and manage the community throughout the whole regeneration process.

The information acquired from both processes will enable the eco-conception stage to start. It is about integrating both the design and construction process in a circular framework. Smart design refers to the principles that will facilitate the circular regeneration process. Flexibility and adaptability are key to guarantee spaces can conform to new lifestyles and functions as well as to extend their durability, especially when talking about buildings. Resilience to cope with environmental and social challenges and be able to come out stronger and more innovative. Self-sufficiency in terms of performance, spaces that thrive by valorizing existing local resources, that avoid putting extra-weight on the environment, but actually help it regenerate. The construction process emphasizes the need to think of construction as a process and not as a result. Localness is an important principle for this part, as it seeks to not only valorize local materials but also to train and employ the local population. The second principle is to minimize waste in every stage of the process.

The following key aspects should be taken into consideration to achieve a smart design and a local and efficient construction process:

### Materiality

- Durability: allows to extend the life-cycle of a building or to guarantee the reusability of the building elements.
- Efficiency: prefer materials that don't demand huge amounts of energy to be produced nor to be installed.
- Local resources: give priority to materials that have been sourced locally, this can be from other construction sites or produced locally.
- Innovation: be open to use bio-based, reused and recycled materials.

### Building Technique

- Repairability: building elements that are easy to repair guarantee a better maintenance and longer life-cycle.
- (Dis)assembly: the way building components are joined can facilitate or impede the reuse of materials and elements.
- Local workforce: reskilling and employing the local population can help transmit the generated knowhow to others and facilitate the regeneration process.
- Waste reduction: avoid building techniques that generate a lot of waste, prefabricated systems and modular designs allow to ensure an efficient use of resources.

### Temporary Uses

Time is an important resource sometimes neglected in the renovation process. Some ideas may need to be tested first to see if they work or some activities may need to happen a few times a year in order to activate certain processes. Spaces that are open to experimentation and innovation, that do not have a defined function, are key spaces in the circular regeneration process.

### Layout

- Flexibility: a space should be able to change its function throughout time, in the short-term as well as in the long-term.
- Adaptability: users should be able to adapt spaces to their needs, examples of self-renovation could be interesting to integrate in this approach.
- Modularity: modular systems not only allow to adapt more easily a structure to other needs, they also make a more efficient use of material resources.
- Mixed Use: allowing more uses promotes diversity and opens-up possibilities to what can happen.

### Performance

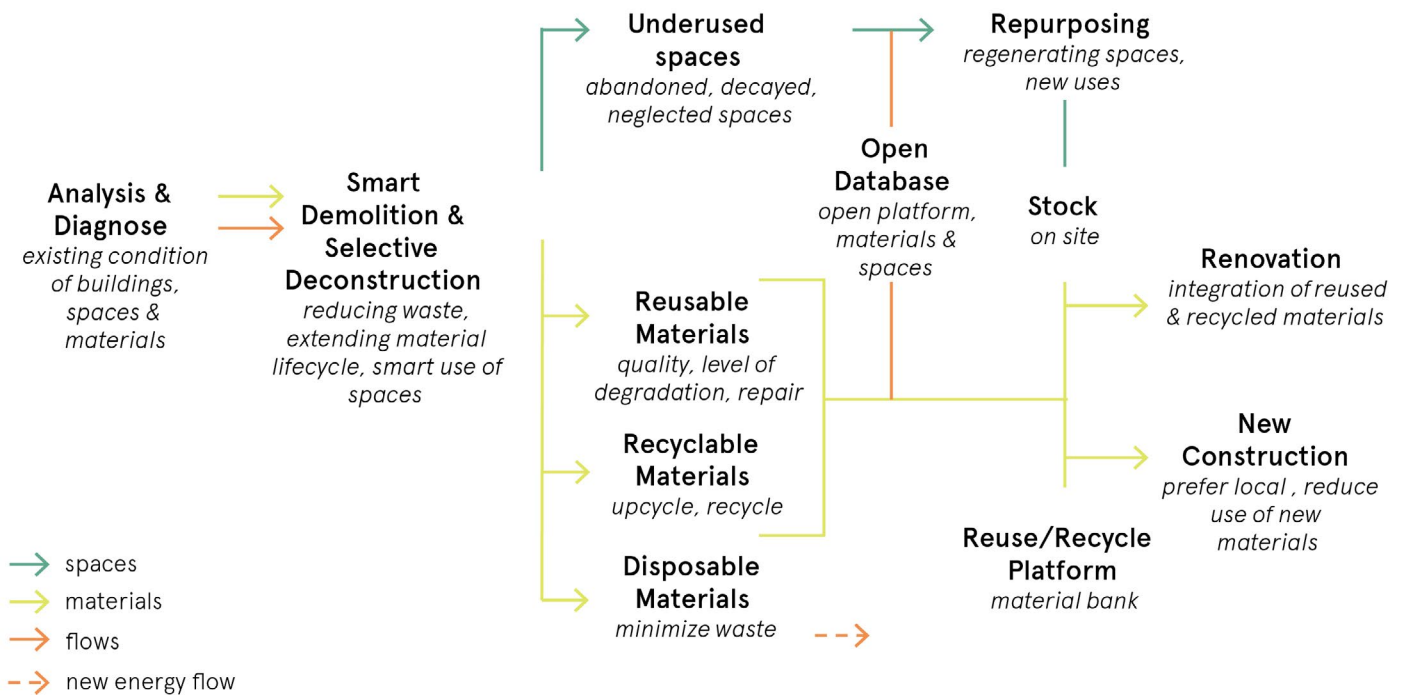
- Water: recovering and reusing water diminishes the pressure on our current hydraulic system, as well as promotes increasing the permeability of our soils helping to regenerate them.
- Energy: reducing the energy consumption of buildings by retrofitting them as well as improving or sharing our household appliances, while at the same time developing systems of renewable energy production that can create new value for the community.
- Air: improving the current ventilation systems in housing and public facilities while at the same time promoting the regeneration of soils and greenery to improve our air quality.
- Waste: reducing household and building waste is the most crucial step. After, a community-managed sorting system facilitates recycling and reuse, while at the same time making it possible to repair and remanufacture certain items.
- Food: a big part of household waste is food, in France for 2017 it meant 83kg per inhabitant per year and 33% of all household waste.<sup>9</sup> Compost is a valuable resource that can be used to regenerate soils or be transformed to biofuel. Urban farms or collective gardens may also be an attractive solution to promote local products and strengthen social ties.

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<sup>9</sup> ADEME (Ed.). (2020, April). Déchets Chiffres-clés. L'essentiel 2019 (Rep.). Retrieved September 18, 2020, from <https://www.ademe.fr/dechets-chiffres-cles>

### 3.2 A circular vision of the built environment

#### ● Construction and Rehabilitation phase



Processes related to one phase may overlap with the next phase, such is the case of the first stage of the construction & rehabilitation phase. The analysis & diagnose stage feeds from the open database of the conception & design phase. Here we already start classifying the spaces and materials according to their state to analyse how they can be employed during the construction and rehabilitation process. Once we know the state of the buildings we pass to the smart demolition & selective deconstruction stage. We have to keep in mind the goal is to recover as much material as possible to avoid waste and extend the materials' life-cycle. According to the Circular Amsterdam report, "by dismantling existing buildings in more efficient ways and by separating their waste streams, materials and components of old buildings can be better reused" (Bastein et al., 2016).

It is important to identify in this process the different material streams that will result from the deconstruction and demolition. Firstly, we have the reusable materials, we need to know their quality and level of degradation to figure out how they can be reused and if there is the need to repair or clean them before. Secondly, we find the recyclable materials, these are elements that need to go through a more intensive process in order to be reincorporated into the construction chain, such could be the case of glass from windows that can be melted and recycled or wood chips that are by-products of different production sites upcycled as OSB panels.<sup>10</sup> This

10 Lendager, A. (2018, October). Upcycle House: Increasing Building Performance. Retrieved November 1, 2020, from <https://urbannext.net/>

Figure 4. Construction and rehabilitation phase

Figure 5. Use phase

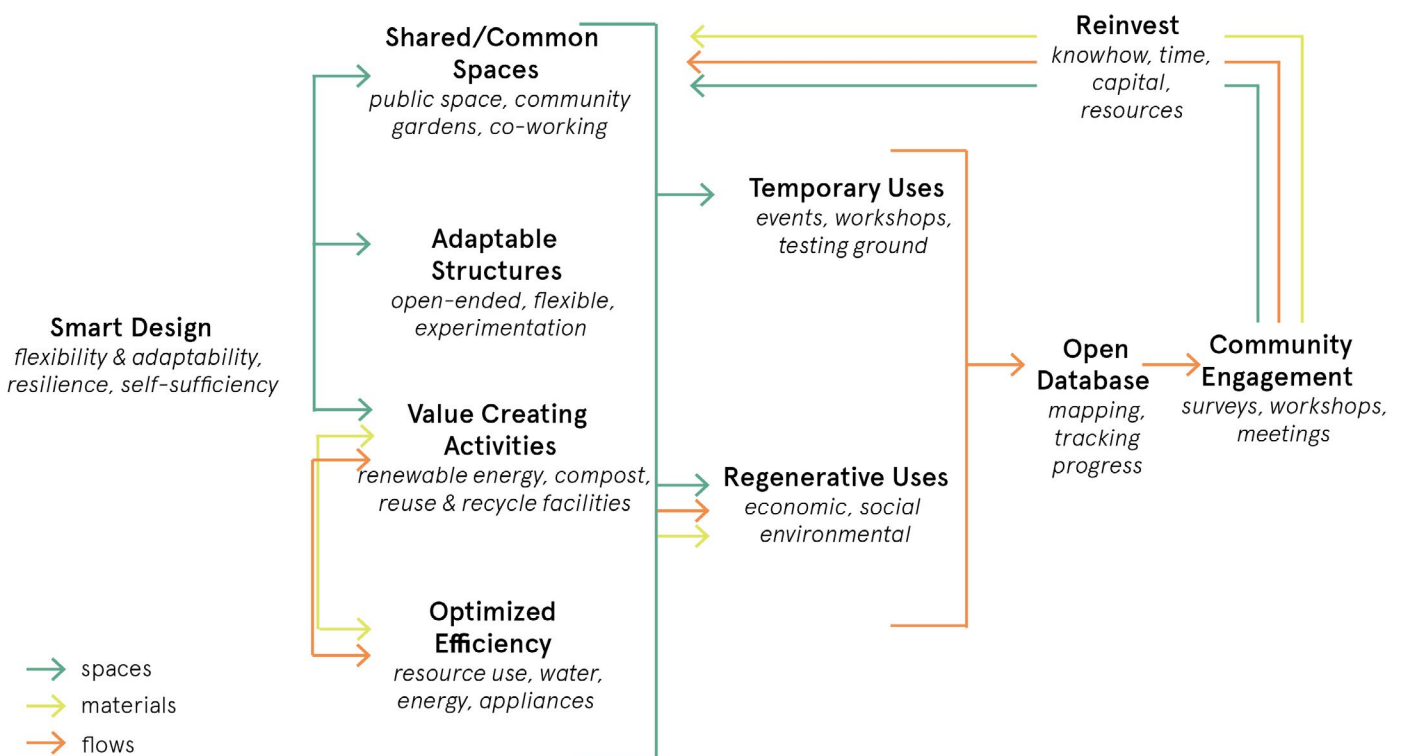


## Chapter 3. Circular Regeneration Framework

process requires a greater amount of energy so is less preferable than reusing but there is still plenty of room for innovation and experimentation. The last stream are the disposable materials, they may be so degraded or damaging for the environment and people's health that it is better to take them out of the construction chain. Such is the case for example of asbestos that was often used in the 20th century until it was finally banned in France in 1997.<sup>11</sup> The recovered materials will need to be stored, sorted and repaired.

Here is where the information on underused spaces can be employed in order to figure out which of these spaces could be repurposed as a temporary stocking place near the renovation site or to actually become a reuse or recycle platform. Both types of material banks would have to keep a material inventory published in the open database that will enable renovation and new construction projects to integrate these materials. This will help reduce the use of new materials and therefore save natural resources needed to produce them as well as reinforcing the development of a local reuse & recycling industry.

### ● Use phase



upcycle-house/  
 11 ANSES. (2016, August). Asbestos: Presentation, health effects, exposure and regulatory framework. Retrieved November 13, 2020, from <https://www.anses.fr/en/content/asbestos>

## 3.2 A circular vision of the built environment

This phase first input goes back to the smart design stage of the conception and design phase. Here we develop further what principles are important to facilitate regenerative circular uses and activities. In terms of spatiality, the emphasis is laid on the principle of shared and common spaces, they not only allow us to make a more efficient use of space, as for example places that are currently half of the day empty that could be utilized for other activities, but also as the Ellen MacArthur Foundation report (2015) mentions “such shared facilities could increase utility for households at an affordable cost and encourage a more community-based lifestyle”. When sharing costs and responsibilities, we can start implementing activities that would be impossible to realize by a household alone. We can find already interesting initiatives in the northern neighborhoods of Marseille such as community gardens -jardin partagés- and several fablabs. Another important spatial principle is the creation of adaptable structures, these are places that are not given a specific function but that can host a variety of activities, they are open-ended in this way as in the way they are built, we can imagine a modular flexible system that can be reduced or expanded according to the needs of the moment, they are places for different kinds of experimentation: materiality, building technique, layout, uses...

The third principle is what we call value creating activities, this value often comes from local resources that had not been valorized before. They can create a certain utility for the households, depending on the way their ownership is defined. Such can be the case of a renewable energy production system owned by the community, repair and reuse facilities run by the inhabitants or community compost-hubs. The fourth principle may overlap or enable this value creating activities, the optimized efficiency principle refers to the forms we can reduce our current material and energy consumption while improving our living standards. Think of the energy retrofitting of a building that lowers the heating requirements, extends the life of the building while increasing the interior thermal comfort and reducing the electricity and gas expenditures. Other examples might be sharing and using more energy efficient and water saving appliances, or installing a rain recovering system reducing our water consumption and utilizing a resource that otherwise goes to waste.

Some activities of the four principles may be temporary, they may happen in the form of events and workshops or as testing grounds for new ideas, we need to have the flexibility and openness to experiment and check which activities can thrive in the community and which may need to be changed. While other activities may be regenerative and bring about new economic, environmental and social value. As the economist Kate Raworth explains “an economy that is regenerative by design is one in which people become full participants in regenerating Earth’s life-giving cycles so that we thrive within planetary boundaries.”(Raworth, 2017) This means that



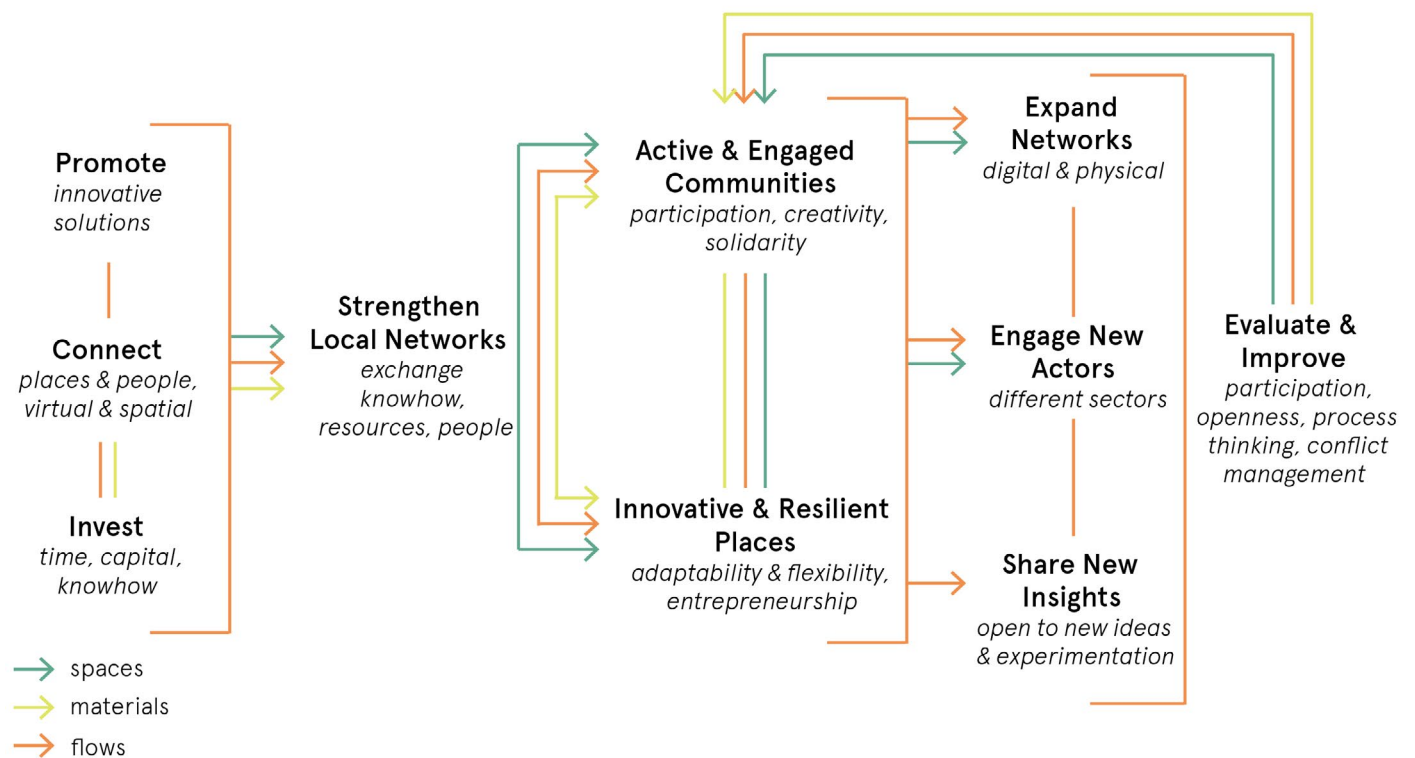
Figure 6. Scaling phase

## Chapter 3. Circular Regeneration Framework

these regenerative activities must be inclusive, help to build back nature’s life-cycles on which our society depends and transform our understanding of value, from value as profit to value as “embodied wealth”.<sup>12</sup>

Keeping an open database of all these activities will help us map and keep track of the advancements made while at the same time enable us to share this new information inside and outside the community. As mentioned before participation is crucial to achieve a regenerative system, we have to keep on engaging the community through events, meetings, workshops and surveys to share knowhow and best practices and seek ways to improve and manage conflicts. Through this, we will know how to reinvest time, material and financial resources as well as knowhow into on-going and new regenerative circular activities.

### ● Scaling phase



This phase seeks to consolidate and strengthen the previously mentioned practices as a circular regenerative system. The first steps to achieve this are rather on a local scale.

<sup>12</sup> Raworth, K. (2017). Get Savy with systems: From mechanical equilibrium to dynamic complexity. In Doughnut Economics, Seven Ways to Think Like a 21st-Century Economist (pp. 161-200). London, London: Random House Business Books 2017.

## 3.2 A circular vision of the built environment

To begin with, we need to promote innovative solutions, places that dare to experiment should be rewarded and if successful their experience should be shared and diffused. Secondly, we need to connect places and people, similar practices can share their knowhow as well as certain practices may benefit from the participation of new members. An important tool to achieve this is the open database that has been developed throughout the whole process. Thirdly, we need to invest in these practices, some may need funding to be able to realize their goals, others may need technical advice from experts, while others may need help to manage certain conflicts. These three steps will help strengthen local networks that will be able to exchange knowhow and resources through the connections between different people and actors.

The networks are made of two important components: active and engaged communities where participation, creativity and solidarity are fostered and innovative and resilient places which have the capacity to adapt to new challenges as they are flexible and open to experimentation. This creates an entrepreneurial environment where innovation is encouraged and rewarded.<sup>13</sup> Once the local network is strong we have different options for extending it. Firstly, we can start expanding the system through creating new digital and spatial connections between existing local networks, in other words expanding the networks. Another option is to open the network to new sectors or people, or what we call engaging new actors. They may be interested in providing their knowhow or adding their spaces to the network. Imagine there is an industrial-site near the regeneration project that could recycle certain construction materials that could be reused in the renovation works, or a school that could provide spaces and teachers for the training workshops. The more people implement a circular regenerative vision, the stronger the system becomes. The third option is to look out for best practices outside the network, what we have named sharing new insights. There may be possibilities we are not aware of as technology and research advances. Keeping the system open to new ideas and experimentation is therefore central for the regeneration of the system. Lastly, with every expansion of the network we need to keep on evaluating and improving our process in order to consolidate and achieve active and engaged communities as well as innovative and resilient places.

There are four key aspects we need to pursue while doing this: participation of the local inhabitants to democratize processes, openness to experimentation and innovation, process thinking to benefit both people and the environment and local strategies of conflict management to foment self-reliance and autonomy.

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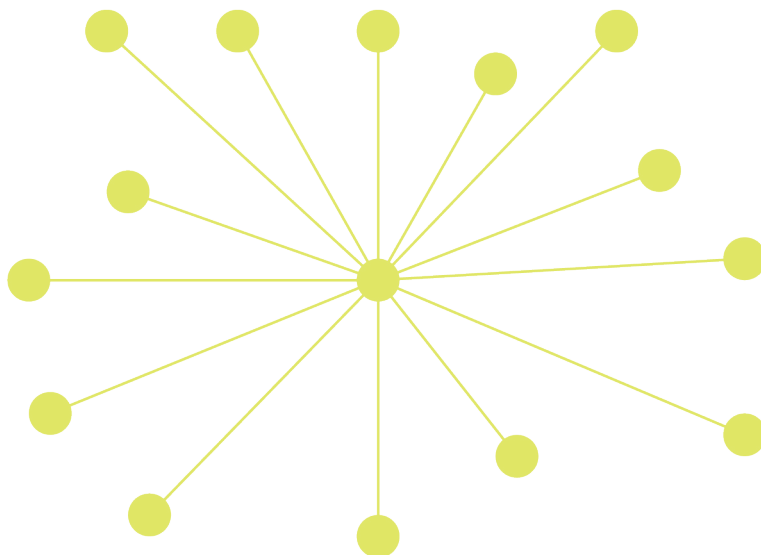
<sup>13</sup> Based on: Mazzucato, M. (2015). *The Entrepreneurial State, Debunking Public vs. Private Sector Myths* (2018 ed.). London, Great Britain: Anthem Press.

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Figure 7. Centralized system scheme

### 3.3 Spatializing the vision: organization of the system and scale of the nodes

The way we define how the system works in the territory will help us understand how to activate and develop the vision. First we need to establish how the system is going to be organized. There are three possible scenarios for this:

- A centralized system where all nodes relate to one: this would mean the central node dictates what type of actions each node would have to take to implement the system. This would be inefficient as innovation and knowledge creation could only happen in one node and then diffuse to the others and not all resources would be valued, only the ones the central node finds relevant. Power would be too concentrated in one node, being rather an exclusive system that does not foster participation nor engagement. Besides, the system would be fragile and unbalanced as diversity would be very low as everyone applies the same actions making it highly redundant.



- A polycentric system where not all the nodes are linked: a hierarchy would come out of this system, some key nodes would be responsible for developing and testing the system and then pass their knowledge to certain nodes. Although this system would allow more experimentation than the centralized system, still some nodes would somehow be isolated from the system as they could only communicate with one key node. The system would be resilient to some extent as there would be a higher degree of diversity and a more balanced redundancy. Notwithstanding, it would be inefficient as not all potential resources would be utilized and there would be power imbalances between the key nodes and the rest.

### 3.3 Spatializing the vision: organization of the system and scale of the nodes

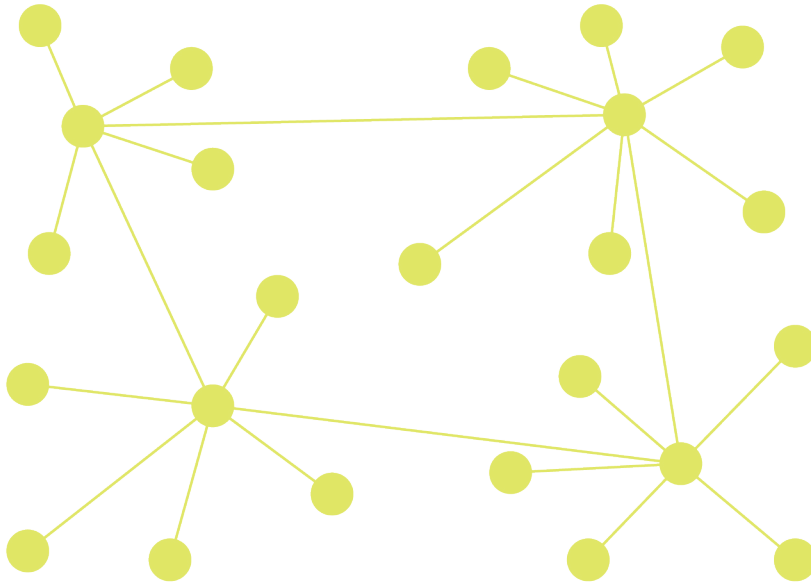


Figure 8. Polycentric system scheme

- A distributed system: here there would be no hierarchy between the nodes, each node would be responsible for understanding their local potential and their own transformation process. Even so, the nodes would be interconnected so they could easily share information and give feed-back to each other. Participation and engagement would be encouraged as each node would know its relevance and would benefit from being part of the system. Power imbalances would be avoided, while cooperation would be fostered. At the same time, the system would be resilient as it would allow diversity to thrive and as communication would be enabled there would also be redundancy as different nodes would test the same approach. Lastly, the system would be efficient in the way all local resources could be mobilized in order to find the best local approach.

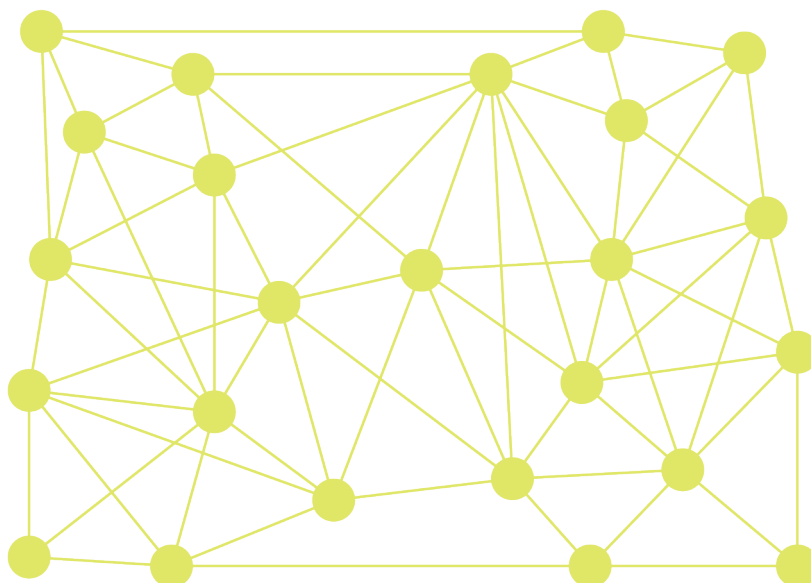


Figure 8. Distributed system scheme

When going back to our research question: *'How can we embed and nurture a circular economic model into the Quartiers Nord in order to transition to a resilient, inclusive, and participative future?'* The best organization alternative seems to be the third scenario: a distributed system. Firstly, we could embed more punctually the model into the territory as each node would have the autonomy to define the way it would valorize its local resources according to their expectations and possibilities. Secondly, as the organization mode promotes participation and cooperation the nurturing would come from within the node as well as from the interconnectedness of the system. Moreover, the local resources of each node would nurture the node and each node would be essential to nurture the system, this makes it an inclusive system, where the processes and actions of each node would be valorized. A similar effect would happen in terms of resilience, as the resilience of each node is fostered through the regenerative activities and processes set in place, the overall resilience of the system is increased. This is further strengthened thanks to the interconnectedness of the system, fragilities in one node can be worked out by the whole system as information, resources and knowhow can be easily transmitted from one node to the other.

The next step after defining how the system will be organized is to determine what the spatial materialization of the node will be. For this we can also imagine different scenarios based on the spatial organization of Marseille:

- The housing complex (HLM): there are a myriad of housing complexes in Marseille. In the northern districts alone in 2013 we could already find 101.447 dwellings of which 3.9168 were social and a total of 588 social housing complexes of very different sizes and typologies.<sup>14</sup> Choosing the housing complex as the node of the system would give us a very large and complex system, organizing it, following it up and evaluating its progress would demand a lot of time. Each node would also be very limited to its possibilities, not all housing complexes account with the needed spatial resources to start the process nor with the social organization or interest needed for it. This would cause the system to develop a hierarchical structure as only certain housing complexes would be able to develop the process and some others would be left behind.
- The district (arrondissement): Marseille is organized in 16 districts. When only looking at the northern districts (13th to 16th), we find already big differences between them, the population density varies as well as the socio-economic conditions. The nodes

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<sup>14</sup> Marseille Provence Métropole. (2015). Atlas du Parc Locatif Social Marseille (Rep.). Retrieved July 2, 2020, from [http://doc.agam.org/doc\\_num.php?explnum\\_id=4264](http://doc.agam.org/doc_num.php?explnum_id=4264)

### 3.3 Spatializing the vision: organization of the system and scale of the nodes

would therefore have very different characteristics and weights. For example, the node of the 13th district would represent 91.906 people while the one of the 16th district 16.392 people.<sup>15</sup> That means one node would be five times bigger than the other. This would create imbalances in the system as well as difficult certain key processes of the cycle. For instance, how do you organize the participation stage, who gets to participate and who does not. Moreover the scale is too big for a person to be aware of what happens in the whole district and have actual expectations on it. The node would need to exclude people in order to function as well as it might not be able to valorize all resources as a natural hierarchy would need to emerge in order to organize itself.

- The neighborhood (quartier): There are 111 neighbourhoods conforming Marseille, of which 33 are located in the northern districts.<sup>16</sup> These neighborhoods are characterized by the presence of a vast amount of social housing complexes usually in need of or under renovation works, large extents of underused and degraded open areas as well as an overall lack of public facilities and services. They function mainly as enclaves as the majority are quite disconnected from the city center due to a limited offer of public transport and a difficult topography. Moreover, the population density in these neighborhoods is quite high, on average we can find 2.943 dwellings and 7.545 inhabitants in each neighborhood, the lowest being 319 dwellings and 614 inhabitants in Les Riaux (16th district) and the highest in Saint Barthelemy (14th district) with 6.174 dwellings and 18.655 inhabitants as for 2012.<sup>17</sup> Many of these neighborhoods are inhabited by a fragile and vulnerable population in need of better living conditions and better life and work opportunities. This may be the reason why we can find different planning projects of the Metropole and the city already present in these areas working at this scale. Such is the case of the former PNRU and now NPNRU and the Projet de Territoire Marseille.

Although there are notable differences between the neighborhoods, this scale seems to have the potential to become the node of the system. To begin with, there exists already an institutional focus, analysis and organization at this scale that would facilitate the implementation of the program. Secondly, the physical conditions seem to offer an adequate amount of potential resources to valorize,

15 Insee. (2015). Données sociodémographiques par quartiers et arrondissements de Marseille (de 1982 à 2012). Retrieved March 4, 2020, from <https://www.insee.fr/fr/statistiques/2385003#consulter>.

16 Hocquet, M. (2016). Les 111 quartiers de Marseille - Croissance démographique à l'est, déclin au centre-ville. Retrieved October 30, 2020, from <https://www.insee.fr/fr/statistiques/2019743>.

17 Insee. (2015). Données sociodémographiques par quartiers et arrondissements de Marseille (de 1982 à 2012). Retrieved March 4, 2020, from <https://www.insee.fr/fr/statistiques/2385003#consulter>.

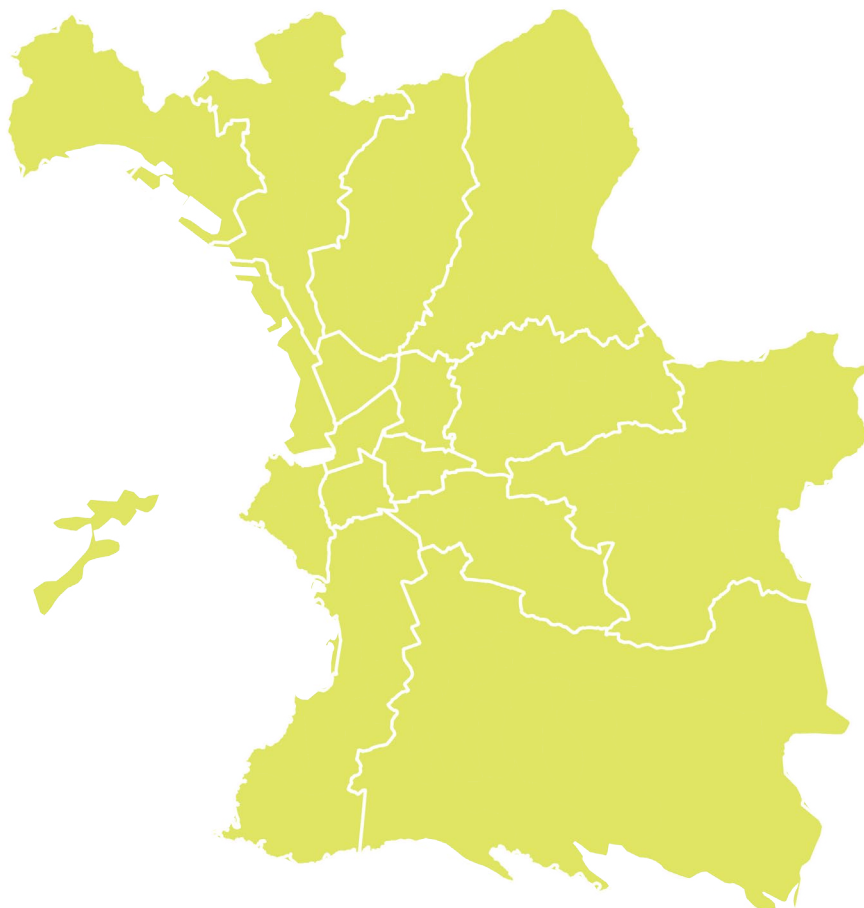
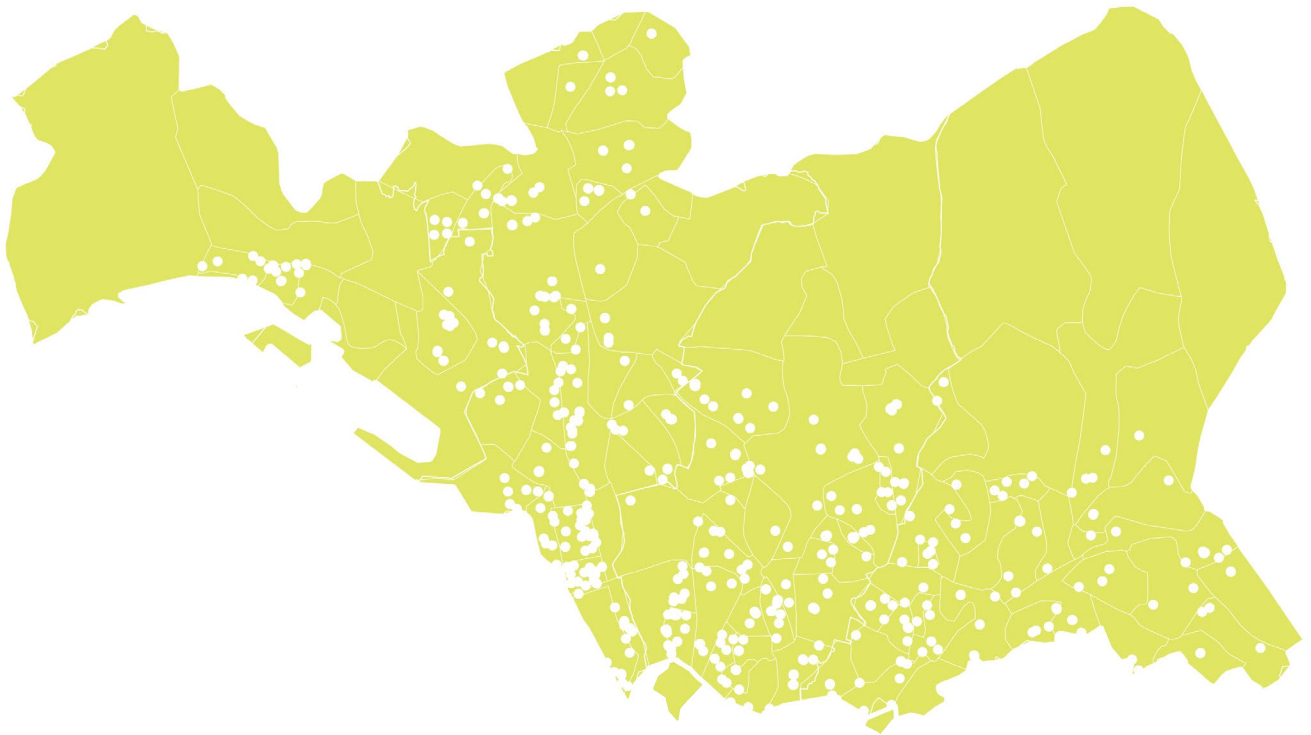


Figure 9. Social housing complexes in the Northern neighborhoods.



Figure 10. The 16 districts of Marseille





### 3.3 Spatializing the vision: organization of the system and scale of the nodes

a good combination between built heritage and open areas that are currently degraded or underused. Lastly, there seems to be a huge potential and need for inclusion and participation of the inhabitants. This is certainly a challenge due to the fragile and pervasive socio-economic conditions found in the neighborhoods. Nevertheless, the cycle has been envisioned in such a way that the skills, expertise and involvement of the inhabitants can be built-up and reinforced along the process.

The system in general would have a certain degree of complexity, as each neighborhood would account for one node, but there would be enough diversity to test different approaches and initiatives. The distributed organization of the system would also be guaranteed as the differences between the nodes are not too unbalanced and the development and interconnectedness of each node would help nurture the system.

#### *Circular Regeneration Labs*

After our scenario analysis, we can conclude that the best scale for the node is the neighborhood. The next task is to define the nature of the node. As we are aware of, the urban issues the vision wants to tackle are persistent and complex. They demand a different approach where collaboration and social learning and innovation are key aspects. This approach has been taking form in different European cities as what we call Urban Living Labs (ULL). "They are claimed to be a particular form of spatially embedded sites for learning, as well as for the co-creation of knowledge, products, technologies, and service innovations in local experiments. Experimenting in urban laboratories is seen as an instrument for urban and territorial innovation, being able to offer space for adaptive and multi-actor learning environments. Within this real-world context, new practices of self-organization and (infra-) structures can be tested. Moreover, ULLs are intended to promote the collaboration between a variety of actors and, with their experimental sites, are also considered to have value for long-term sustainability transitions."<sup>18</sup>

Based on the ULL approach, we propose interpreting the nodes as circular regeneration labs. In general, they follow the same principles as any ULL. These labs will happen at the neighborhood scale where a lot of emphasis will be laid on the relation between innovation and people's empowerment. The labs will encourage experimentation in both practices and governance in order to achieve this transition we envisioned to a more resilient, inclusive and participative future.

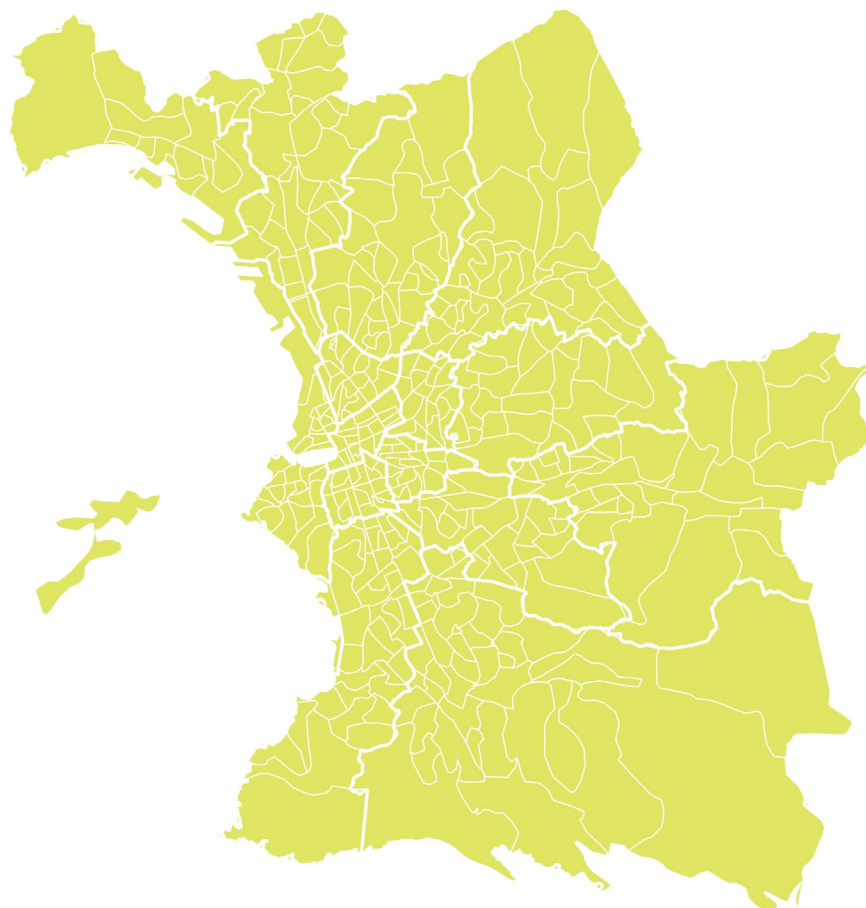
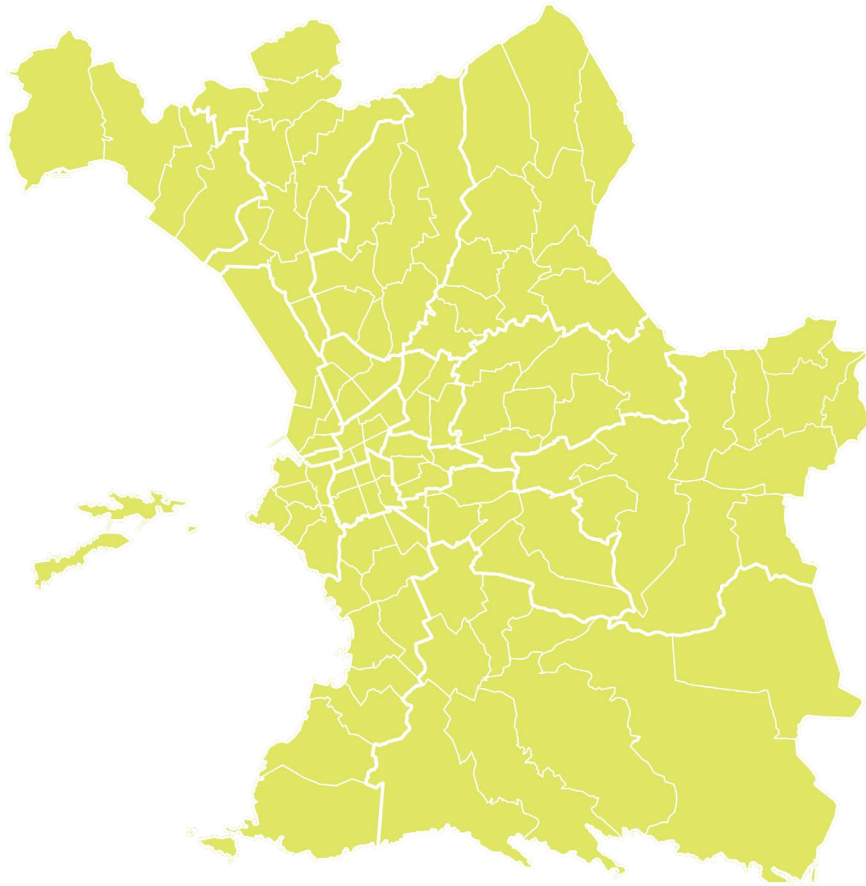
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18 Puerari, E., Koning, J. D., Wirth, T. V., Karré, P., Mulder, I., & Loorbach, D. (2018). Co-Creation Dynamics in Urban Living Labs. *Sustainability*, 10(6), 26 doi:10.3390/su10061893

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Figure 11. The 111 neighborhoods of Marseille.

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Figure 12. Marseille division in IRIS

## Chapter 3. Circular Regeneration Framework



### **3.4 Activation and Development Framework**

We have already pointed out the organization of the system as well as the scale and the nature of the node, but to answer fully to the research question on how to embed and nurture this circular regeneration model into the territory we have designed what we call an Activation and Development Framework. The framework is set out in six stages where the relationship and the role of both the node and the system are explained. The stages are defined by a key action that will be developed more in detail for both the system and the node in the following chapters. As for now we will present the main structure of the framework and the role the node and the system play in each stage:

## Chapter 3. Circular Regeneration Framework

Stage	Definition	Role of the System	Role of the Node	System - Node Relation
<b>1. Identify</b>	First analysis stage where we locate, classify and potentialize the places and resources where the process can take place.	Determining and analyzing the nodes.	Analyzing the valorization potential of local resources.	The system process defines where the node process can begin.
<b>2. Prepare</b>	Second analysis stage where communication and connections are settled for the first time. Information and knowledge exchange happen at different levels.	Defining possible development paths and connections between nodes.	Developing local capacity by involving, informing, engaging and empowering the local population	Simultaneous processes, both processes nurture each other.
<b>3. Activate</b>	Stage based on the linking of resources, time and people. Experimentation and co-development are key principles.	Facilitating and coordinating nodal processes.	Co-developing a synergetic local regeneration process that promotes and rewards experimentation and innovation.	The node activates the system
<b>4. Consolidate</b>	Reinforcing and compounding stage by developing a collaborative environment.	Compounding and sharing knowledge created from each node. Fostering new nodal connections.	Sharing knowledge and data to feed the system's processes.	The connections between the nodes are strengthened consolidating both the system and the node.
<b>5. Evaluate</b>	Assessment and analysis stage of impact and progress made in different scales.	Identifying system's fragilities to improve and strengths to potentialize.	Punctual and global assessment of node's impact, engagement and progress.	The nodal assessment feeds the system's assessment. Connections are assessed at the systemic scale.
<b>6. Improve</b>	Development of a regenerative and self-managing mechanism at systemic and nodal level.	Coordination and compiling of nodal strategies. Facilitating and advancing successful strategies.	Establishing a self-management and co-maintenance strategy based on local capacity.	Iterative long-term process happening at both levels.





# 4

## **Understanding and Preparing the System: Urban Regeneration Program**

## 4.1 Identify the nodes of a circular regeneration system

The first step of the circular regeneration framework is the identification across the territory of the nodes that can be activated at the system scale as laboratories for circular regeneration. Within the circular framework, the system is characterized by the spaces, materials, actors and people which can act and interact as resources or barriers in a transition perspective.

### 4.1.1 Urban renovation projects as circular regeneration nodes

Urban renovation projects are the nodes that can nurture a territorial system of circular regeneration. The thesis focuses on the (N)PNRU framework, but other types of renewal projects exist in Marseille, like the Euroméditerranée perimeter and the Programmed Operation for the Improvement of Housing (Opération Programmée d'Amélioration de l'Habitat, hereinafter OPAH). The projects promoted by ANRU are part of either the PNRU or the NPNRU. They can be classified according to the advancement of each stage identified within the circular regeneration framework: conception and design, construction and rehabilitation, use and scaling. Out of the 16 projects of the northern neighbourhoods, 5 are in conception and design phase and 6 are completing the construction and rehabilitation works.

### 4.1.2 Urban renovation projects: a territorial system of mines and recycling nodes

At the system level, the projects of urban renovation can be mines of demolition materials and places for material reuse. As shown in figure 3, the number of demolitions and constructions planned in a certain neighbourhood are not always equal. Moreover, all the projects include new constructions, but not all of them plan to demolish dwellings. Finally, the phasing of the projects means that in some places, the generation of demolition waste and the demand for material in construction works do not always coincide in time. Therefore, one neighbourhood cannot always be simultaneously the generator of materials – the mine – and the opportunity for reuse – the recycling node. Moreover, in the course of project implementation, a neighbourhood is alternately a producer of construction waste and a reuse point for new construction. For this reason, it is necessary to consider the territory as a dynamic system of mines and recycling nodes, of which figure 3 is a picture by the end of 2020.



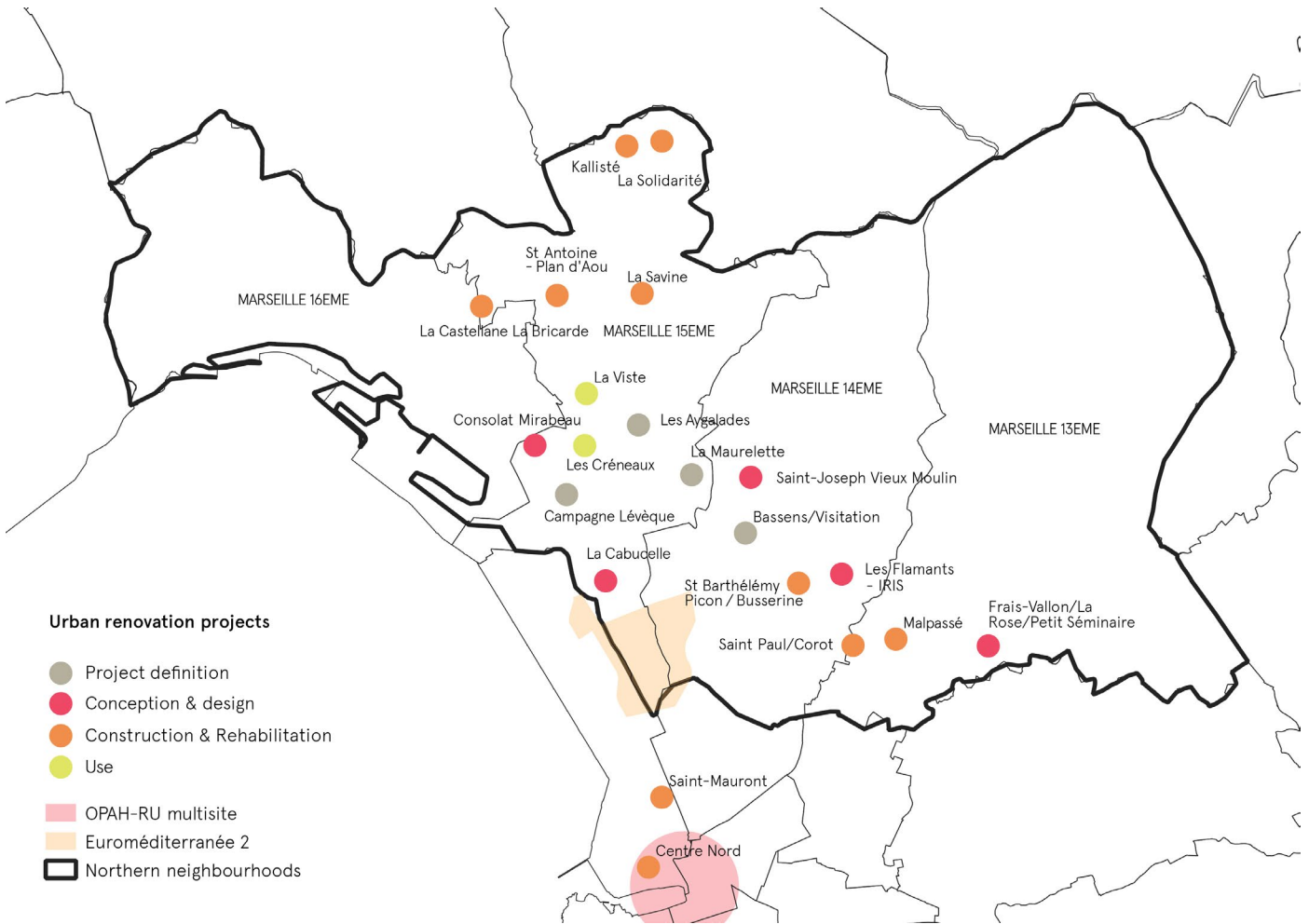
Figure 1. Urban renovation projects in Northern neighborhoods.



Figure 2. Advancement of NPNRU projects based on built environment phases



# Chapter 4. Understanding and Preparing the System



## NPNRU projects Built Environment phase

- Conception & Design
- Construction & Rehabilitation
- Use
- Scaling



## 4.1 Identify the nodes of a circular regeneration system

### 4.1.3 Key Actors: top-down urban renovation and bottom-up circular initiatives

#### *A complex governance for urban renovation*

The governance of urban renovation in Marseille is operated by actors that can be classified in four categories. Non-elected public bodies are publicly owned companies that provide expertise and funds to public policies. The ANRU designs, regulates and finances the national renovation programs. The Caisse des Dépôts et des Consignations (hereinafter CDC) is the French bank for territorial development. Therefore, it is a major actor funding housing policies, in particular social housing loans for social landlords. The National Agency for the Improvement of Housing (Agence nationale pour l'amélioration de l'habitat, hereinafter ANAH) is a public agency financing co-ownership renovations. At the metropolitan level, the Local Company of Equipment and Planning of the Metropolitan Area (Société Locale d'Équipement et d'Aménagement de l'aire Métropolitaine, hereinafter SOLEAM) is in charge of piloting and land control for renewal projects on the metropolitan territory. He is often an actor in (N)PNRU projects and sometimes a project owner on some parcels. The social landlords are usually either public or semi-public companies, but private entities abiding by the regulations of social rental can be social landlords and have access to public loans for social housing provision.<sup>1</sup>

The second category of actors consists of elected public entities. They refer to the administrative scales of territorial governance. The regional council (Conseil régional) of the PACA region mostly finances urban renovation programs within the scope of regional plans for energy rehabilitation and support to housing access for vulnerable populations. The region also plays an important role of mediation on territorial development issues. The departmental council (Conseil départemental) of the Bouches-du-Rhône has a similar role as the region, and it coordinates and finances the Departmental Action Plan for Housing of Deprived People (*Plan Départemental d'Action pour le Logement des Personnes Défavorisées*).<sup>2</sup> As has been explained, the

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1 Service Public FR. (2019). Logement conventionné Anah : Qu'apporte l'intermédiation locative sociale? Retrieved November 26, 2020, from <https://www.service-public.fr/particuliers/vosdroits/F34825>

2 Département Bouches-du-Rhône. (2020). Le plan local d'action pour le logement et l'hébergement des personnes défavorisées. Retrieved November 26, 2020, from <https://www.departement13.fr/nos-actions/logement/les-engagements/le-plan-local-daction-pour-le-logement-et-lhebergement-des-personnes-defavorisees/>

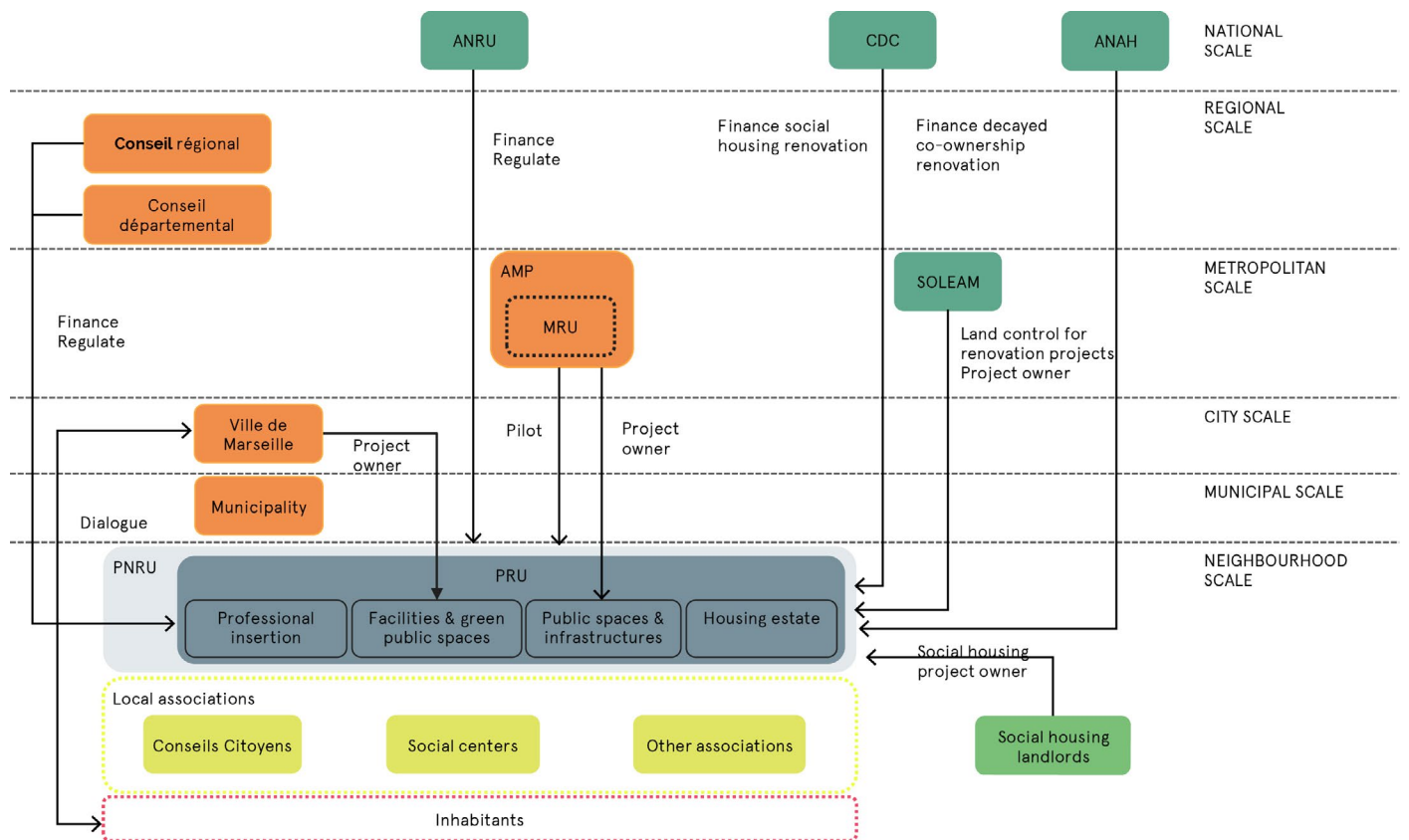
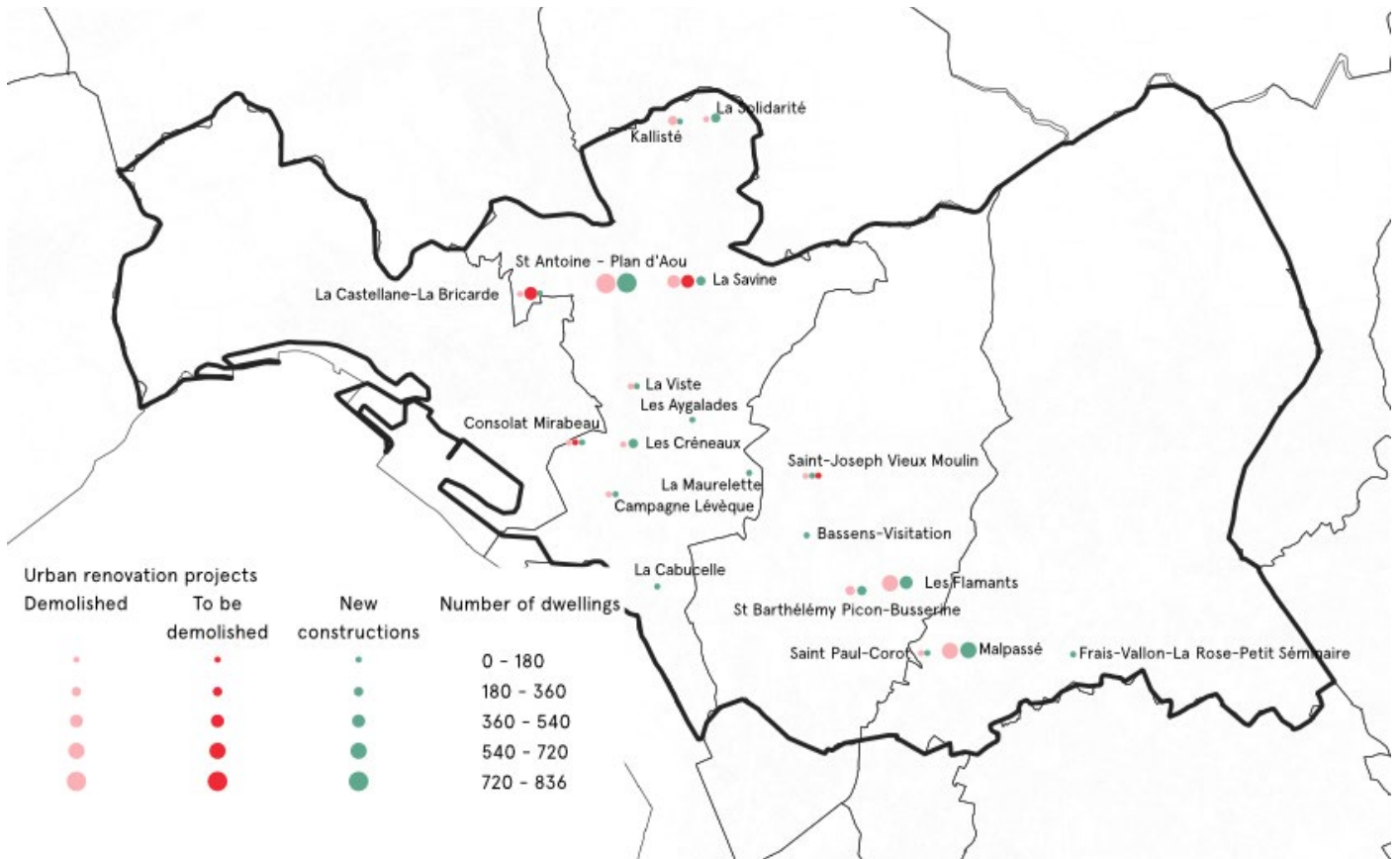


Figure 3. Demolition and new construction in NPNRU projects



Figure 4. Governance of NPNRU program

# Chapter 4. Understanding and Preparing the System



Legend



## 4.1 Identify the nodes of a circular regeneration system

metropole has gained a central role in urban renovation programs. Not only is it the project owner for the interventions on public spaces and infrastructures, it has also integrated in January 2020 the Mission Renouvellement Urbain (MRU), which corresponds to former Marseille Rénovation Urbaine, a group of public interest composed by the State, the regional council, the department council, the Metropole, the city of Marseille, the city of Septème-les-Vallons, the regional association of social housing landlords and the CDC. MRU pilots the projects of the (N)PNRU. The city of Marseille is the promoter of renovation projects and project owner as far as public green spaces and facilities are concerned. The municipalities involved have the role of dialogue with inhabitants and associations.

### *A constellation of circular initiatives*

The northern neighbourhoods are a territory of bottom-up initiatives that try to improve the living conditions of inhabitants with local resources and knowledge. This work identifies initiatives that aim at directing the reuse of material or spatial resources that exist locally and that else would have been underused. In the multilevel transition perspective, these are the niches of innovation that seek to scale up through opportunities created by the established institutional regime of urban renovation.

The spatial resources that are optimised are either industrial brownfields, that can be reused for a new purpose, housing spaces that find a new temporary purpose; for instance, the cooperative Hôtel du Nord connects dwellers with people who seek temporary housing in the northern neighbourhoods, as temporary workers or people who visit a relative in the Hôpital Nord, one of the main hospital compounds in the city.

The material resources used by these initiatives are either construction and demolition waste, which can be reuse in other works, or waste from households that is transformed in Fablabs or in "ressourceries", a term that designates places with tools and know-how to repair objects or use them to make new objects. They differ from Fablabs because of their explicit orientation toward reuse and repair.

In between the use of spatial and material resources, there exists a hybrid type of resource and reuse strategy which has an emphasis on the reintroduction of green elements in the city. Green-based initiatives, such as shared gardens or urban farming, are relevant



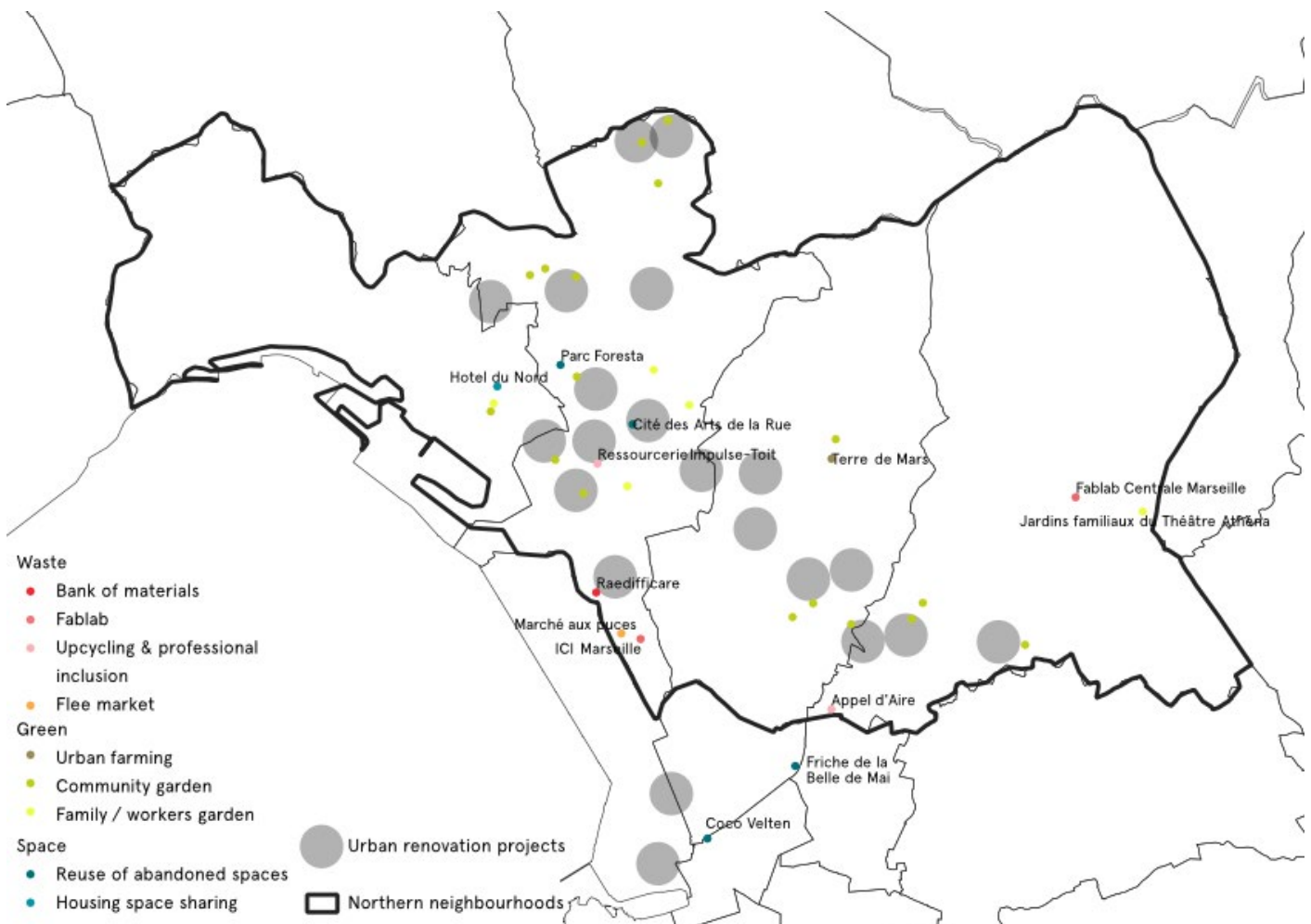
Figure 5. Types of circular initiatives present in the northern neighborhoods



Figure 6. Location and classification of circular initiatives

## Chapter 4. Understanding and Preparing the System

Type of Action	Stock & Sort	Repair & Reuse	Share	Market	Skill & Knowledge
Phase in cycle					
Conception & Design		<ul style="list-style-type: none"> <li>• Raedificare</li> <li>• Parc Foresta</li> </ul>	Parc Foresta		
Construction & Rehabilitation	Raedificare				
Use	Compost hubs	<ul style="list-style-type: none"> <li>• La Cité des arts de la rue</li> <li>• La Friche de la Belle de Mai</li> <li>• Ressourcerie</li> <li>• Fablabs</li> </ul>	<ul style="list-style-type: none"> <li>• Shared gardens</li> <li>• Hôtel du Nord</li> <li>• Fablabs</li> </ul>	Flea market	<ul style="list-style-type: none"> <li>• La Friche de la Belle de Mai</li> <li>• Recycling for professional inclusion</li> </ul>
Scaling	Lemon Tri	Raedificare	Hôtel du Nord	Urban farming	<ul style="list-style-type: none"> <li>• Zero Waste Marseille</li> <li>• Lemon Aid</li> </ul>



## 4.1 Identify the nodes of a circular regeneration system

to the circular framework because they improve the use of open collective spaces by giving them a purpose and enable collective activities such as gardening; in some cases, urban farming is also a regeneration strategy for abandoned places, such as the old bastide Mas des Gorguettes which was transformed into the farm Terre de Mars; gardens also regenerate the soils by preserving permeability as a necessary feature of urban spaces; finally, the initiatives are often combined with collective compost hubs to valorise organic waste from households.

### 4.1.4 The northern neighbourhoods: a mine for transition (SWOT analysis)

The northern neighbourhoods can be interpreted as potential mines where resources, which are spaces, materials, actors and also people exist but have to be valorised. In general certain conditions are shared throughout the northern districts. This analysis examines where are the main strengths and opportunities to activate the circular regeneration program, as well as the main weaknesses and threats. The outcomes derive from the socio-economic and spatial analysis of the districts and urban renewal projects specifically, as well as several interviews that were held with institutional actors.

#### *Strengths and Opportunities*

In spatial terms, the area is centrally located in the metropole, this means the program could not only have an impact on the city scale but also at the metropolitan scale. The elevated number of urban projects- 19 in total; 16 of national importance and three of regional relevance- shows the attention given to these districts beyond the metropolitan scale. This attention is in part due to their high fragility but also to their renewal potential and the impact they can have on the liveability of the metropolis. The urban renewal projects by themselves can provide the needed resources to regenerate the area and foster the development of a reuse and recycling sector that could have an impact at the metropolitan scale.

Moreover, the proximity to natural areas provides incentives to regenerate neglected or underused green areas and connect them to these natural parks. This is further reinforced by the Metropolitan Climate plan where a lot of emphasis is laid on climate adaptation through the regeneration of natural areas. These green areas can be spaces for circular-economy initiatives like Parc Foresta led by Yes We Camp. Another important spatial condition is the availability of vacant spaces and industrial brownfields. These spaces can be used for the storage of demolition waste, but they can also be made available for grass-root circular initiatives to experiment collective

## Chapter 4. Understanding and Preparing the System

	Spaces	Materials	Actors	People
S	<ul style="list-style-type: none"> <li>• Proximity to natural areas</li> <li>• Central location in the metropole</li> </ul>	<ul style="list-style-type: none"> <li>• Numerous urban projects</li> <li>• Buildings with standardized construction techniques &amp; prefab elements</li> </ul>	<ul style="list-style-type: none"> <li>• High density of local associations</li> <li>• Presence of small-scale local circular initiatives</li> </ul>	<ul style="list-style-type: none"> <li>• 30% of the population in Marseille living in ND.</li> <li>• Growing awareness on waste &amp; CO2 reduction</li> <li>• Large amount of jobs in the construction sector</li> <li>• Higher employment growth in ND than in Marseille</li> </ul>
W	<ul style="list-style-type: none"> <li>• High density &amp; concentration of social housing</li> <li>• Mono functionality and lack of centralities</li> <li>• Majority of SH built before 1975</li> <li>• Rigid and massive social housing complexes</li> </ul>	<ul style="list-style-type: none"> <li>• Non-valorized waste from demolition of NPNRU sites</li> <li>• Lack of facilities to stock, sort &amp; process construction materials</li> <li>• Missing information on material composition, value &amp; state of buildings</li> <li>• Underdeveloped reuse &amp; recycle industry</li> </ul>	<ul style="list-style-type: none"> <li>• Eroded local economy</li> <li>• Lack of financial resources</li> </ul>	<ul style="list-style-type: none"> <li>• High dependency on social security transfers</li> <li>• Fragile family situations (single parent &amp; large)</li> <li>• Above average poverty rate</li> <li>• High unemployment rate, specially between single mothers &amp; youth</li> <li>• Job precarity</li> </ul>
O	<ul style="list-style-type: none"> <li>• Availability of underused spaces (ex-industrial sites...)</li> <li>• Ongoing UR: 16 neighborhoods under the NPNRU, 3 under the PRIR</li> </ul>	<ul style="list-style-type: none"> <li>• Job seeking in particular services sector</li> <li>• Insertion programs for the unemployed in UR</li> </ul>	<ul style="list-style-type: none"> <li>• CE national funds</li> <li>• Building Energy Renovation Plan</li> <li>• Metropolitan Climate plan</li> <li>• Sharing &amp; learning from best practices in EU &amp; France</li> <li>• Metropolisation of urban policy</li> </ul>	<ul style="list-style-type: none"> <li>• Growing young population</li> <li>• UR projects with high impact due to high population density</li> </ul>
T	<ul style="list-style-type: none"> <li>• Low rate of private owners</li> <li>• Low housing mobility</li> <li>• Lack of connectivity between social housing complexes</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of systematization in waste valorization from construction sites</li> <li>• Illegal waste deposits</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient support for local circular initiatives</li> <li>• Lesser independance of MRU after integrating metropole</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing number of households below the poverty line</li> <li>• Available jobs not matching population skills</li> <li>• Low employability of young population (no diploma, no training, criminality)</li> </ul>

## 4.1 Identify the nodes of a circular regeneration system

activities. Coco Velten is a good example of how space can be made available for temporary experimentation and activation of local-actor networks.

Concerning the built environment, there is a high number of social housing buildings which have been built simultaneously from the 1950's until the 1980's with standardized construction techniques and prefabricated elements. On the one hand, at the national scale there is since September 2020 a Building Energy Renovation Plan (Plan Rénovation Énergétique des Bâtiments) in place that seeks to lower household energy expenditure, as well as reduce the energy consumption of residential and tertiary buildings. Many funds and investments are being released, for what concerns social housing "for social landlords, 3 billion euros in subsidized loans will be granted for the renovation of 500,000 housing units over 5 years".<sup>3</sup> In the case of the northern districts this is a huge opportunity for the regeneration of public housing. On the other hand, the energetic renovation can also bring about changes in the current urban renovation practices. In the case of Marseille, the industrial building techniques and elements of the housing stock have the potential to develop dismantling, reuse and re-assembling techniques and practices that can be applied across the territory. Moreover, the knowledge can be passed on more easily as we can develop standard solutions. The modularity of these building elements allows us also to increase the adaptability and flexibility of their applications, as they could be reused in the same type of buildings or be employed to refurbish an ex-industrial building for example.

The high number of existing circular-economy initiatives in Marseille shows that there is interest from the population in circular topics. It means as well that there is already a network of actors that can be the grass-root elements of a circular regeneration, with a precious knowledge of the local context. At the national scale, ADEME has developed a circular economy fund aimed at supporting and financing local authorities, businesses and associations to develop further the reuse and recycling industry as well as reducing household waste.<sup>4</sup> While at the European scale, the circular economy approach is also being more and more widely implemented. Amsterdam, Brussels, London and Glasgow are some of the leading European cities in terms of transitioning to a circular economy. The more cities, governments and people develop and implement circular practices the more knowledge will be available for sharing and the more other cities will

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<sup>3</sup> Ministère de la Transition Écologique et Solidaire. (2020, September). Plan de rénovation énergétique des bâtiments (France, Ministère de la Transition Écologique et Solidaire). Retrieved 2020, from <https://www.ecologie.gouv.fr/plan-renovation-energetique-des-batiments>

<sup>4</sup> Ademe. (2020, June). Le Fonds Économie Circulaire. Retrieved 2020, from <https://www.ademe.fr/expertises/dechets/passer-a-laction/fonds-economie-circulaire>



## Chapter 4. Understanding and Preparing the System

be interested in following this approach.

The population of the northern neighbourhoods is numerous (30% of Marseille population<sup>5</sup>) and young, according to the INSEE (The National Institute of Statistics and Economic Studies) as for 2016 22,2% of the population is under 14 and 19,3% between 15 and 29 years old. This means that the northern neighbourhoods are a mine of young human capital who can benefit greatly from the circular regeneration program, in terms of improved livability but also increased skilling and learning opportunities.

Lastly, the building sector is a major pole of local employment in the northern districts, residents have know-how in construction and can be easily involved in renovation works. More than 14% of jobs are in the construction sector, being at its highest in the 15th district with more than 16%.<sup>6</sup> Another important sector are personal services defined by the INSEE as “personal services are characterized by the provision of a technical or intellectual service mainly intended for individuals (or households), even if some of them also concern businesses.” A big percentage of job seekers (27%)<sup>7</sup> are looking for jobs in this sector. The circular regeneration with its repair, restore and regenerative activities has plenty of jobs to offer in this sector. Furthermore, the job creation in the area has been more dynamic than in the rest of the city. While in the northern districts almost 5000 new jobs were created from 2011 to 2016, Marseille only had a growth of 760 jobs.<sup>8</sup> This means that overall employment didn't increase much, but that jobs are moving to the northern districts.

### *Weaknesses and Threats*

The high concentration of social housing has been both a cause and a consequence of the stigma on the northern neighbourhoods as a deprived urban area, and the decayed condition of real estate built before 1975 has only reinforced this negative image and worsened the housing conditions of inhabitants. Moreover, the lack of legibility of the space causes centralities to be invisible or weak, so they are not able to foster and nurture collective activities and behaviours. This is further increased by the hilly topography of the area and the lack of public transport, disconnecting people further from the city center of Marseille and employment poles located near Aix-en-Provence.

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5 INSEE. (2015). Données sociodémographiques par quartiers et arrondissements de Marseille (de 1982 à 2012). Retrieved March 4, 2020, from <https://www.insee.fr/fr/statistiques/2385003#consulter>

6 Idem.

7 AGAM. (2020). L'essentiel en chiffres: Économie Emploi. Retrieved September 22, 2020, from <https://spot.agam.org/pentaho/api/repos/:public:eco:synthese2.wcdf/generatedContent>

8 INSEE. (2020). Dossier complet Commune de Marseille (pp. 11-16, Rep. No. 13055). INSEE. Retrieved 2020, from <https://www.insee.fr/fr/statistiques/2011101?geo=COM-13055>.

## 4.1 Identify the nodes of a circular regeneration system

The social housing estates are also majoritarily medium to high-rise buildings comprising small two to three-bedroom apartments planned and conceived as large scale projects. Most households are renters (57,5%)<sup>9</sup> whereby the responsibility and power to renew the housing estates lies solely in the social landlord. Most social landlords own a large amount of housing estates and tend to await for national funds to actually renovate or rehabilitate the buildings. Therefore, even if the inhabitants are unsatisfied with the conditions of the buildings, their possibilities to renovate these complexes are very limited. They depend on the will and the funds of the social landlord and governmental instances.

This state-led renovation process is currently happening in the northern districts. Nevertheless no attention has been paid to the anti-adaptiveness and self-regenerating capacity of these buildings. If changes have been made they have been mainly focused on diversifying the housing offer in order to attract other socio-economic groups to these areas, as well as demolishing certain high-rise buildings to de-densify the neighborhoods. There is whatsoever no interest in giving the inhabitants the needed tools to be able to self-renovate their dwellings nor an interest in questioning current renovation practices. We already developed this part in Chapter 3. From an interview with Giorgia Andreoli<sup>10</sup> currently working for the MRU we know that all demolition waste has been taken to landfills and there exists no intent to valorize this waste.

The lack of interest in questioning and rethinking renovation practices can also be seen in the absence of facilities to stock, store, repair and recycle construction materials. The Northern districts only account for example with two waste reception centers. In contrast, the city is famous for its illegal dumpings found even in natural parks. The reuse and recycling industry is also less advanced than in other parts of Europe, there exist no actual regulation for the implementation of reused materials in construction and rehabilitation sites, nor is it common practice to do a material diagnosis of a building before demolishing it. These are crucial aspects to take into consideration when developing a circular regeneration program.

Even though at the national scale a Circular Economy Fund has been created, this measure is only recent and hasn't fully permeated at the Metropolitan scale. There exists a Metropolitan Plan for the Prevention of Assimilated and Household Waste released in 2019 aimed at becoming a zero-waste metropolis by 2035. In it, circular economy does play an important role to achieve this, but it is also recognized in the report that one of the main objectives is to increase awareness between the population to reduce household

<sup>9</sup> INSEE. (2020). Dossier complet Commune de Marseille (p.9,Rep. No. 13055). INSEE. Retrieved 2020, from <https://www.insee.fr/fr/statistiques/2011101?geo=COM-13055>

<sup>10</sup> G. Andreoli, personal communication, 30 October, 2020.



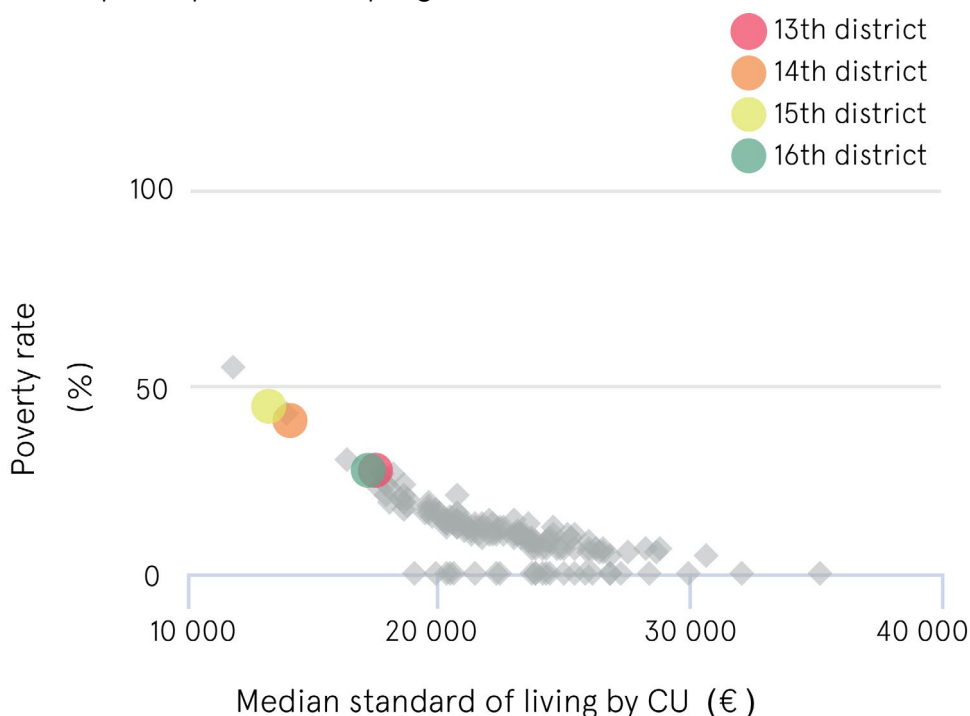
Figure 7. Poverty rate of the different municipalities of the Metropole.

Adapted from Niveau de vie médian et taux de pauvreté en 2015, by INSEE, 2015, <https://spot.agam.org/pentaho/api/repos/%3Apublic%3Aeco%3Asynthese2.wcdf/generatedContent?&cp=13055>

## Chapter 4. Understanding and Preparing the System

waste and change behaviours. Another important aspect of the plan is that each territory of the Metropolis, in the case of the Northern districts, the territory of Marseille, still has to develop its own action program to actually achieve the objectives of the plan.

Concerning the population living in the northern districts, as we have mentioned in the first chapter the socio-economic landscape is rather fragile, and this fragility seems to be increasing. The poverty rate is 27% for the 13th and 16th districts, 40% in the 14th and 44% in the 15th district. Being between the poorest districts of the Metropole. The situation is even worse for renters (40% in the 13th and 16th districts, 52% in the 14th district and 57% in the 15th district).<sup>11</sup> We know therefore that the residents of the social housing complexes are amongst the most vulnerable of the Metropolis. Although a big part of the population is young, many of them don't follow higher studies after high school. The scholarization rates decrease drastically after they turn 18 (from almost 100% to 60% in the 13th district, 50% in the 14th and 15th districts and only 40% in the 16th district).<sup>12</sup> This means that their employability might be low for circular jobs that demand highly skilled people, however the program also can create medium level and low-skilled jobs. Nevertheless it will be of major importance the program can provide the inhabitants with reskilling and educational opportunities in order to really enable them to be active participants in the program.



<sup>11</sup> INSEE. (2020). Dossier complet Commune de Marseille (p.18, Rep. No. 13055). INSEE. Retrieved 2020, from <https://www.insee.fr/fr/statistiques/2011101?geo=COM-13055>

<sup>12</sup> INSEE. (2020). Dossier complet Commune de Marseille (p.10, Rep. No. 13055). INSEE. Retrieved 2020, from <https://www.insee.fr/fr/statistiques/2011101?geo=COM-13055>

## 4.2 Preparing the System

Once the territory has been characterized as a system of potential nodes for circular regeneration, it is necessary to understand how a new urban metabolism, initiated in a top-down way by institutions, can meet the local initiatives which try to regenerate neighbourhoods with their own low-resource approaches, based on their grass-root knowledge of places and people. The goal is to catalyse top-down and bottom-up actors and actions toward a shared vision within a framework of governance that is able to provide leadership and generate a broad commitment of actors.

### 4.2.1 Leadership for a common vision

The first priority is to design a network of actors that can emerge a common vision of the circular regeneration program. This requires an entity to dialog with actors of different natures and scales across the territory in order to understand their needs, practices and resources, and based on this understanding. The private actors concerned are social landlords in the first place, but then construction firms are crucial because they are those who operate the works of demolition, construction and rehabilitation of buildings. At the same time, local associations are relevant because they are relays with the inhabitants of neighbourhoods. Their practical knowledge of the social, economic and cultural conditions of dwellers is necessary to propose appropriate solutions for the reuse of spaces and professional insertion of inhabitants. Finally, the city of Marseille and the municipalities of 13th-14th and 15th-16th districts are the main promoters of a circular renovation policy, so their adhesion is fundamental for a circular regeneration program.

As Giorgia Andreoli confirmed<sup>13</sup>, MRU has been designed with the purpose of creating dialog with actors concerned by urban renovation projects, and this is why the entity can take the lead in the elaboration of a common vision for circular regeneration.

The term “circularity experts” refers to an ensemble of actors whose nature can be associative or firms who are identified because they detain knowledge and know-how in the reuse of materials for construction or in the reuse of spaces. Their technical expertise is precious because they are able to enhance the skills of those who implement the renovation projects and the reuse of materials and space. For this reason, their role is crucial in the elaboration of a credible program of circular regeneration as they advise MRU and provide training for private and third-sector actors. For instance, the know-how of Raedificare is acknowledged by institutional actors in the reuse of demolition waste at the metropolitan scale. Similarly, Yes We Camp and Plateau Urbain are known for their interventions in significant projects of space reuse as the Parc Foresta and Coco Velten.

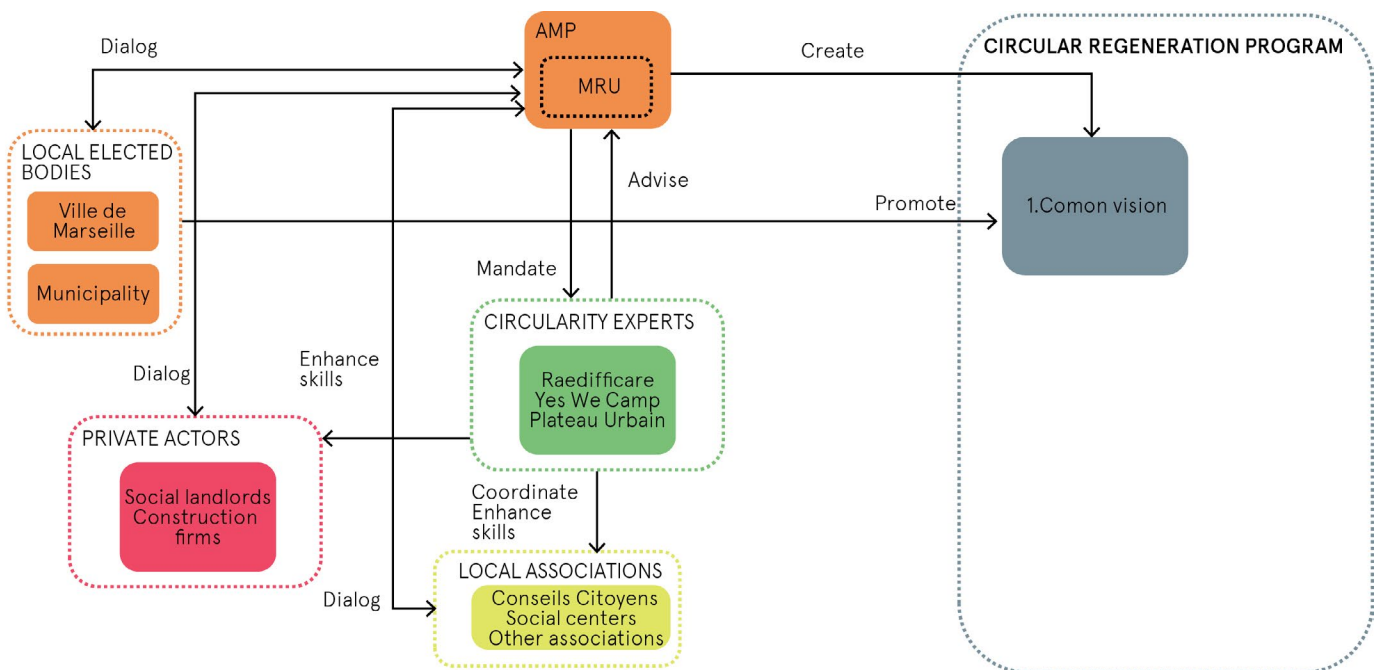


Figure 8. Main actors' roles in leadership for a common vision

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<sup>13</sup> G. Andreoli, personal communication, 30 October, 2020.

## Chapter 4. Understanding and Preparing the System



Legend



## 4.2 Preparing the System

### 4.2.2 Nurturing seeds of circularity

The second step is to nurture local initiatives that raise awareness about the reuse of resources in the neighbourhoods. The purpose of this step is to create a broad popular support for the regeneration program by raising awareness of inhabitants on the resources available and the benefits of their reuse. Therefore, the activities related to this step should foster citizen participation. For instance, 7 projects of ANRU in the area include a community garden in the functional program of the open spaces. Besides, Giorgia Andreoli mentioned the intention to create a partnership with the Institute of Circular Economy to implement reuse in schools at the level of canteen and of school materials.<sup>14</sup> These initiatives are likely to require only a small amount of material inputs, but it is important to follow their evolutions because they are part of the elaboration of a common vision that also includes the inhabitants.

### 4.2.3 Identifying pilot projects and creating partnerships

The third step is to experiment practices of resources reuse through pilot projects on the territory. In this frame, circularity experts are those who coordinate private actors and associations in the implementation and who provide advice and training for the success of the project. A pilot project is a project that can take place at the level of a neighbourhood concerned by renovation policies, and that implements one aspect of resource reuse. For instance, the reuse of materials in the projects with future demolitions (La Castellane-Bricarde, La Savine, Consolat-Mirabeau and Saint-Joseph-Vieux Moulin) can be coordinated by Raedificare and implemented by local construction firms. Simultaneously, partnerships should be created with entities that are able to finance pilot projects, such as ANRU, CDC, ANAH, the Regional and Department councils and the city of Marseille. These pilot projects are an opportunity to test the hypotheses and the vision elaborated at the first step. Therefore, their relevance depends on the quality of the feedback allowed by the governance structure. They should be able to question the goals, practices and governance of the regeneration framework. Pilot projects are practical exercises to construct a solid circular regeneration program that is actually supported by the network of actors concerned.

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14 G. Andreoli, personal communication, 30 October, 2020.

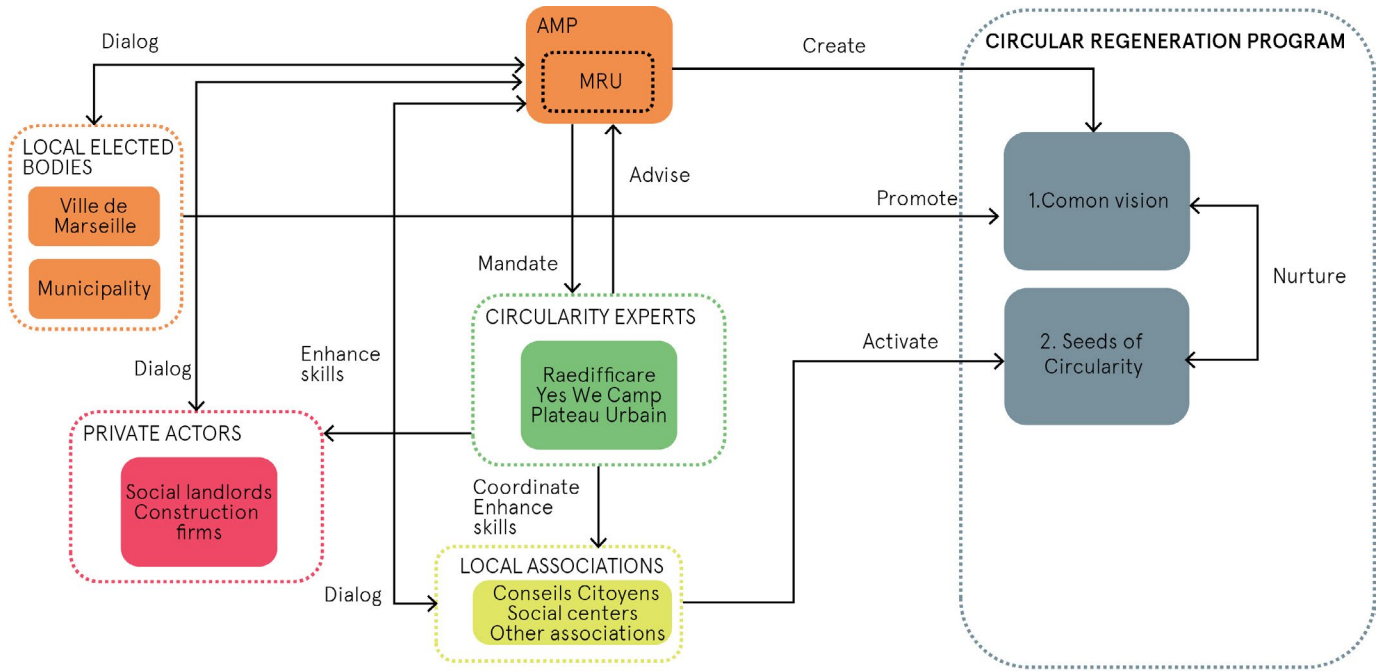


Figure 9. Main actors' roles in nurturing seeds of circularity

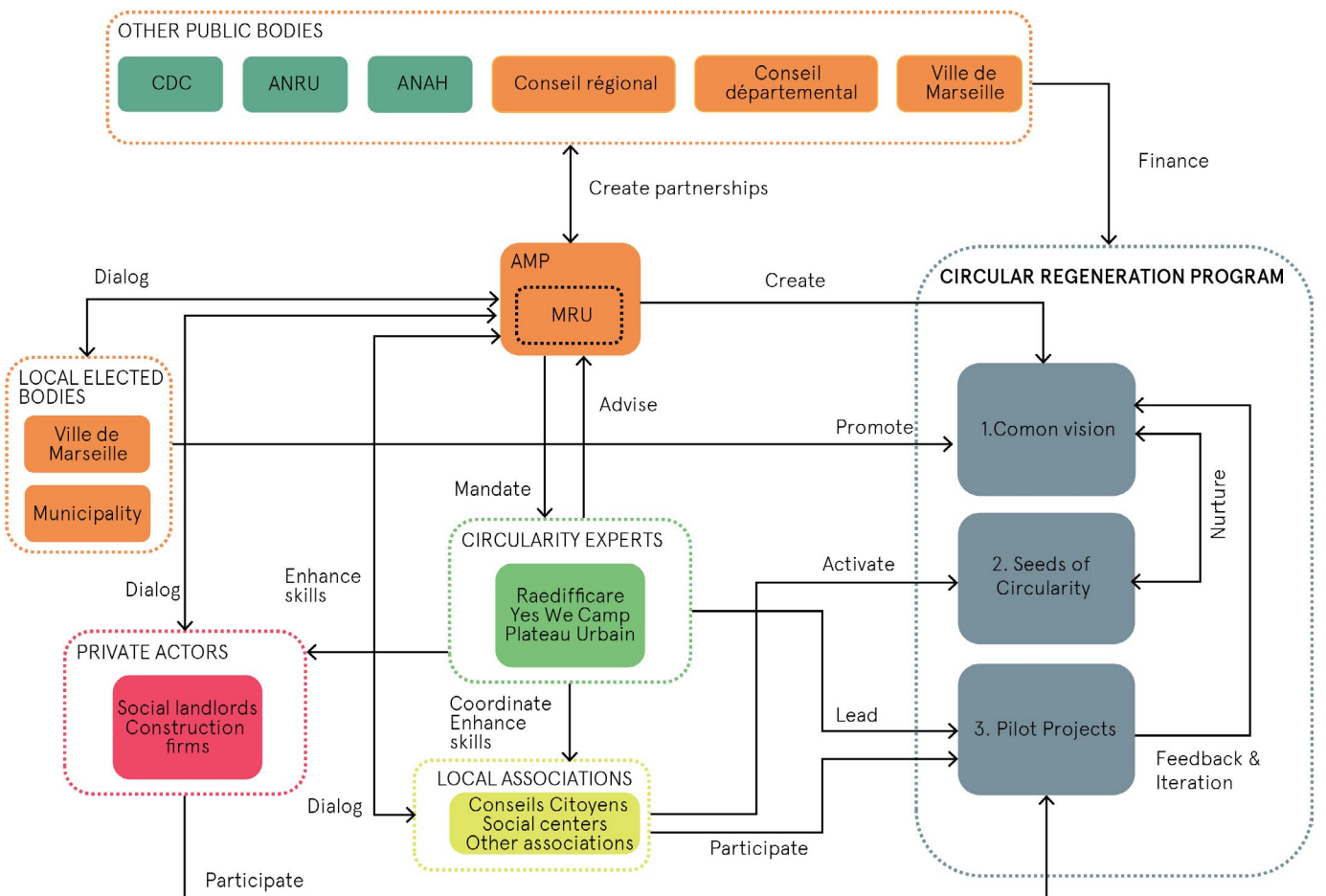


Figure 10. Main actors' roles in identifying pilot projects and creating partnerships

# Chapter 4. Understanding and Preparing the System



Legend



Legend



A decorative graphic consisting of two sets of concentric circles. The inner set consists of three thin, light-colored rings, and the outer set consists of three slightly thicker, light-colored rings. The circles are centered on the page and overlap each other.

**5**

**Initiating the Circular Regeneration Labs**



## Chapter 5. Initiating the Circular Regeneration Labs

There are two main stages of analysis needed to initiate the circular regeneration labs. Each stage has three main lines of action that explain how the different resources can be enabled. These resources are divided in three categories: spaces, materials and flows, and people. For certain actions each play an independent role, while in others the action may depend on their interaction, in some other cases one resource may help to reinforce the other resource.

### 5.1 First stage of analysis: Identify local resources and opportunities

This first stage is meant to help local actors and authorities to recognize and determine which resources are available in the neighbourhood to actually start the regeneration process. Some of them may be currently neglected, ignored or perceived as valueless. The aim of this step is therefore to make the invisible visible by providing a circular lens that helps to locate, classify and potentialize the existing local resources.

#### 5.1.1 Locate the existing local resources

This action is based on knowing where the resources can be found, their scale and size as well as identifying if they are a particular local resource of something that is prevalent amid the neighborhood or even the district.

**Spaces:** The different phases of the built environment cycle provide a broad perspective on where the circular regeneration processes can take place. The list of spaces we will provide is based on the recurrent spatial conditions found among the different neighborhoods of the northern districts. This list is not limited to the examples we provide, but should be used as a guidance when mapping the possible spaces to activate in the regeneration process.

1. Social housing complexes (HLM): As mentioned in chapter 3, the northern districts account with around 588 housing complexes and 39.168 social dwellings.<sup>1</sup> The neighborhoods selected by the urban renewal plans of the city target a bit more than a third of these social dwellings (approximately 13.881 dwellings)<sup>2</sup>. Most of these complexes were built between the 1950's and the 1970's with some exceptions from the 1980's and 1990's. The majority are what is known in France as grands ensembles that can be translated as large housing states. They were the national response to a pervasive housing crisis accentuated by the end of WWII. Moreover, the state considered these new housing units as part of a long-term perspective of urban and social modernization, which involved the industrialization of the building sector. (Legoullon, 2016) Therefore, the majority of the housing units we find in Marseille follow similar construction and layout principles.

<sup>1</sup> Marseille Provence Métropole. (2015). Atlas du Parc Locatif Social Marseille (Rep.). Retrieved July 2, 2020, from [http://doc.agam.org/doc\\_num.php?explnum\\_id=4264](http://doc.agam.org/doc_num.php?explnum_id=4264)

<sup>2</sup> Own counting based on project sheets and atlas of parc locatif social.

## 5.1 First stage of analysis: Identify local resources and opportunities

Medium to high-rise buildings of three to four room apartments of about 65m<sup>2</sup> to 85m<sup>2</sup>. Built mostly out of prefabricated concrete elements and standard window and door elements, as well as flat roofs. Open areas in between the buildings used as parking space or common green area.

Concerning the different phases of the built environment cycle these spaces can play an important role throughout the cycle.

- Conception and design phase: the way many of these buildings have been designed does not allow the inhabitants to change these structures to their needs. Thinking in ways these buildings could become more flexible to new uses and needs as well as more adaptable by the inhabitants could extend their life-cycle as well as improve the living conditions of their dwellers. Another important aspect concerning these buildings is their poor energy and resource performance, we can imagine new ways to utilize them more efficiently as well as even produce their own energy or recover their own water. There is also big space for improvement in terms of the materials being used for their renovation as well as in the building techniques in order to facilitate maintenance and the reusability of their components.
- Construction and rehabilitation phase: many of the renovation projects of the NPNRU happen simultaneously or within a small time difference. Considering these buildings as our main resource banks can provide the needed resources for the next construction or rehabilitation project, reducing the amount of waste being created during the demolition process and lowering our need to produce more construction materials. The standardized building techniques used among these housing complexes can also facilitate the reuse process as we can develop replicable solutions that can be implemented all along the different nodes.
- Use phase: as these are places that concentrate a big amount of the neighborhoods' population, there is a lot of human capital to experiment and try out circular activities in the now underused or unattractive open areas and common spaces. These activities should be developed and maintained by and for the inhabitants. These activities may help regenerate certain spaces as well as create value for the community, the aim is to increase their self-sufficiency, improve their living conditions as well as to strengthen social ties.
- Scaling phase: the myriad of social housing complexes amid the northern districts can be seen as the different cells of the nodes developing their own local circular solutions. Naturally in order to create a system there needs to be communication between the cells. Each housing complex is a testing ground, but as in every experiment to be relevant findings and results need to be shared, therefore the development of a platform and a coordinating instance need to be formed in order to achieve this.

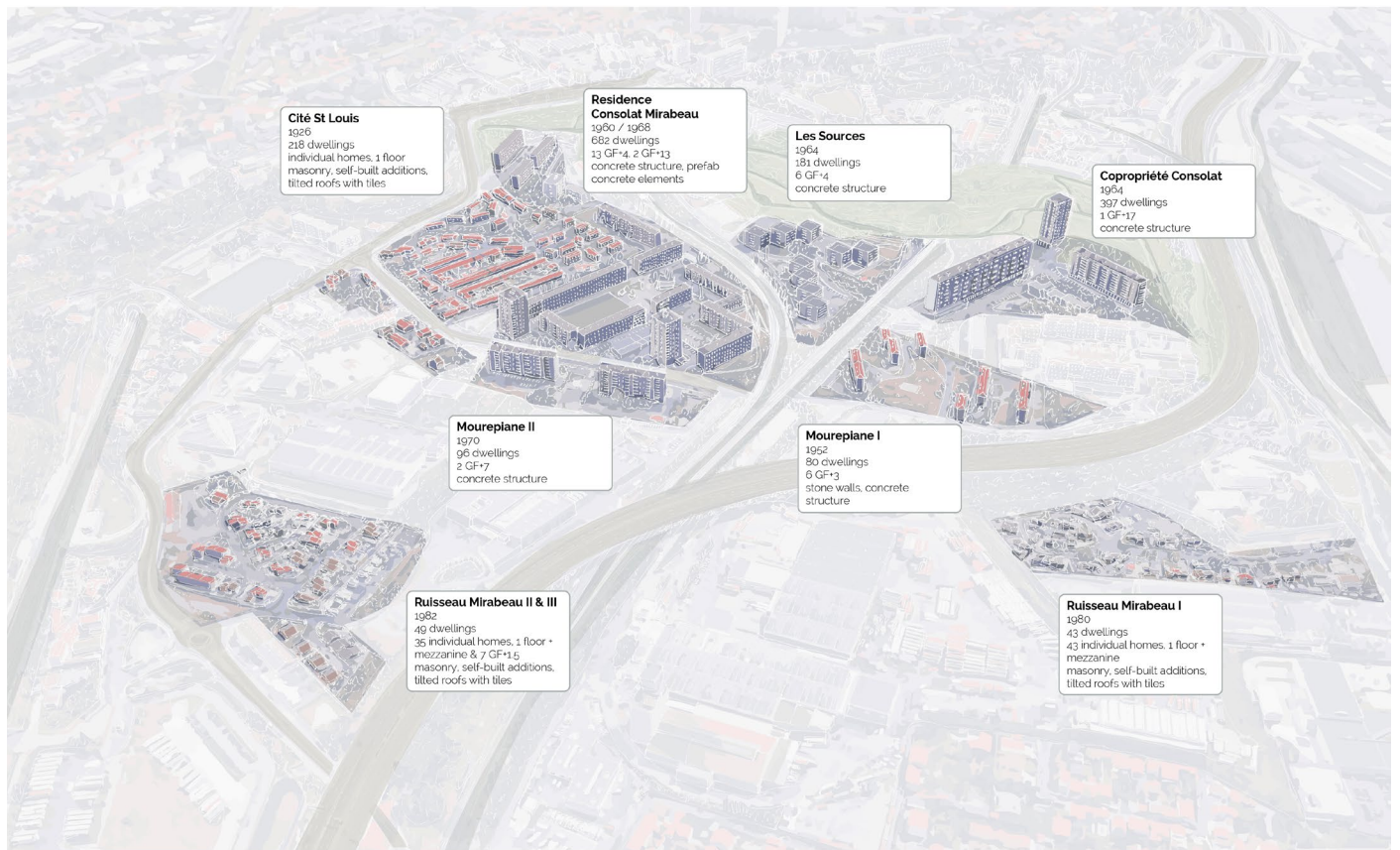
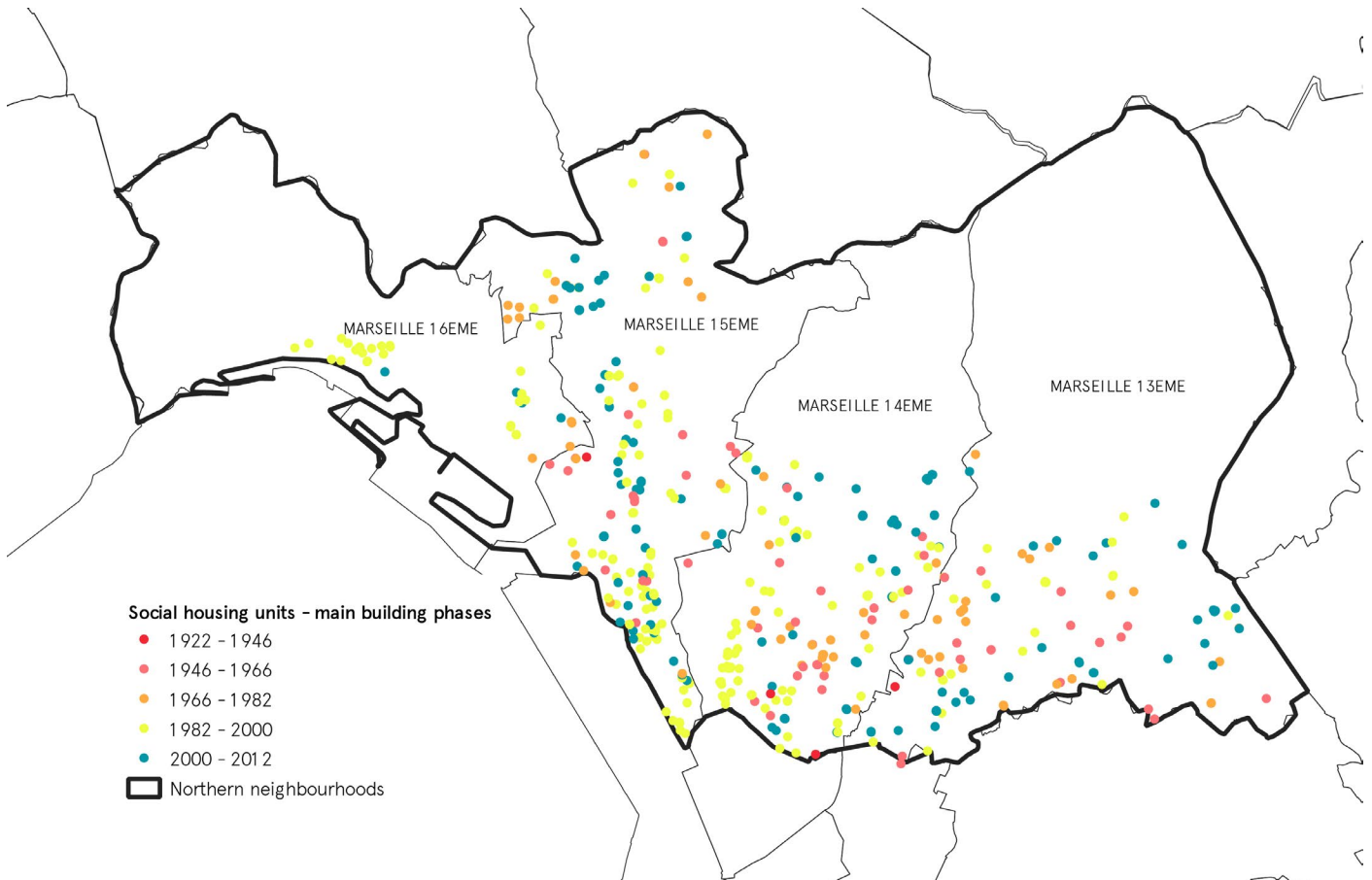


Figure 1. Social Housing complexes in the Northern neighborhoods classified according to their date of construction



Figure 2. Social housing complexes in NPNRU project Consolat-Mirabeau

# Chapter 5. Initiating the Circular Regeneration Labs



## 5.1 First stage of analysis: Identify local resources and opportunities

2. Ex-industrial sites: As many other cities, Marseille suffered the decline of its industrial economy from the 1960's onwards. Many industrial activities were related to the port trade, mainly based on the transformation of raw materials coming from the different French colonies. As the city now moves into an advanced tertiary economy, many of these industrial sites have been abandoned and haven't found a new use. Depending on the size, the location and the infrastructure of these sites we can imagine different ways in which these places can be of use in the implementation of the vision.

● Conception and design phase: In order to incorporate these spaces to the cycle, we need to rethink how their current layout and components could be valorized in order to bring new life to the neighborhoods and become enablers of the regeneration process. The idea is not to tear these places down but to actually adapt them to the different activities needed to achieve the vision.

● Construction and rehabilitation phase: Some of these sites may be useful in order to facilitate the reuse and recycling of construction materials. If near to the renovation sites, they may be used as storage space where sorting and repairing activities can take place. Another possible use is to transform them into reuse and recycling platforms. This may need more capital to be achieved as certain recycling processes demand more equipment and knowhow, but there may be industrial actors interested in developing this side of their business.

● Use phase: In Marseille there already exist interesting initiatives that through the refurbishment of an industrial site have been able to create fascinating social and cultural centers. Such is the case of la Friche de la Belle de Mai located in the city center. A former tobacco factory that has been transformed into a creation and innovation hub. Between its facilities we can find artist residences, performance and concert halls, shared gardens, a games and sports area, a restaurant, a bookstore, a nursery, 2,400 m<sup>2</sup> of exhibition space, an 8,000 m<sup>2</sup> roof terrace, a training center.<sup>3</sup> Following this example we can imagine how these ex-industrial sites could be adapted and transformed into social innovation hubs where training, work, experimentation and social activities could be hosted.

● Scaling phase: These places have the potential to have an impact beyond the local scale. Although they may be located in one node, they may be used by different nodes at the same time. This makes them ideal to become the physical platforms where people can connect with each other as well as a forum where ideas and practices can be presented and diffused. They can therefore be interpreted as the spatial connections between the nodes.

<sup>3</sup> Arnaudet, A. (2020, October 08). Le projet. Retrieved August 19, 2020, from <https://www.lafriche.org/la-friche/le-projet/>

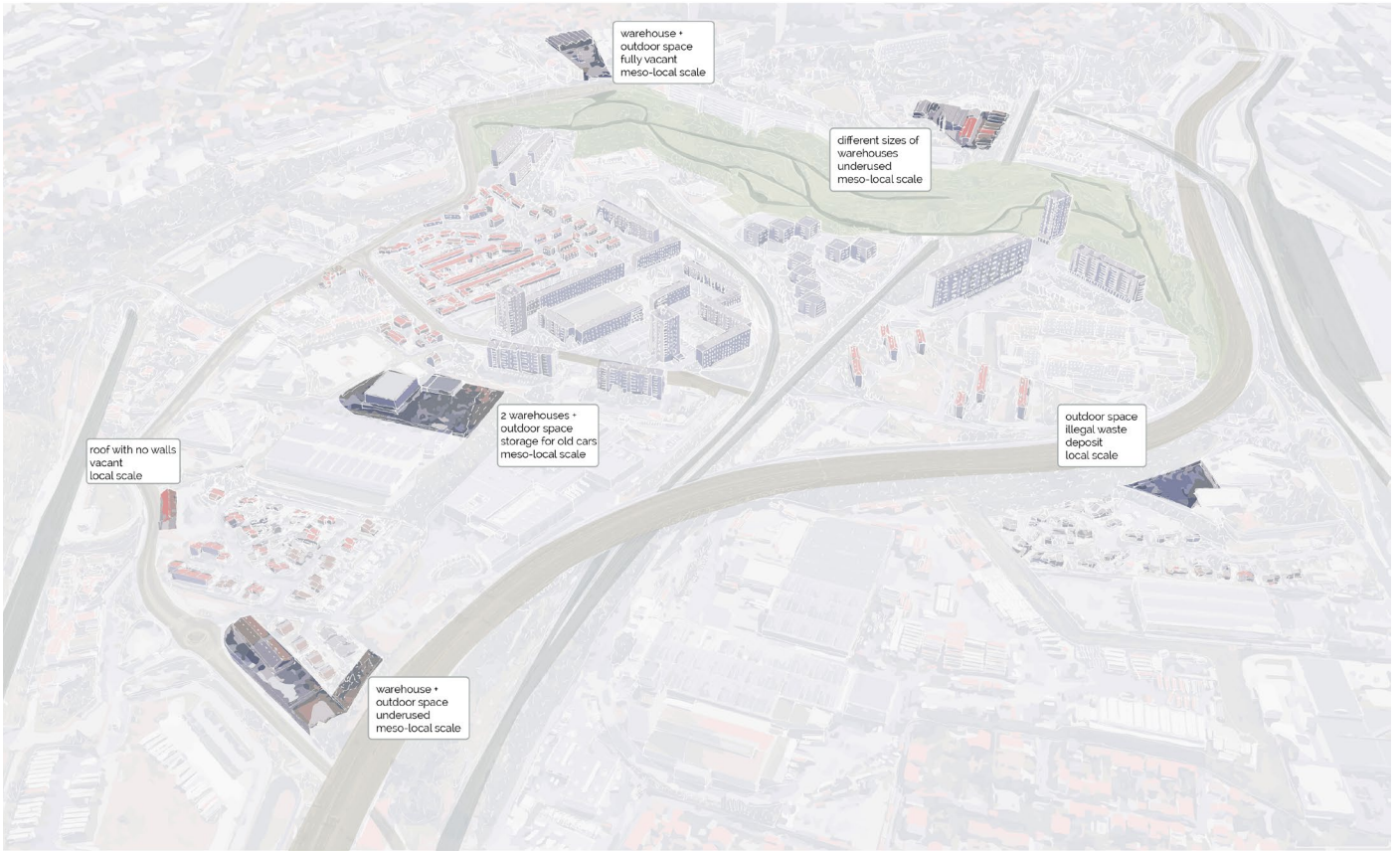


Figure 3. Ex-industrial sites in NPNRU project Consolat-Mirabeau



Figure 4. La Friche de la Belle de Mai. Retrieved from Friche la Belle de Mai, by C. Dutrey, 2020, <https://www.lafriche.org/la-friche/lieux/le-toit-terrasse/>.

# Chapter 5. Initiating the Circular Regeneration Labs



## 5.1 First stage of analysis: Identify local resources and opportunities

3. Enclosed collective spaces: When the housing estates were built many of them included certain collective facilities, such as locals for small businesses, social centers and schools. As the majority of the housing states were erected in the peripheries disconnected from the city center, these facilities were built to counteract the lack of access to social, educational and commercial activities. Many of these collective spaces are still in use but are in urgent need of renovation, such is the case of certain schools and social centers that the NPNRU already considers part of their renewal scope. Other of these collective facilities, especially the small commercial businesses have suffered from the establishment of big commercial centers and supermarkets nearby, many of them have closed while others can barely survive. These spaces can be activated during the regeneration process in different ways.
  - Conception and design phase: For this phase to start we need to understand the needs and aspirations of the inhabitants, but also to create awareness and build-up knowledge on sustainable, regenerative and circular practices as well as possible means to collaborate. Schools and social centers are great places to initiate this process as they already have the needed social and physical infrastructure or the capacity to develop it.
  - Construction and rehabilitation phase: As many of these facilities are already considered in the renovation process of the NPNRU, they could also be provided with materials recovered from other construction sites or the other way around, being providers of reusable and recyclable material. Other possible roles these places may take in this phase is by hosting part of the training sessions that will be given in order to enable the inhabitants to participate in the construction and rehabilitation process.
  - Use phase: Following the logic of the locals for commercial activities, these same locals could be used for other value-creating activities, think for example of a repair café, where people could consume locally produced products as well as get their appliances repaired by someone from the neighborhood or even learn how to repair them themselves, or a small fablab where people can learn coding, 3D-print or provide information for the platform, while others share an open space where they can work. Schools could also implement more circular activities inside their buildings, the school's cafeteria could integrate local products to their menus, create a compost hub and vegetable garden for the students to learn about nature and how to cultivate, their furniture could be made out of recovered material or repaired locally or even provide the students with the option to take repair and reuse workshops.
  - Scaling phase: Schools are important places to start raising awareness and encourage the inhabitants to participate in the regeneration process. Later on they could even develop a circular regeneration guide for other schools that want to apply these principles too. They are also important places to promote

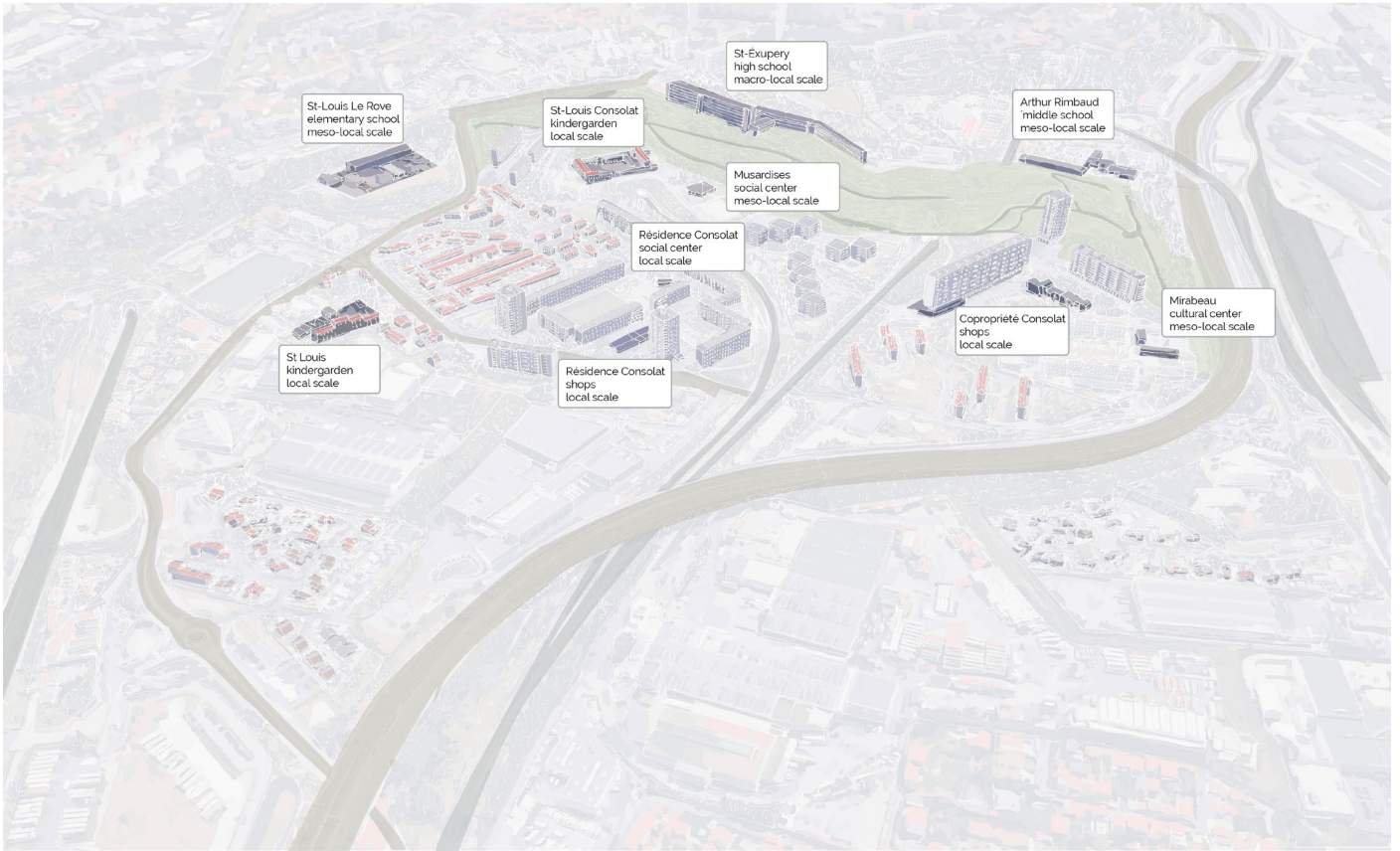


Figure 5. Enclosed collective spaces in NPNRU project Consolat-Mirabeau



Figure 6. Local anti-waste cafeteria of Coco Velten. Retrieved from Coco Velten, by Coco Velten, 2020, <https://cocovelten.org/#cantine>.

# Chapter 5. Initiating the Circular Regeneration Labs



## 5.1 First stage of analysis: Identify local resources and opportunities

innovative solutions and share new insights but also to evaluate the progress being made by the program. They are a natural sensor of the changes in behaviour and lifestyle going on in the community. We can know through them how engaged the community is and how they are adapting their consumption and social patterns throughout the program.

4. Open public spaces and green areas: As we already mentioned, because the housing states tend to concentrate a lot of people in a couple of massive buildings, there is a great abundance of open space in between and around these complexes. Many of these areas are currently used as parking spaces, sports fields or playing areas for kids, although some of them are simply left unused. In certain neighborhoods interesting activities have started to emerge in some of these spaces. In half of the neighborhoods concerned by the NPNRU in the northern districts, shared gardens or as they are known in France *jardin partagés* are being developed. They bring new resources, skills and knowledge to the inhabitants as well as help strengthen social ties. Although not abundant, there also exist bigger parks inside or between neighborhoods. The topography of Marseille makes these parks mostly hilly or steep and therefore difficult to access, but there are incredible views to the mediterranean sea and the city to experience. All these open areas can be enabled in different ways during the regeneration process bringing about social as well as environmental benefits.
- Conception and design phase: One important aspect in this phase is designing not a final outcome but a process in which experimentation and innovation is enabled. We need to test certain solutions or initiatives not only to understand their feasibility but also to figure out how to adapt them to the local circumstances and create a durable engagement. It is in this sense that these open areas are key tools for experimentation, they can host temporary initiatives that may help to initiate other processes or connect certain initiatives with each other. We will develop this idea further in the next phases. From a different design perspective it is important to look at the current environmental performance of these open areas. The key question we have to answer is if these places are actually helping nature regenerate or if they are actually inhibiting this process. Once this is done we need to think which strategies and actions we need to take in order to enable this fundamental process to happen.
  - Construction and rehabilitation phase: Construction works in general tend to erode the land around them due to the need of space to store materials and machines as well as to assemble certain components that can not be assembled on the building and so on. Demolition works have an even bigger effect on the surrounding areas and even the environment as a whole. They



produce more than 39 times as much waste materials per square meter as construction activities (Wang et al., 2012). This waste occupies a lot of land space and reduces the fertility of the soils, moreover if it is dumped illegally it may even affect the groundwater and surface water due to the demolition waste leachate, and the transport and disposal machinery used in the demolition process may bring negative effects to the air such as dust and gas emission, noise pollution (Ding et al., 2016). This all means that we need to develop better construction and demolition practices in order to protect the environment. In the local scale if an open area is already impermeable it may be preferable to use this area to store materials and waste instead of using a vegetated permeable area. After the construction works a lot of attention needs to be paid to the regeneration of these soils, as they may be severely damaged. On a more global scale, demolition should be avoided where possible and methods such as selective deconstruction should be preferred and advanced, the use of prefabricated materials and biodegradable ones may also help reduce the environmental impact these practices have.

- Use phase: The key priority concerning open areas is to reinforce their regenerative capacity while bringing social benefits to the community, in other words restoring our relationship with nature. Protecting and increasing their biodiversity with endemic species, permeating the soils, avoiding more land taking, using natural fertilizers such as compost, avoiding over-maintenance and creating ecological corridors are important actions that will help us achieve this. A more natural environment in general will help us increase the resilience of these communities against climate change. These places will become the cooling islands so needed in the summer, the natural drainage system making flooding less probable and damaging, the habitat for bees, butterflies and other insects that pollinate our crops, the natural CO<sub>2</sub> storage system cleaning our so polluted air. There is a lot of space for cooperation and innovation in these areas, and the more we work as a community to achieve this, the greater the effect will be.
- Scaling phase: By improving the natural local ecosystem of each node, the whole ecosystem will start to improve. There are important natural parks located at the north of the northern districts that by connecting the urbanized areas through ecological corridors, they can actually start an in depth regeneration of the area and later the city. This could even have a metropolitan impact that would go beyond the circular regeneration program, but there are many plans and programs supporting it. Such is the case of the Metropolitan Ambition for 2040 aiming to make from agriculture & landscape the source of new prosperity<sup>4</sup>, the Metropolitan Climate Plan that sees the metropolis as a

4 Métropole Aix-Marseille-Provence. (2018, June 28). Ambition 2040 12 Engagements Pour Une Métropole à Vivre (France, Métropole Aix-Marseille-Provence). Retrieved September 19, 2020, from <https://www.amp-metropole.fr/projet-metropolitain>

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Metropolis that adapts to the impacts of climate change to ensure the sustainability of its development<sup>5</sup>, as well as the Local Plan for Intercommunal Urbanism (PLUi) whose different actions align to the regeneration of natural ecosystems at a metropolitan scale: implement an ambitious & virtuous development strategy based on principles of sustainable development and preservation of the environment, preserve biodiversity by ensuring the protection of the ecological frame, promoting landscapes that bear local identities, favor urban renewal and limit space consumption, improve the living environment of residents throughout the territory (proximity to services, public spaces, relation with nature, quality of built environment).<sup>6</sup>

**Materials and flows:** For each phase of the built environment cycle, there may be a different approach to the existing materials and flows in the node. We use the term materials for the tangible resources that are a product of human action or of which human action depends on in order to function. The term flow refers to the way these materials are streamed throughout the system, some may be recuperated, others regenerated, but what we mainly want to avoid is for them to be wasted. In a circular economy there are two types of flows, technical and biological. The technical flows must continuously cycle through the system so that their value can be captured and recaptured.<sup>7</sup> Biological flows refer to natural resources, such as energy, water, plants, biodegradable waste and air, we follow the definition of the Ellen MacArthur foundation as those materials that can safely re-enter the natural world, once they have gone through one or more use cycles, where they will biodegrade over time, returning the embedded nutrients to the environment.<sup>8</sup> What follows is a list of these resources and an analysis on how they can be employed in the different phases of the cycle. As in the case of the spatial resources, there may be more resources available in the nodes that we are not mentioning, the list can be extended by each node.

5 Métropole Aix-Marseille-Provence. (2020, March). Régénération Plan Climat Aix-Marseille-Provence (France, Métropole Aix-Marseille-Provence, Agenda Environnemental). Retrieved September 21, 2020, from <https://www.ampmetropole.fr/prevoir-anticiper-prevenir-pour-preserver-et-sauvegarder>

6 Métropole Aix-Marseille-Provence. (2019, December 19). Projet d'aménagement et de Développement Durables (France, Métropole Aix-Marseille-Provence, Territoire Marseille Provence). Retrieved March 11, 2020, from <https://www.ampmetropole.fr/urbanisme-intercommunal-plui>

7 Ellen MacArthur Foundation. (2017). The Circular Economy In Detail. Retrieved September 19, 2020, from <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

8 Idem.

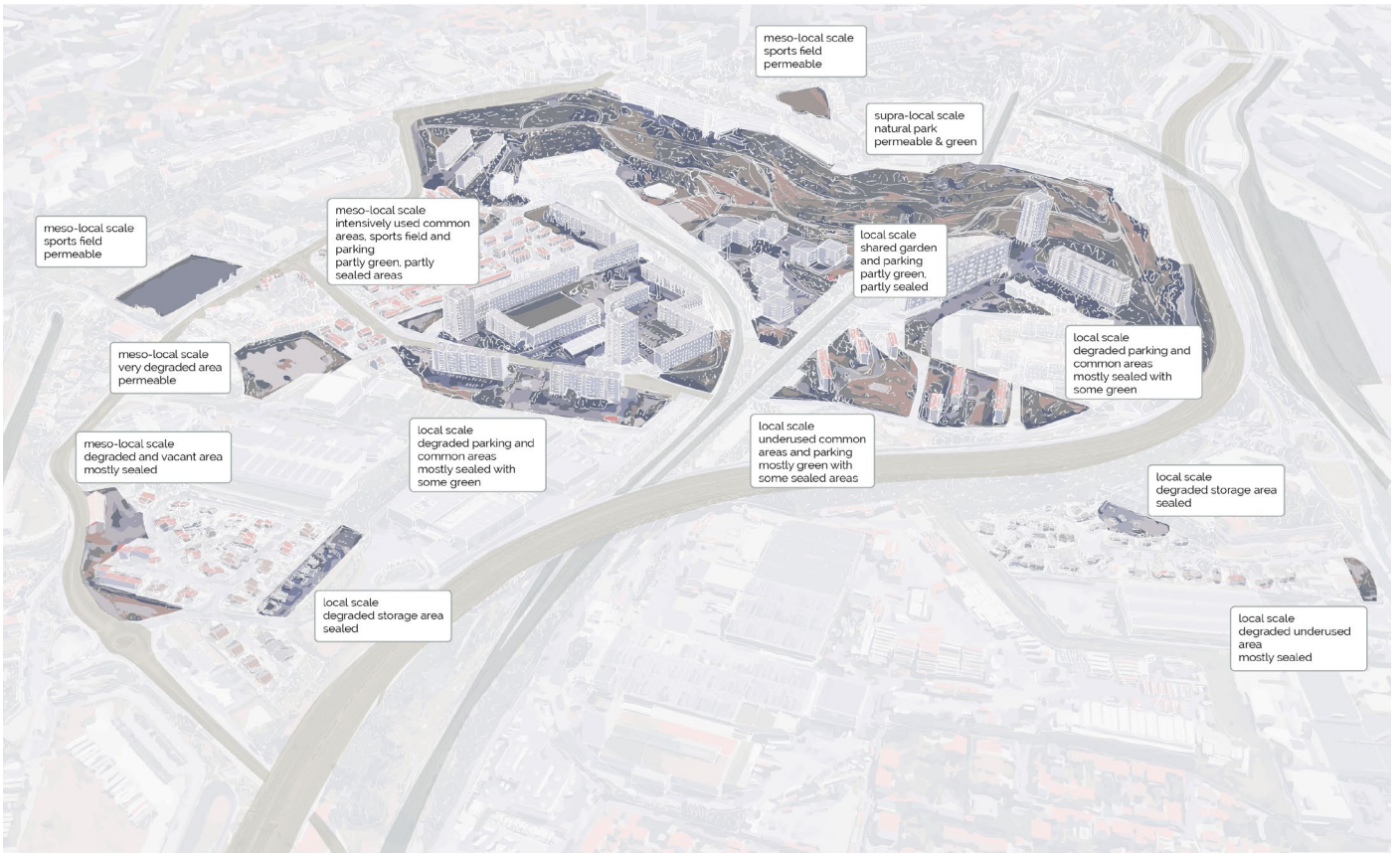


Figure 7. Open public spaces and green areas in NPNRU project Consolat-Mirabeau



Figure 8. Participatory construction process of shared garden La Viste with recuperated materials. Retrieved from Collectif etc, by Collectifetc, 2013, <http://www.collectifetc.com/realisation/au-belvedere-de-la-viste/>

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### *Technical materials and flows*

1. Construction materials: When we start seeing our buildings as valuable resource banks, we understand that although some buildings may no longer be inhabitable, their materials life may still be prolongable. In other words, there is still a lot of value to be recaptured from a degraded building. Nevertheless in order for this value to be recaptured, there are certain practices we need to change or advance in order to achieve this. We will develop this at the hand of the different built environment phases.
- Conception and design phase: A circular approach to building and rehabilitating starts at the design stage. The reusability of a construction material depends not only on characteristics inherent to it, such as its durability and sustainability, but also to the way they are handled and installed on site. If for example the joints are made with cement they may be more difficult to disassemble than if they are made with bolts. Therefore the design decisions should not only focus on the type of materials being used but also in the building techniques that will be employed.
  - Construction and rehabilitation phase: In order for construction materials to be recuperated there are several actions we need to consider. Firstly, we need to employ adequate techniques to guarantee the materials are not damaged, mixed or can be easily repaired, this means advancing more efficient dismantling and waste separation techniques, as well as developing better procurement standards. Secondly, we need to establish where they are going to be stored. We need to think efficiently in terms of logistics, how can we reduce transport, time and energy costs. If the materials are going to be reused in the same neighborhood, a temporary stock place on site may be recommended, while in other cases a reuse and recycle platform in between neighborhoods may work better. Third, we need to develop a system to track where materials are stocked and where they can go, a sort of digital inventory that can be easily accessed by the interested actors. Fourth, inside the storage places materials need to be sorted. If they are reusable, they need to be cleaned out and repaired. If recyclable, we may need to send them to the platforms where they are going to be processed. Lastly, we need to guarantee the quality and reusability of these materials by establishing guidelines and targets for high-value reuse and recycle.<sup>9</sup>
  - Use phase: Certain recuperated construction materials may no longer be reusable or recyclable in new or rehabilitated buildings, but may be repurposed to build street furniture or as paving

<sup>9</sup> Circle Economy, TNO, & Fabric. (2016). Circular Amsterdam. A vision and action agenda for the city and metropolitan area (Rep.). Retrieved September 20, 2020, from <https://www.circle-economy.com/resources/developing-a-roadmap-for-the-first-circular-city-amsterdam>



Figure 9. Dismantling process of North Station in Brussels. Retrieved from Rotor by RotorDC, 2019, <http://rotordb.org/en/projects/rotor-dc-reuse-made-easy>

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for streets and squares. Inhabitants could participate in this process, learning new techniques and taking responsibility for the renovation and maintenance of their public spaces. Furniture could also be built from these recuperated materials for schools, local businesses or the refurbishment of ex-industrial sites. Later on, the inhabitants could organize themselves independently and install their own workshops of furniture made out of recuperated materials.

- **Scaling phase:** It is important that there is a free flow of construction materials between nodes, there may be neighborhoods that are planning plenty of demolitions but are not ready yet to start constructing, while others may need only to rehabilitate some buildings. The materials of one neighborhood may therefore be employed more efficiently in the neighborhood next door. The open database mentioned in the vision is key for facilitating this material exchange. Enough information should be included in the database, such as pictures, dimensions, location, pieces in stock and price. There already exist interesting platforms doing this around Europe, this is the case of Raedificare<sup>10</sup> in Marseille and RotorDC<sup>11</sup> in Brussels. Apart from creating a database, they also give assistance to interested buyers. This assistance and expertise side of the business still needs to be developed in Marseille, but interesting collaborations could emerge from working with already existing actors.



<sup>10</sup> Raedificare. (2019). Le réemploi des matériaux de construction du bâtiment. Retrieved September 11, 2020, from <https://raedificare.com/>  
<sup>11</sup> Rotor Deconstruction. (2020). Rotor Deconstruction. Retrieved October 15, 2020, from <https://rotordc.com/>

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2. Household inert waste: According to the Environmental Agency of France (Ademe) household waste in France accounts for 39 millions of tonnes per year or 580kg/hab, households are responsible for 9% of all waste produced in France. From this waste 67% is inert waste, it includes paper, glass, plastics, textiles and other types of waste. Although household consumption has been increasing, household collected waste decreased from 2010 until 2015 but seems to be increasing more rapidly again. The reuse sector is growing each year a bit more, in 2017 1 million tons were recuperated while in 2014 only 780.000 tons.<sup>12</sup> Even so, there are many practices still hampering the progress of the reuse and recycle sector; 48% of household waste is still recollected by the Municipalities unsorted of which 68% is incinerated and 24% stocked in landfills, this means once the waste is not sorted by the households, the municipalities don't invest in their sorting for reuse or recycling. On top of that, the current sorting system only recovers 21% of household waste, this means the current system is not effective nor efficient and is in need of reformation. The nodes should focus therefore on developing local strategies to reduce this material stream as well as to potentialize its valorization.

● Conception and design phase: The way a building is designed can difficult or facilitate the recollection and sorting process of household waste. Certain housing states in the northern districts tend to concentrate more than 600 dwellings, imagine all the waste these families produce. When starting a renovation process it is therefore important to examine as well how effectively and efficiently the waste management system of the complex works. Together with the inhabitants strategies should be developed to facilitate this process. There may be for example a lack of space to place the different containers, or containers may be too far away for certain families, these are problems that can be solved through design. Other problems may be more related to a lack of information or awareness, these problems may need to be tackled through more social approaches.

● Construction and rehabilitation phase: Although the reuse of building materials for construction and rehabilitation seems to be more efficient and logical, there is great potential in the recycling of inert household waste as construction materials. This is a sector already under development in different parts of Europe. There exists for example NewspaperWood, developed in Norway from the combination of newspaper and solvent, creating a similar product to a wooden plank that is waterproof and flame retardant.<sup>13</sup> Another interesting example is Recy-

12 ADEME (Ed.). (2020, April). Déchets Chiffres-clés. L'essentiel 2019 (Rep.). Retrieved September 18, 2020, from <https://www.ademe.fr/dechets-chiffres-cles>

13 NewspaperWood. (2020). NewspaperWood About. Retrieved October 5, 2020, from <https://newspaperwood.com/about/>

block, developed by the Dutch designer Gert de Mulder, it is a rectangular translucent block made out of heated and pressed plastic wrappings otherwise impossible to recycle that can be used to make dividing walls or furniture.<sup>14</sup> There are infinite possibilities under development where experimentation and innovation play a very important role. Integrating these types of materials in the construction process or providing the resources to achieve this are two possible paths for this material stream.

- Use phase: Part of what we call household waste is not paper, plastic and glass, but also electronic and electric appliances, clothes and textiles, and furniture. These items may not need to go to a recollection center somewhere in the city but be actually recuperated and valorized in the neighborhood. To begin with, many electronic and electric appliances may just need to be repaired to extend their use, while the ones no longer repairable may still have components that can be remanufactured or refurbished. With the right training and skills, some inhabitants could start their own repairing and remanufacturing businesses. The second-hand industry in clothes, furniture, books and decoration items is also something that can be developed at a local scale. There could be markets organized where the inhabitants could trade, sell and buy these items or even permanent locals where these activities could happen. The valorization of household waste could be one of the key resources needed to activate a local circular and sustainable economy that brings new value and skills to the community.
- Scaling phase: Reducing the amount of household waste, valorizing it locally and raising awareness will help to increase the capacity of the municipality in managing and sorting waste. Also by supporting the use and innovation of recycling waste materials as construction materials may incentivize different industries to participate in this process as the market for these products will be expanded, other actors that may want to participate are schools and universities where this type of materials and knowhow may already be under development.

### *Biological materials and flows*

3. Household biodegradable waste: From the 39 millions of tonnes of household waste produced in France every year, 33% is biodegradable waste.<sup>15</sup> In 2013 a national pact was signed to reduce food waste by a half by 2025.<sup>16</sup> This pact not only

14 MaterialDistrict. (2014, January 31). Recy-Block. Retrieved October 19, 2020, from <https://materialdistrict.com/material/recy-block/>

15 ADEME (Ed.). (2020, April). Déchets Chiffres-clés. L'essentiel 2019 (Rep.). Retrieved September 18, 2020, from <https://www.ademe.fr/dechets-chiffres-cles>

16 Direction Générale de l'Alimentation. (2020). Pacte National de Lutte Contre Le Gaspillage Alimentaire 2017-2020 (France, Ministère de l'Agriculture et de l'Alimentation, Direction Générale de l'Alimenta-

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includes households and restaurants, but also the production, transformation and distribution side of the food sector. As the vision is mainly based on the neighborhood scale, we will focus only on household waste and how the built environment can host certain activities to valorize and use more efficiently this flow.

- Use phase: Consumption and production in some degree of food will mainly happen at this phase. In the conception and design phase it may be important to start identifying if the community would be interested in starting certain food related activities, this could take place in underused open areas, rooftops or even parks. Urban farming is still under development, but overall in Europe and France interesting initiatives are emerging. Paris is even planning to open the biggest urban farm in the world on top of the Paris Exhibition Center that will measure more than 14.000m<sup>2</sup>.<sup>17</sup> And in Marseille, collective gardens in the different neighborhoods are being developed with the participation of the inhabitants. Another interesting initiative of the Metropolis has been the placement of collective compost hubs<sup>18</sup> in the city center of Marseille. These collective compost hubs could also be placed in the Northern districts, as they could help regenerate the soils of eroded open areas that want to be vegetated as well as as fertilizer for the collective gardens.
- Scaling phase: If different housing estates become interested in the development of their own collective gardens, local production could start to expand to a degree where people can start trading their products. This of course would require certain coordination and organization to be achieved, but there may also be some interest from schools and restaurants to use these locally produced products for their meals. There could also be knowhow exchange between the nodes on cultivating, cropping and processing techniques. There are plenty of opportunities to be discovered in this realm, but the interest of the inhabitants and a coordinating body are crucial to achieve this.

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tion). Retrieved 2020, from <https://agriculture.gouv.fr/pacte-national-de-lutte-contre-le-gaspillage-alimentaire-les-partenaires-sengagent#:~:text=Le%20Pacte%20national%20de%20lutte,%C3%89tat%20pour%20relever%20ce%20d%C3%A9fi.>

17 FRANCE 24. (2020, June 22). Farm on a Paris rooftop: Urban farm aims to be Europe's largest. Retrieved October 19, 2020, from <https://www.france24.com/en/20200622-farm-on-a-paris-rooftop-urban-farm-aims-to-be-europe-s-largest>

18 Ochier, V. (2017, May 05). Compostage collectif en centre ville. Retrieved September 19, 2020, from <https://www.economiecirculaire.org/initiative/h/compostage-collectif-en-centre-ville.html>



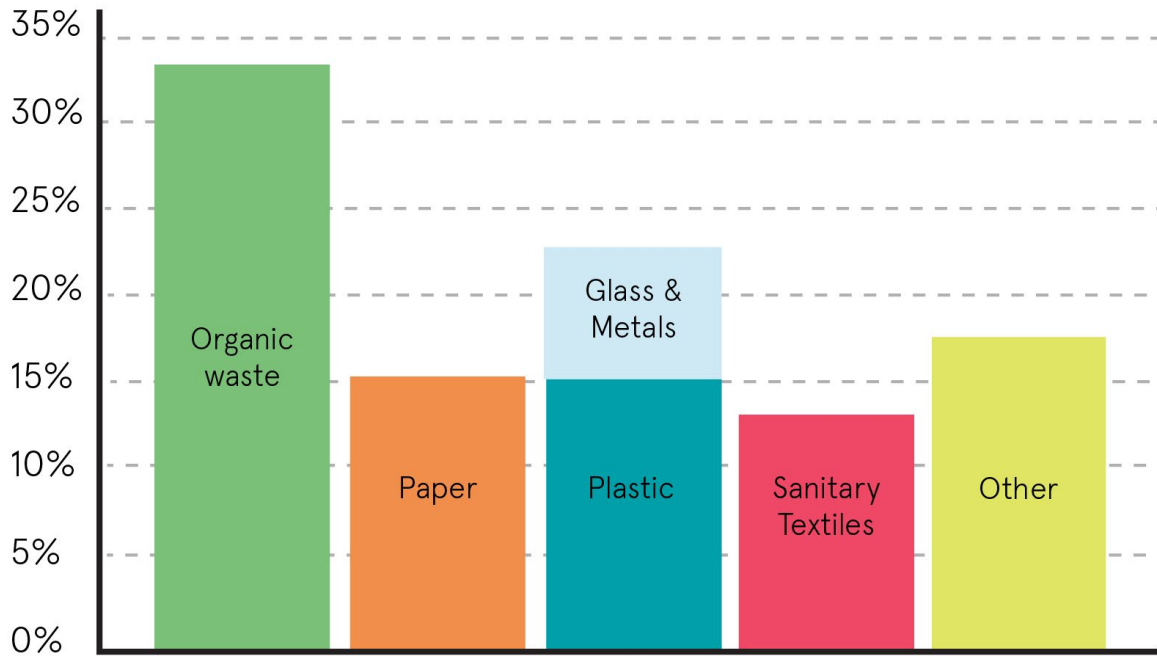
Figure 9. Household waste composition in France as for 2017. Adapted from Déchets chiffres-clés - L'essentiel 2019 by Ademe, 2020, <https://www.ademe.fr/dechets-chiffres-cles>



Figure 10 & 11. Community Compost Hubs in Marseille. Retrieved from Territoire Marseille Provence by Métropole Aix-Marseille-Provence, 2020, <https://www.marseille-provence.fr/index.php/reduire-ses-dechets/le-compostage>



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4. Energy: One of the fundamental characteristics of a circular economy according to the Ellen MacArthur Foundation is the shift to an economy powered by renewable energy in order to decrease resource dependence and increase the resilience of the system.<sup>19</sup> In France, there has been a slight increase in the use of renewable energy from 6,6% in 2007 to 10,7% in 2017. Nevertheless most energy consumption still comes from nuclear energy, fossil fuels and gas.<sup>20</sup> The share of energy expenditure in the consumption of households was 8.5% in 2017. Households energy consumption has also increased significantly compared to other sectors, going from 43% in 1990 to 46% in 2017 being the biggest energy consuming sector above transport (43%) and industry (9%).<sup>21</sup> The Metropolitan Climate Plan takes the challenge to become by 2030 a carbon neutral as well as an energy positive metropolis. In terms of the built environment it aims to reduce its energy consumption by renovating 3% of the housing stock, which means 20 000 housing units per year and 90% of all tertiary buildings built before 2012 by 2050. It wants as well to produce all the energy it consumes which means more investment in renewable energy and reducing by 50% energy consumption.<sup>22</sup> Let's now examine how the different phases of the built environment can contribute to this.

● Conception and design phase: One key issue is to think of efficient and sustainable ways to increase the energy performance of buildings without damaging the environment. In a circular regeneration process we need to think how energy and material flows are being used along the whole cycle. We start therefore already examining how the material was produced to what the actual reuse of this material, once the building is in need of renovation or can no longer be used, can be. For example, certain synthetic isolation materials may improve the energy performance of buildings but once the buildings come to the end of their lifecycle these materials are not yet able to be reused

19 Ellen MacArthur Foundation. (2015). Towards a Circular Economy: Business rationale for an accelerated transition (Rep.). Retrieved 2020, from <https://www.ellenmacarthurfoundation.org/publications/towards-a-circular-economy-business-rationale-for-an-accelerated-transition>

20 Ministère de la Transition Écologique et Solidaire. (2019, May). Chiffres clés des énergies renouvelables - Édition 2019 (Publication). Retrieved 2020, from <https://www.statistiques.developpement-durable.gouv.fr/chiffres-cles-des-energies-renouvelables-edition-2019>

21 Ministère de la Transition Écologique et Solidaire. (2019, September). Chiffres clés de l'énergie - Édition 2019 (Publication). Retrieved 2020, from <https://www.statistiques.developpement-durable.gouv.fr/chiffres-cles-de-lenergie-edition-2019>

22 Métropole Aix Marseille Provence. (2020, March). Régénération Plan Climat Aix-Marseille-Provence (France, Métropole Aix-Marseille-Provence, Agenda Environnemental). Retrieved September 21, 2020, from <https://www.ampmetropole.fr/prevoir-anticiper-prevenir-pour-preserver-et-sauvegarder>

and cause a lot of damage to the environment, the same applies to their production process that is highly energy and material intensive, in a circular regeneration approach we would then examine other types of isolation materials that could be reused or are biodegradable. A key tool to facilitate this process is introducing life-cycle assessment procedures and standards for the choice of construction and renovation materials. In terms of energy production, there is also a lot of potential to make buildings energetically self-sufficient, although this requires more investment. One possible path could be installing solar production systems on the roofs or even on the walls, the solar industry has been improving greatly in the last decades, so there are certainly a lot of applications with which we can experiment.

- Construction and rehabilitation phase: When comparing deconstruction to demolition techniques the biggest difference in terms of environmental impact comes from the possibility that deconstruction brings to effectively reuse and recycle the materials being dismantled, in other words being able to replace the use of new construction materials.<sup>23</sup> Deconstruction does require more time and is more labour intensive, it is calculated that it requires up to 6 times more labour, but this is not per se negative in the case of Marseille where the unemployment rate is 18,30% as for 2016 and even higher in the Northern districts 24,25%.<sup>24</sup> The cost of deconstruction is also higher, although this scenario may easily change in the future as disposal costs are increasing due to European regulation and the development of the reuse and recycling industry and market could make deconstruction more interesting for developers. Therefore in order to make significant energy reductions in this phase the key priority should be to develop better and more attractive deconstruction as well as reuse and recycling practices in the building sector.
- Use phase: What concerns energy savings in this phase, there are different paths to be followed. Firstly, when sharing spaces and appliances consumption can be reduced, this could be specially interesting for fragile communities as they may all need access to certain commodities but not per se be able or interested in purchasing them. Second, there are the savings made possible through renewal and retrofitting, technology is advancing at a fast pace and many electric appliances have become much more energy efficient, light bulbs are a good example of this, LED's and CLD's are 25% to 80% more efficient than traditional

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23 Coelho, A., & Brito, J. D. (2013). Conventional demolition versus deconstruction techniques in managing construction and demolition waste (CDW). *Handbook of Recycled Concrete and Demolition Waste*, 141-185. doi:10.1533/9780857096906.2.141

24 Insee. (2015). Données sociodémographiques par quartiers et arrondissements de Marseille (de 1982 à 2012). Retrieved March 4, 2020, from <https://www.insee.fr/fr/statistiques/2385003#consulter>.

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incandescent lighting and can last 3 to 25 times longer.<sup>25</sup> Also when buildings are retrofitted energy demand is lowered by increasing the thermal capacity of the building (more isolation, better windows) as well as installing more efficient heating and ventilation systems. A last step concerns energy production already tackled in the conception and design phase. Inhabitants could become prosumers, this entails being a producer and consumer at the same time. It is important that if production is started, people are aware of how much they are producing and consuming so that they can organize and take the right measures to guarantee the correct work of the system. This production could actually create value for the inhabitants in the form of energy savings or if they become energy positive, they could actually sell this energy to interested parties.

- Scaling phase: The way the system is organized as a distributed system where each node nurtures the system, could have a major impact in terms of energy. If renewable energy production is activated in the different nodes and they are then connected through microgrids, we could start talking about a distributed polycentric renewable energy system.<sup>26</sup> Eventually, this would mean decoupling from the centralized energy system and the development of autonomous but interdependent energy communities. For this to happen, there still needs to be organizational, technological and physical reforms to be made, but it is certainly an interesting possibility to explore if we want a more sustainable and resilient future.
5. Water: The Metropolis is responsible for the supply, distribution and sanitation of this valuable resource. 80% of the Metropolitan population is supplied by surface water.<sup>27</sup> In general we cannot say Marseille has a problem of water scarcity, but water pollution and flooding does seem to be more and more recurrent problems due to the increase of urban areas and climate change. How from the built environment cycle perspective can we help to mitigate these two issues.

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25 Office of Energy Efficiency & Renewable Energy. (2019). How Energy-Efficient Light Bulbs Compare with Traditional Incandescents. Retrieved November 19, 2020, from <https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/how-energy-efficient-light>

26 Moroni, S., Antonucci, V., & Bisello, A. (2016). Energy sprawl, land taking and distributed generation: Towards a multi-layered density. *Energy Policy*, 98, 266-273. doi:10.1016/j.enpol.2016.08.040.

27 Métropole Aix-Marseille-Provence. (2019, November 13). Garantir, assurer, préserver, pérenniser la ressource en eau... protéger l'environnement. Retrieved November 3, 2020, from <https://www.ampmetropole.fr/garantir-assurer-preserver-perenniser-la-ressource-en-eau-protger-lenvironnement>

- Conception and design phase: Urbanization usually entails land-taking and sealing of former green or permeable open areas. When starting the conception phase of a regeneration process, it is important we build upon already existing structures and avoid more land-taking. The already existing open areas should also be regenerated in such a way that permeability is increased. In case of flooding, these open areas will help us absorb more easily the run-off water and increase the resilience of the built environment. Another possible solution that can be determined in this phase is if rainwater recovery will be enabled, this will reduce pressure on the metropolitan water system and will raise the self-sufficiency of the built environment.
  - Use phase: It is important awareness is raised on the responsible use of water but also on how to avoid polluting it more to ease the sanitation processes that happen at the Metropolitan scale. If a rainwater recovery system is implemented, this water could be used to water the open areas, the shared gardens or even for the maintenance of the buildings. Other applications could be inside the dwellings for uses that don't require potable water, such as flushing toilets or cleaning.
  - Scaling phase: Overall the resilience of the territory will be increased as more and more nodes develop their own water strategies. In terms of flooding mitigation, the more areas are made permeable and land-taking is avoided, the more the territory will be able to tackle this issue. What concerns self-sufficiency, the more the nodes are able to develop their own rainwater recovery systems, the more they will be able to smartly use this resource to regenerate their soils and reduce their dependency on the metropolitan water supply.
6. Soil and Vegetation: These resources are closely related to the spatial resource of open areas. The relevance of these particular resources relies in the way their regeneration can bring major environmental and social benefits to the communities and the territory as a whole. Having accessible biodiverse green areas improves the life quality of the inhabitants but also the resilience of these places against climate change. Landscape is considered in the metropolitan plan one of the major sources for new prosperity<sup>28</sup> and one of the main goals of the PLUi is to implement an ambitious & virtuous development strategy based on principles of sustainable development and preservation of the environment.<sup>29</sup> Let's examine how the circular regeneration vision

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28 Métropole Aix-Marseille-Provence. (2018, June 28). Ambition 2040 12 Engagements Pour Une Métropole à Vivre (France, Métropole Aix-Marseille-Provence). Retrieved September 19, 2020, from <https://www.amp-metropole.fr/projet-metropolitain>

29 Métropole Aix-Marseille-Provence. (2019, December 19). Projet d'aménagement et de Développement Durables (France, Métropole Aix-Marseille-Provence, Territoire Marseille Provence). Retrieved March 11, 2020, from <https://www.ampmetropole.fr/urbanisme-intercommunal-plui>

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through its different phases can contribute to these goals.

- Conception and design phase: We need to examine which tools the community has or can develop to help regenerate the soils and vegetation of the neighborhood. It is important that we not only envision the regeneration of individual pieces of land, but see them as part of an ecosystem. This means we need to develop an environmental regeneration strategy for the neighborhood, without forgetting that the neighborhood is also part of a bigger system. There are certain key principles that can be applied to the regeneration strategy, such as increasing biodiversity, unsealing open areas and connecting through ecological corridors the different areas.
- Use phase: The sustainable management and maintenance of soils and their vegetation should be advanced from a collaborative perspective. It is important to identify how the community can develop local strategies to protect while at the same time benefit from these green areas. There are interesting examples already taking place in Marseille where different collectives with governmental support are regenerating neglected or underused open areas with the help of local communities. Such is the case of Parc Foresta, a former clay quarry of 16 hectares bought since 2015 by a group called Résilience conformed by different associations that seeks "to imagine and test the idea of a park, a leisure space but also a tool to produce, share and learn from local resources and with those who live there".<sup>30</sup> The emerging uses of the park therefore combine environmental, economic and social aspects. There is space for "sport and hiking, botany and gardening, play and exploration, animals and biodiversity, but also for local production through permaculture and traditional agricultural techniques".<sup>31</sup>
- Scaling phase: As mentioned in the conception and design phase, the environmental regeneration strategies applied in each node are part of the environmental regeneration strategy of the whole system. There are different scales that should be tackled in order to regenerate our natural environment that the built environment is part of. Therefore we should always keep in mind the regeneration also depends on the links we make between the nodes as well as the already existing natural parks. There are open areas that concern more than one neighborhood, such is the case for example of Parc Foresta, these areas demand more coordination and resources, but have the capacity to become key places for connecting different actors and communities as well as to promote innovative solutions.

30 YesWeCamp. (2018, December 13). L'histoire du site. Retrieved September 19, 2020, from <https://parcforesta.org/index.php/2018/12/13/lhistoire-du-site/>

31 YesWeCamp. (2018, December 13). Axes de réflexion. Retrieved September 19, 2020, from <https://parcforesta.org/index.php/2018/12/13/axes-de-reflexion/>



Figure 12 & 13. Activities in Parc Foresta. Retrieved from Yes We Camp by Yes We Camp, 2020, <https://yeswecamp.org/foresta/>

## Chapter 5. Initiating the Circular Regeneration Labs



## 5.1 First stage of analysis: Identify local resources and opportunities

**People:** The amount of engagement, collaboration, knowledge, information and capacity needed to achieve the vision underline the importance of involving the local inhabitants and actors from the beginning of the process. Without their involvement there is no chance of actually being able to embed and nurture a circular regeneration process into the territory. Throughout the framework we will explain the role the inhabitants and local actors can take to actually activate and develop the circular regeneration process of each node. As for now, we will focus on two main aspects that need to be identified from the beginning to initiate the process.

1. Local associations and collectives: They may have formed spontaneously or through the implementation of other programs, the important part is they represent the local population and not the interests of some party or industry. These groups already are a form of social organization that can work as a mediator between the goals of the program and the needs and aspirations of the inhabitants. It is important that we establish strong partnerships with these groups and give them the right tools in order to be able to start the regeneration process.
2. Local seeds of innovation: As circular economy is a young and evolving topic, finding already existing circular initiatives in the territory may be difficult. Nevertheless, if a neighborhood already has this type of initiatives, they can be engaged from the beginning as their expertise will be much needed to understand how other initiatives can be developed. They also are proof of an already existing interest in circularity and can help engage new actors and people.



Figure 14. Resources to analyze in Circular Regeneration Labs.

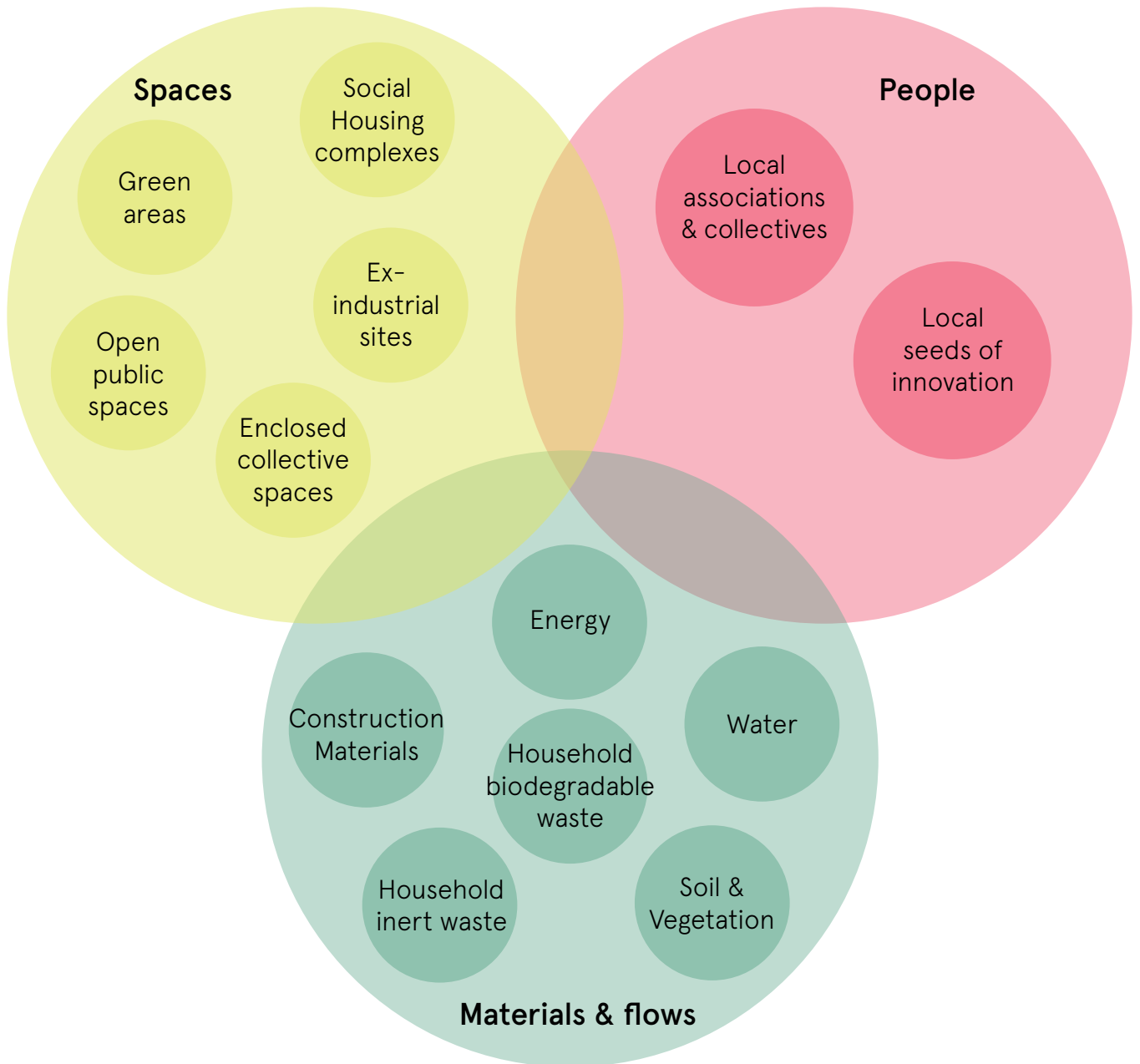
### 5.1.2 Classify the identified resources

Once we have located the local resources that are available in the neighborhood, we can start classifying them according to their current state. Based on their classification we will know if they need to be regenerated, how available and accessible they are and if they are already being used in the neighborhood. This information will be key in the next step where we analyze their potential and difficulties to be integrated in the regeneration process.

**Spaces:** There are different aspects that need to be taken into consideration to understand the current state of the different spatial resources. The following ones are the most relevant:

- Ownership: Some spaces may be a private asset while others a public one or even a partnership between both. Knowing who owns a space allows us to know who has the responsibility and the interest to be involved in the regeneration process. It also gives an insight on how complex the regeneration process will





## 5.1 First stage of analysis: Identify local resources and opportunities

be, as more owners imply the need for more organization and coordination.

- Intensity of use: This gives us information on both the relevance of these spaces in the neighborhood but also the type of process that will need to be followed in order to regenerate them. Take for example one of the social housing estates, their use is highly intensive as they are the places where people live and spend most of their time. This means they are very relevant, but also that during the rehabilitation process if this is done thoroughly, the residents will need to be very well informed as well as the fact that they will need a temporary place to stay. The Metropolis already has a program to accompany inhabitants during this process called Espace accompagnement habitat (Habitat Support Space) where they support, inform and advise the inhabitants during the rehabilitation and energy retrofitting process of their dwellings.<sup>32</sup>
- Maintenance: How degraded or well-maintained a space is certainly related with both the use and ownership of the place. To stay with the example of the social housing estate, the owner that is mostly a social landlord rents the different dwellings to a very diverse public, some of them may take better care of their dwellings than others, this means some of them may be more in need of a renovation than others. He therefore may decide to postpone the renovation works until he gets public national funding to do this. This creates a vicious cycle where no one takes responsibility for the maintenance of the buildings and they might even end-up being demolished and creating tons of waste instead of procuring a regular maintenance that allows the building to be rehabilitated in a less costly way. This means that when we analyze the maintenance degree of a place, we also need to ask ourselves how this maintenance can take place from a more local collaborative perspective and not wait for big national programs to renovate these places, as this may mean more resources, waste and a shorter built environment cycle.

**Materials and flows:** Many of these resources need to go through a process in order to be valorized in the built environment cycle. Think about the construction materials that need to be dismantled from the existing buildings, and then stored, cleaned and repaired in order to be reused. The same applies for biodegradable household waste, that needs to be recollected and composted in order to be used as fertilizer for the regeneration of soils. We will therefore focus on two main aspects.

- Availability: This refers to how present the resource is in the neighborhood. For example if no building is set to be dismantled, then the construction materials will be scarce and may need

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<sup>32</sup> Métropole Aix-Marseille-Provence. (2020, October 15). L'Espace Accompagnement Habitat. Retrieved November 19, 2020, from <https://www.ampmetropole.fr/espace-accompagnement-habitat>

## Chapter 5. Initiating the Circular Regeneration Labs

to come from other nodes. Another example may be soil and vegetation, the neighborhood may have an abundance of permeable open areas that need to be regenerated, so there may be a big interest to recollect biodegradable household waste to be transformed into compost.

- **Accessibility:** This relates to the complexity of the processes that are needed in order to get hold of the resources. For instance in the case of renewable energy solar panels need to be installed which entails economic, technical and physical efforts making the resource less accessible. In comparison the recollection of household appliances no longer in use to be repaired and resold entails less effort and is therefore more accessible.

**People:** In the case of our human local resources, the focus lies more in how embedded they are in the territory and how much experience and knowhow they have. Therefore the three aspects we will look at are the following:

- **Formation:** Refers to the time they were established as well as to how they originated. We need to know how recent they are as well as if they were formed from a bottom-up or top-down perspective. A bottom-up perspective would mean that the initiative or association resulted from the self-organization of local inhabitants, while a top-down perspective means they were formed through an institutional program or plan.
- **Engagement:** It helps us measure how active the association or initiative is in the community. There may be associations that are looking out for solutions and initiatives to respond to the needs and aspirations of the community, while others are only active now and then when for example the institutional program demands it.
- **Connectivity:** Examines how the associations or initiatives are connected with each other. It may be that the association is only connected to other local associations, while in other cases there may be associations linked to supra-local actors. If the association already has a big network, this will help us initiate the regeneration process more easily as we can automatically engage more actors from the beginning.

## 5.1 First stage of analysis: Identify local resources and opportunities

### 5.1.3 Potentialize the classified resources

This action is meant to evaluate based on the previous classification what are the challenges and opportunities to integrate and valorize the local resources. This step should be used as a tool to guide the development of the regeneration process as from here we already can start picturing how the different resources can be activated and which resources will have a bigger impact for the regeneration of the neighborhood. These resources will give a certain identity and approach to the node, but this is further defined and detailed in the next stages. We will use the same classification categories to underline the possible challenges and opportunities for each resource.

**Spaces:** The aim is to know which spaces are in substantial need of regeneration, but also which ones are the easiest to activate. These two types of evaluations may differ, as for example an already green open space may be the easiest to regenerate while a degraded social housing estate may be in the greatest need for renovation, but the most complex to activate.

Categories	Opportunities	Challenges
<b>Ownership</b>	<ul style="list-style-type: none"> <li>• Public funds and programs to regenerate public assets.</li> <li>• Already existing interest of owners to renovate.</li> </ul>	<ul style="list-style-type: none"> <li>• Coordination and organization of different owners.</li> <li>• Lack of interest and funds to participate from the owners.</li> <li>• Mostly tenants with few resources living in the housing estates.</li> <li>• Vacant spaces with no clear owner.</li> </ul>
<b>Intensity of Use</b>	<ul style="list-style-type: none"> <li>• Intensively used spaces due to central location and interest.</li> <li>• Accessible underused or vacant spaces with potential to host activities.</li> <li>• Temporarily active spaces where a lot of people gather.</li> </ul>	<ul style="list-style-type: none"> <li>• Underused spaces due to lack of access and interest.</li> <li>• Abandoned spaces due to insecurity.</li> <li>• Intensively used spaces that are difficult to not use during the renovation process.</li> </ul>
<b>Maintenance</b>	<ul style="list-style-type: none"> <li>• Degraded spaces with strong community engagement.</li> <li>• Well-kept spaces with lack of activities.</li> </ul>	<ul style="list-style-type: none"> <li>• Degraded spaces due to mismanagement and lack of interest.</li> <li>• Degraded spaces due to conflictual agreements between owners and users.</li> </ul>

## Chapter 5. Initiating the Circular Regeneration Labs

**Materials and flows:** For this type of resources the opportunities and challenges concern how to better recover or regenerate these resources and which are the ones the easiest or more difficult to activate;

Categories	Opportunities	Challenges
<b>Availability</b>	<ul style="list-style-type: none"> <li>• High quantity of buildings to be dismantled.</li> <li>• Use of construction techniques that allow easy dismantling and disassembling of components.</li> <li>• Abundance of permeable and green areas.</li> <li>• Already existing local renewable energy production.</li> <li>• Already existing compost hubs.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of buildings to be dismantled.</li> <li>• Already renovated buildings where no material recuperation was implemented.</li> <li>• No waste separation by households.</li> <li>• Abundance of very degraded sealed soils.</li> </ul>
<b>Accessibility</b>	<ul style="list-style-type: none"> <li>• Already existing capacity to separate and recollect household waste.</li> <li>• Already existing capacity to reuse and repair household inert waste.</li> <li>• Proximity to open areas that can be used as stock, storage and repair spaces for recuperated construction materials.</li> <li>• Existing initiatives and funds to reduce food and inert waste.</li> </ul>	<ul style="list-style-type: none"> <li>• Already demolished buildings where no material recuperation was implemented.</li> <li>• Use of construction techniques in buildings that don't allow dismantling or disassembling.</li> <li>• No access to storage, sorting and repairing facilities of construction materials.</li> <li>• Lack of funds to install renewable energy production systems.</li> </ul>

**People:** The analysis should help to establish which initiatives and associations have the potential to become key partners in the regeneration process. Some initiatives may be used as best practices, while others may need some support to have a bigger impact or consolidate;

## 5.1 First stage of analysis: Identify local resources and opportunities

Categories	Opportunities	Challenges
<b>Formation</b>	<ul style="list-style-type: none"> <li>• Recently created circular initiatives that can be replicated in other parts of the neighborhood.</li> <li>• Well-established local associations that have great knowledge of the neighborhood.</li> </ul>	<ul style="list-style-type: none"> <li>• Formerly existing circular initiatives that failed and had to close due to lack of funds or interest.</li> <li>• Artificially created associations with no common interests or goals.</li> </ul>
<b>Engagement</b>	<ul style="list-style-type: none"> <li>• Strong associations that represent a diversity of people.</li> <li>• Circular initiatives that have had a big impact on the community.</li> </ul>	<ul style="list-style-type: none"> <li>• Small associations that only represent a very reduced number of people.</li> <li>• Conflictual interests inside the associations or initiatives.</li> </ul>
<b>Connectivity</b>	<ul style="list-style-type: none"> <li>• Local associations that are connected to other local associations inside or outside the neighborhood.</li> </ul>	<ul style="list-style-type: none"> <li>• Isolated initiatives that lack support and are not known in the neighborhood.</li> </ul>

## 5.2 Second stage of analysis: Prepare the field

This stage is based on building engagement and empowering the local inhabitants. It happens once the local resources have been identified as this information needs first to be made visible and accessible in order for people to have the right tools to start the regeneration process. The three lines of action are aimed to go deeper in the empowerment and engagement process, but are based on knowledge and information exchange, sometimes from the people to the experts and institutions, other times from the institutions to the people, others between the different groups of people. We will follow the same structure as in stage one where we explain the three lines of action and how they apply to the different resources.

### 5.2.1 Learn and Share

The aim of this step is to foster information and knowledge exchange between both the local inhabitants and the institutional instances. Different information streams are activated in this step. The first one concerns understanding the needs and aspirations of the local inhabitants. The second one is meant to share the knowledge and information created through the first stage of analysis. The third

## Chapter 5. Initiating the Circular Regeneration Labs

one is based on presenting to the local inhabitants already existing circular initiatives, as the concept of circularity may be new and complex, showing how it has been applied and what it can entail is a very important tool to help the inhabitants imagine how it could be applied in their neighborhood.

**Spaces:** Determining which spaces are best for this information exchange to happen may facilitate or difficult the process. This choice may be taken together with the local associations, as they may already have built partnerships with existing places. Nevertheless, it should be a space that is accessible, frequently used and where people feel comfortable. Schools or social centers could be enabled for this, or public spaces near facilities or services. As we are talking of a whole neighborhood, there may be different spaces active at the same time. In these spaces workshops and events will take place where people can share their knowledge as well as learn about the local resources available in their neighborhood and talk to people already active in circularity initiatives. It is also recommended to make a digital platform that gathers the information on the local resources, as well as the best practices so that all inhabitants can get access to it, even if they don't participate in the workshops and initiatives.

**Materials and flows:** During the workshops the information on the local resources can be refined, as in the first stage certain assumptions could have been made. For instance, there may be already existing initiatives in the neighborhood that valorize household waste that we may not be aware of. We should also find ways to quantify how much of the resources are currently being wasted, that could be valorized by the community. The more we make visible our waste, the more people will want to take action. The platform is therefore a work in progress that keeps building itself the more information we gather. There may be information that can only be made available through the participation of experts, for instance to know how much construction materials can be reused, a diagnosis needs to be made by a specialized instance. Once this is done, this information should be part of the platform's database.

**People:** Associations and circular initiatives are asked to invite people to participate in the different workshops, as well as to inform them on the existence of the platform. Circular initiatives will also be invited to share their knowledge and experience in the different workshops and events, as people may be curious about knowing more about the way they work and how they have been created.

## 5.2 Second stage of analysis: Prepare the field

### 5.2.2 Train and Exchange

This step is meant to introduce further the inhabitants to the concept and practices of circularity. If we want the local inhabitants to become active participants, there need to be opportunities to acquire new skills and knowledge. Specially if the goal is to develop a reuse and recycling industry that encompass different skills and awareness. There are different processes entailed in this sector where people could participate, as it goes from the dismantling and sorting to the repairing and recycling. Each process entails a different set of skills that could provide different types of jobs to the community.

**Spaces:** The training workshops have two goals, to help the inhabitants acquire new skills as well as to activate underused spaces near the social housing complexes. As many of the skills needed are mainly developed by doing, the workshops will be mainly focused on the actual regeneration of open and collective spaces. There is space for experimentation and exchange during these workshops, as the workshops are meant rather as a testing ground for new ideas. Therefore the products of the workshops could be used as furniture for public spaces or events or to refurbish collective spaces.

**Materials and flows:** There may be other nodes where renovation has already started, the recuperated materials of other sites may be used during the training workshops once the inhabitants feel comfortable to start experimenting with them. The first studies could be made to understand how they could be reused, although this will be further developed in the next step. Other important activities that could start taking place are small-scale sorting initiatives in the different housing complexes, this could give us an insight of what type of materials can be gathered and what destiny could be given to them. We can determine if the valorization can be done locally, or if we need to send certain materials somewhere else in order to valorize them.

**People:** In certain neighborhoods, people may already have experience in self-renovation or repairing techniques. This gives us a head start in the regeneration process as human capital takes time to be developed. These people will be invited to share their knowledge with other inhabitants during the workshops, they have the potential to become valuable teachers during the whole regeneration process. We can also learn from them what they consider the main difficulties and challenges to repairing and self-renovating and map out together how to facilitate certain processes.



### 5.2.3 Re-imagine and co-design

Once information has been exchanged and gathered, as well as people have acquired more skills and knowledge, we can start collectively envisioning how to activate the resources in a circular way. In this step people are invited to use their imagination, be open to new possibilities and experiment. This step is rather a brainstorming exercise rather than a planning operation.

**Spaces:** We are used to thinking in spaces as only having one function, the idea of this step is to start imagining what type of activities could take place in the different spaces as well as examining interesting combinations. In a sense we are matching needs and aspirations with the different local resources. Think of the different examples we have mentioned throughout the identification stage such as Parc Foresta and La Friche de la Belle de Mai, they both have managed to regenerate an underused or vacant space and bring life to the community through the combination of environmental, social, economic and cultural activities.

**Materials and flows:** With the recuperated material from households and other renovation sites, we can start building prototypes and testing solutions. This stage also allows us to search for new ideas outside the neighborhood, this could be done digitally or physically. The key of this step is to explore and re-imagine how the different materials and components could be reused. For example, the different windows of a renovated building could be turned into a greenhouse or former doors into workshop tables. This step is key to ignite the creativity of the inhabitants and diffuse the experimentation and innovation mentality. Another crucial activity during this phase is to put natural resources on the foreground. The main aim is to raise awareness on how to use these resources more sustainably in order to allow them to regenerate more effectively. The inhabitants will be introduced to different sustainable practices, such as rainwater recuperation, renewable energy production, urban farming and composting.

**People:** Experts will be invited to share their insights with the inhabitants. The sharing could happen in different ways. Forums or more informal talks could be organized for people to present their projects and main learnings. Another possibility would be to organize workshops where people can learn how to apply the experts techniques. It will all depend on the type of experts that will be invited. For example if it is an expert from an urban farm, a workshop could be organized where people already start creating their own urban farm, in comparison if it is an expert from a cultural center a talk may be more appropriate. In this sense this step is also about being open to experiment with different approaches to learning.

The background of the page is a solid light green color. Overlaid on this background are several overlapping circles, each composed of three concentric white lines. These circles are arranged in a vertical chain, with each circle overlapping the one above and below it. The number '6' is centered within the middle circle of this chain.

# 6

## **Activating the Nodes while Consolidating the System**

## Chapter 6. Activating the Nodes while Consolidating the System

The previous two analysis stages should help us gather enough information and knowledge about the neighborhood as well as prepare the local inhabitants to be active participants in the activation and consolidation stage. While the activation stage depends on the evolution and progress of each node, the consolidation stage is achieved through the linking of the different nodes, in other words the system will help sustain and strengthen the different nodes and this will at the same time help consolidate the system. Through this multi-layered approach where both stages interact and reinforce each other we can ensure the continuity of the regeneration program. We will therefore examine the activation and consolidation stage apart, following the same structure as in the previous chapter, where we explain how the different resources –spaces, materials and flows, and people– are enabled in each line of action.

### 6.1 Third stage: Activate resources and people

This stage is about determining how the regeneration process will take place and materializing these actions. For this stage to happen people need to be engaged and empowered, these processes have already started in the previous stages, but we need to keep reinforcing them. Through the different lines of actions we will explain how together with the community the regeneration process is fully set in motion.

#### 6.1.1 Co-develop a regeneration plan

After the brainstorming exercise, a masterplan should be developed together with the community. In the masterplan we should define what actions and projects need to be undertaken, as well as which spaces and resources will be prioritized. This is a crucial step as it will be our main guide during the whole process. It is therefore crucial to build consensus between the different actors and organize the community in such a way that different actions can be coordinated and supervised.

**Spaces | Materials and flows:** The masterplan should be employed as a tool to link and create synergies between the different types of resources. What we mean by these is that certain material resources might help regenerate a space while the rehabilitation of a space might provide us with the needed resources to start the next action. In a sense what we want to create is a chain of actions where one action's output is the input for the next action. Naturally certain actions will happen simultaneously, allowing the whole neighborhood and not just a small part to participate in the regeneration process. An example of what we mean could be that the dismantled and recovered materials of a building under rehabilitation are used to refurbish an ex-industrial site, in this ex-industrial site we set out an urban farm, the vegetables that come from this urban farm are sold to the school's cafeteria and the food waste of the cafeteria is transformed into compost to regenerate an underused green area. The masterplan is therefore not a final result but the design of a regeneration process based on the needs and possibilities of the neighborhood.

## 6.1 Third stage: Activate resources and people

**People:** While developing the masterplan we need to form as well what we call local groups of action. As many actions will be happening simultaneously in different parts of the neighborhood and different actions need to be coordinated in order to give continuity to the regeneration process, these groups will be responsible for the advancement, communication and supervision of the different actions and projects. Ideally the groups will be a combination of local inhabitants, existing associations and experts, although the experts might be shared by different groups.

### 6.1.2 Restore through projects and actions

Once the masterplan has been defined, we can start the regeneration process in the spaces where the identified material resources can be enabled. As the masterplan is designed as a process and not a final result, this line of action is not a step that lasts a certain amount of time but a continuous process that is fed and consolidated at the hand of the next lines of action. Nevertheless we will use this step to clarify what we should take into consideration when starting the regeneration process.

**Spaces:** Different regeneration sites will be chosen to start the process, the choice of these spaces will be based on the previous analysis and the potential these spaces have to set in motion other actions or projects. This should already be decided in the co-development phase. Once these sites are chosen, we gather the needed resources to actually start renovating or regenerating them, this could entail funds, assigning a local action group, physical resources and even locating other spaces where the recuperated resources can go. It is important that we take into consideration that regeneration is a dynamic and open process. The spaces that start the regeneration process might later be transformed into something else as needs and possibilities change and as certain future actions might influence the use and character of these spaces. Hence, it is essential we remain flexible and open to experimentation and adaptations.

**Materials and flows:** As we need to activate and get hold of a different set of material resources, it is important we facilitate certain key processes depending on the nature of the resource. In the case of technical materials we might need to procure and foment their storing, sorting, repairing, tracking and transporting process, in other words coordinating their logistics. As to what biological materials refer we need to integrate sustainable techniques from the beginning in order to be able to use them but at the same time allow them to regenerate. Consider these processes take time, so don't expect to get hold of all the resources simultaneously, but rather keep seeking actions and projects that can provide feedback and inputs for other projects and actions.

## Chapter 6. Activating the Nodes while Consolidating the System

**People:** There are many employment opportunities during the different regeneration projects and actions. As we have mentioned before people's participation is crucial throughout the regeneration process, but their participation should be rewarded. Specially when the different projects and actions are creating value, people should benefit from this value they are helping to create. By examining each phase of the built environment, we will provide a list of the different jobs that could be created throughout the regeneration process. As we will see some of them do require a high level of skills, hence it is crucial capacitation opportunities are enabled for the inhabitants.

Phase	Jobs	Skill level
<b>Conception &amp; Design</b>	• Data gathering and processing	High
	• Digital platform developer	High
	• Communication strategist	High
	• Mediator and coordinator of participation processes	High
	• Research and advice on innovative construction techniques and materials	High
	• Urban planning and design	High
	• Sustainability specialist	High
<b>Construction &amp; Rehabilitation</b>	• Material condition and reusability diagnose and assessment of buildings	High
	• Selective deconstruction and dismantling of buildings	Medium
	• Refurbishment of underused areas as stock, sorting and repair platforms	Medium
	• Storing, sorting and repairing of construction materials for reuse	Medium
	• Quality testing of construction materials for reuse	High
	• Logistics specialist: coordination and communication between different construction sites	High
	• Recycling processes to produce new construction materials	Medium
	• Development and testing of recycled construction materials	High
	• Management of recycling platform	High
	• Rehabilitation and construction works integrating reused and recycled materials	Medium

## 6.1 Third stage: Activate resources and people

<b>Use</b>	• Advice in sustainable practices and techniques	High
	• Installation of sustainable techniques to increase self-sufficiency (rainwater recovery system, solar panels, compost, vegetable gardens)	Medium
	• Maintenance of sustainable techniques	Medium
	• Maintenance and repairing of buildings and their elements	Medium
	• Maintenance and upkeep of green areas	Medium
	• Management of collective and shared spaces	Medium
	• Organization and communication strategist for temporary events and workshops	High
	• Coordination and data gathering of the different circular initiatives	High
	• Coordination and logistics of reusable and recyclable household waste	High
	• Repairing of electric and electronic appliances	Medium
<b>Scaling</b>	• Data analysis and processing	High
	• Coordination and communications manager	High
	• Funds manager	High
	• Looking out and establishing new partnerships	High
	• Research on new circular practices	High
	• Events manager and organization	High
	• Evaluation and impact assessment	High
	• Formulation of reports and guidelines	High

### 6.1.3 Boost the regeneration process

Many initiatives and actions may need certain forms of support in order to thrive. In this case the coordinating institutions can create different instruments to accelerate the regeneration process. We will examine three of these instruments. One could be the creation of a fund for circular initiatives, this process would require the different initiatives to provide a project statement and a budget,

## Chapter 6. Activating the Nodes while Consolidating the System

then the coordinating instance would choose which initiatives to finance, financing could be complemented as well with some form of advice or guidance. A second instrument could be the organization of events where the different initiatives could present themselves to the community and invite new members to participate, in these events different initiatives could also get the chance to exchange insights with each other, these events could happen at the node scale or between different nodes. This instrument is rather meant as a diffusion and promotion strategy. The third instrument is the actual development of innovation and experimentation hubs that have an impact beyond the node. Here different actors from different nodes or even external to them would be invited to participate. These hubs resemble the already existing social innovation centers in Marseille such as Parc Foresta, Coco Velten and La Friche de la Belle de Mai.

**Spaces:** Based on the already existing examples of social innovation centers in Marseille, the ideal spaces for the innovation and experimentation hubs to be developed are ex-industrial sites or underused and large open areas. The type of activities that could take place in these hubs depends on the characteristics of the place as well as the interests and needs of the different local actors and inhabitants. Ideally these places could assist the inhabitants with expertise, information and materials to develop new ideas. The main principle that should be followed when developing these places is fostering multifunctionality and diversity; in other words promoting the development and combination of social, cultural, economic and environmental activities. These places could also host the promotion and diffusion events to connect the different nodes and people.

**Materials and flows:** In order to diffuse and promote the different circular initiatives we need to find ways to make their progress and impact visible. Depending on the resource different measurement methods can be applied. We will enlist the different measurement possibilities that can be developed in the table in the next page.

**People:** The different support instruments should achieve two different goals, one more at the nodal scale and the second at the system scale. At the nodal scale the instruments are meant to support the development of local initiatives and allow the local population to get access to more knowledge, capital, human as well as material resources. At the systemic scale the investments and efforts done to develop different innovation and experimentation hubs, should help attract people and experts that are not yet contributing to the system. These hubs will become strategic places to expand the network and increase the relevance of the program.

## 6.1 Third stage: Activate resources and people

Type of Material	Materials	Measurements
Technical	Construction Materials	<ul style="list-style-type: none"> <li>• Overall reduction of construction waste.</li> <li>• Total waste output from demolition and renovation works.</li> <li>• Amount of reusable materials.</li> <li>• Amount of actual reused materials in other sites.</li> <li>• Amount of materials recuperated for recycling.</li> <li>• Increase rate of reused and recycled materials.</li> <li>• Number of new applications of reused and recycled materials.</li> <li>• Overall reduction in the use of new construction materials compared to business-as-usual renovation projects.</li> </ul>
	Household inert waste	<ul style="list-style-type: none"> <li>• Overall waste reduction.</li> <li>• Amount of unsorted waste.</li> <li>• Amount of rightly sorted waste.</li> <li>• Amount of repaired materials for reuse.</li> <li>• Amount of materials exchanged (2nd hand)</li> <li>• Amount of waste recollected for recycling.</li> <li>• New materials developed through recycling.</li> </ul>
Biological	Household biodegradable waste	<ul style="list-style-type: none"> <li>• Overall waste reduction.</li> <li>• Generated compost.</li> <li>• Areas where compost is used as a fertilizer.</li> </ul>
	Energy	<ul style="list-style-type: none"> <li>• Reduced energy consumption of households.</li> <li>• Number of energetically retrofitted buildings</li> <li>• Renewable energy production.</li> <li>• Number of shared appliances.</li> <li>• Non-retrofitted degraded buildings.</li> </ul>
	Water	<ul style="list-style-type: none"> <li>• Recuperated rainwater.</li> <li>• New permeable areas.</li> <li>• Reduced water consumption from the central hydraulic system.</li> </ul>
	Soil & Vegetation	<ul style="list-style-type: none"> <li>• Regenerated green areas</li> <li>• New green areas</li> <li>• Biodiversity increase</li> <li>• Local food production</li> <li>• Total area used for urban farming</li> </ul>



## 6.2 Fourth stage: Consolidate practices and networks

The main focus of this stage is to generate a collaborative environment between the nodes as well as towards external actors and sectors. The open and dynamic nature of the regeneration process is reinforced through the links and exchanges that the nodes and as an extent the system can perform. Each node may develop its own identity, but their process is defined through a systemic approach. The three lines of action in this stage are meant to create tools to enable collaboration, learning and the expansion of the system.

### 6.2.1 Share local practices

Once the activation process has been started, different projects and initiatives will emerge. Certain initiatives will be more successful and impactful than others. In a collaborative environment we want to learn from these practices in order to improve the already existing initiatives or to start new ones. While the physical realm may have its limited ways to share information, the already existing information technologies allow us to share and process information simultaneously to people located all around or even outside the system. The aim of this step is not to choose one way of sharing but to establish different communication channels that can reinforce each other.

**Spaces:** Concerning the digital realm, the development of a digital platform is crucial to get an overview of what is happening in the different nodes. Every node would be invited to participate in the creation of the digital platform. The digital platform would take the form of what we call a catalog of possibilities. Each node would choose the projects or initiatives that they find the most exemplary and innovative. A sort of ID card would be created for each initiative following an already defined format. We will present a tentative example of this ID card with what we consider crucial information that should be included.

Each node through the analysis stage will identify its own local resources, needs and aspirations. At the beginning it might be difficult to imagine how and where to start the circular regeneration process, or one node might get stuck in the process. On the one hand, these project cards can be used as best practices to learn from for other nodes, as not every node will start at the same time their regeneration process. On the other hand, once we add more and more cards to the platform we can start analyzing and comparing the different initiatives, this part will be further developed in the next lines of action. In general the different categories will help us classify the initiatives in different ways, which will make the whole platform more accessible and user-oriented. For example, we may be looking for possible applications for construction materials at the neighborhood scale. The platform can help us filter these two categories and get a more precise overview. We will examine how

## 6.2 Fourth stage: Consolidate practices and networks

the different categories included in the ID cards can provide valuable information for other nodes and the system as a whole.

Category	Node	System
<b>Scale</b>	Analyze possibilities depending on the size of the project.	Understand at which scale the system is the most active and effective.
<b>Circularity</b>	Examine how other similar projects have linked the different resources.	See what resources are the most valorized and how this is happening.
<b>Costs</b>	Inspect how feasible a similar project is in the node depending on the financial resources and time available.	Get an overview of the overall implementation costs of the project as well as future costs.
<b>Composition</b>	Outline possible associations with already involved actors. Compare the benefits between an institutional-led or community-led initiative.	Map the existing connections. Measure the institutional weight of the different initiatives
<b>Impact</b>	Estimate in which areas the project or initiative could have the biggest impact.	Evaluate in which areas the system has the most impact. Compare the impact of the different nodes.



Figure 1. Prototype of ID card for digital platform.

**People:** The local action groups formed in the beginning of the activation phase could be the ones responsible for compiling all the information and uploading it to the platform in order to create the ID cards. Once the ID cards have been created, all inhabitants should get access to the platform. A profile would be made for each inhabitant in order to access the platform and also to keep track to which node they belong and how many people are participating from each node. Through their profile they could also choose the type of projects and resources they are interested in and get updates according to their preferences. A rating system could be developed as well to start surveying how satisfied the local inhabitants are with the projects. Naturally, only the inhabitants living in the node where the projects or initiatives are taking place could rate those projects.

<p><b>Name of the project or initiative</b></p>	<p><b>SCALE</b></p> <ul style="list-style-type: none"> <li>● <b>Micro:</b> housing estate</li> <li>● <b>Meso:</b> neighborhood/node</li> <li>● <b>Macro:</b> district/several nodes</li> </ul>
<p>Node/neighborhood</p>	<p><b>CIRCULARITY</b></p> <p>Describe how the different resources are being valorized and to which phases the project belongs to.</p> <ul style="list-style-type: none"> <li>● <b>Spaces:</b> where is it taking place/what happened to the space/main actions and activities happening.</li> <li>● <b>Materials and flows:</b> technical materials being used or recuperated/biological materials being regenerated.</li> <li>● <b>People:</b> ways in which people are participating.</li> <li>● <b>Built environment phase:</b> conception &amp; design/ construction &amp; rehabilitation/use/scaling.</li> </ul>
<p>Picture or drawing of the project</p>	<p><b>COSTS</b></p> <ul style="list-style-type: none"> <li>● <b>Construction cost:</b> clarify if savings where made</li> <li>● <b>Maintenance cost:</b> clarify if it is done by the community</li> <li>● <b>Lifespan:</b> temporary -short term/mid-term/ regenerative -long term</li> </ul>
	<p><b>COMPOSITION</b></p> <ul style="list-style-type: none"> <li>● <b>Formation:</b> bottom-up/top-down initiative</li> <li>● <b>Main actors:</b> who started, developed, manages and funds the project</li> <li>● <b>Networks:</b> explain if it is connected to other sectors or other initiatives outside the node</li> </ul>
	<p><b>IMPACT</b></p> <p>Will be further developed in the evaluation stage</p> <ul style="list-style-type: none"> <li>● <b>Social</b></li> <li>● <b>Economic</b></li> <li>● <b>Environmental</b></li> <li>● <b>Urban and Architectural</b></li> <li>● <b>Institutional</b></li> </ul>

## 6.2 Fourth stage: Consolidate practices and networks

**Materials and flows:** The different measurements already being analyzed for each project in the previous line of action –boost the regeneration process– can be added to the platform. The platform will process this information and add it up at the nodal scale. This will give us an overview of the progress made by each node in terms of materials savings, regeneration and production. Once we have processed this information we can weigh the results and calculate how much value each node is creating and how self-sufficient the nodes actually are. This will allow us to compare the different nodes, and see in which areas there is still room for improvement.

→  
Figure 2. Possible method to process material measurements.

### 6.2.2 Connect the nodes

Through the digital platform we can figure out which nodes are working on similar topics and resources. The establishment of networks between them should be stimulated through both the digital and the physical realm. On the one hand, the more connections a node can establish, the more information it will be able to exchange, therefrom consolidating its position inside the system. On the other hand, the more connections the system as a whole has, the more the accumulated knowledge of the whole system can flow freely and be employed, hence consolidating the system.

**Spaces:** Different meetings and events could be organized in the different spaces depending on the type of connection we want to establish. We will provide a list of the different types of connections and the ways they could be enabled in the different spaces.

Connection	Spatial Materialization
<b>Interproject</b>	<p>If the connection is only between two projects, each project can organize a visit to each of the projects. Here it is important that the actors can discuss and exchange information, but also that they see how the actual project works in the territory.</p> <p>A more spontaneous connection could emerge through the organization of events that could take place in open areas where different projects and initiatives are invited to participate.</p>

## Chapter 6. Activating the Nodes while Consolidating the System

### REDUCED

Overall reduction of construction waste.  
 Overall reduction in the use of new construction materials compared to business-as-usual renovation projects.  
 Overall household waste reduction.  
 Reduced energy consumption of households.  
 Number of shared appliances.  
 Reduced water consumption from the central hydraulic system.

### REGENERATED

Reused construction materials in other sites.  
 Number of new applications of reused and recycled materials.  
 Repaired materials for reuse.  
 Materials exchanged (2nd hand)  
 Areas where compost is used as a fertilizer.  
 Energetically retrofitted buildings.  
 New permeable areas.  
 Regenerated green areas.  
 Biodiversity increase.  
 Total area used for urban farming.

### PRODUCED

Reusable construction materials.  
 Construction materials recuperated for recycling.  
 Rightly sorted household waste.  
 Household waste recollected for recycling.  
 New materials developed through recycling.  
 Generated compost.  
 Renewable energy production.  
 Recuperated rainwater.  
 New green areas.  
 Local food production.

### WASTE

Total waste output from demolition and renovation works.  
 Unsorted household waste.  
 Non-retrofitted degraded buildings.

### VALUE CREATION

$$Rg + P - W = VC$$



### SELF-SUFFICIENCY

$$Co - Rd = Cn$$

$$SS = VC - Cn$$

**Co** Consumption before the program started

**Cn** Reduced consumption due to the program

## 6.2 Fourth stage: Consolidate practices and networks

<p><b>Internode</b></p>	<p>The type of activities that could be held depend on what the nodes are seeking out from the connection. If they want to discuss methods and processes, the different local action groups would be invited to participate on a round table where they could openly exchange information and insights. In case there is more interest for certain initiatives or projects, a forum could be organized where the relevant action groups could present the selected projects in detail. A step further could be that from each local action group a pair of representatives would be invited to visit the different projects of each node. The round table as well as the forum could take place in the innovation and experimentation hubs or in the enclosed collective spaces, depending on the size of the group.</p>
<p><b>Project - external actor</b></p>	<p>This connection could emerge out of the temporary events we already mentioned that would be open for all types of public. A second possibility could be that the actors from the project decide to contact an expert or a professional not yet involved in the program. The third possibility would be the other way around where an expert or a professional contacts the project to collaborate with them.</p>
<p><b>Node - external actor</b></p>	<p>The program is mainly focused on households, but depends on the collaboration of other industries and sectors. It might be that a certain industry is already located in one of the nodes, talks could be held with this industry to invite them to collaborate. The most logical connection is that they could be part of the reuse and recycling side of the program, facilitating the development of this sector.</p>
<p><b>System - external actor</b></p>	<p>This connection might happen only after the program has already a good amount of established activities. External actors could be interested in understanding how the program was developed and learn from it. These connections could go beyond the district scale and even the metropolitan scale. If the program turns out to be very innovative and successful, even national and international instances could be interested in collaborating or exchanging information. We will examine in the next line of action how this information exchange could be further facilitated.</p>

## Chapter 6. Activating the Nodes while Consolidating the System

**Materials and flows:** This part is closely related with the node-external actor connections we just mentioned. Many of the materials that can be recuperated from the different neighborhoods, specially the technical materials, need to go through a variety of technical procedures in order to be repurposed again. The local inhabitants may not have the infrastructure nor the knowhow, nor the human resources to do this. Therefore, it is important the nodes or even the system as a whole seek and establish partnerships with industries and professionals who can take this part of the recuperation process into their responsibility. The different tasks that could be taken over by external actors according to the resource are:

Materials	Tasks
Construction materials	<ul style="list-style-type: none"> <li>• Dismantling and deconstruction process in the construction sites.</li> <li>• Stock and inventory of the recuperated construction materials.</li> <li>• Sorting, cleaning and repairing the recuperated materials.</li> <li>• Analysis and research on the reuse of the recuperated materials.</li> <li>• Recycling and upcycling of recuperated materials.</li> <li>• Life-cycle assessment of the reused and recycled materials.</li> <li>• Distribution of recycled and reusable materials to other construction sites.</li> </ul>
Household inert waste	<ul style="list-style-type: none"> <li>• Transport to factories of sorted waste.</li> <li>• Cleaning of sorted waste.</li> <li>• Recycling and upcycling.</li> <li>• Remanufacturing electric and electronic appliances.</li> <li>• Research and testing of recycled materials.</li> <li>• Distribution of recycled materials.</li> </ul>
Biological materials	<ul style="list-style-type: none"> <li>• Fabrication of solar panels.</li> <li>• Distribution and installation of solar panels.</li> <li>• Maintenance of solar panels.</li> <li>• Fabrication of rainwater recovery system components.</li> <li>• Installation of rainwater recovery systems.</li> <li>• Maintenance of rainwater recovery systems.</li> <li>• Distribution of locally produced food.</li> <li>• Distribution of generated compost to other parts of the city (agricultural fields, parks)</li> </ul>

## 6.2 Fourth stage: Consolidate practices and networks

**People:** As we have mentioned in the spaces section, different types of connections on different levels should be fostered to be able to consolidate as well as expand the system. The digital platform is also a useful tool to diffuse the progress of the program and to invite experts and professionals to participate. Through the platform they can easily see how many projects and initiatives are going on in the different nodes and start imagining how they could contribute to the development of the system. As we have seen in the materials and flows section there are many areas of opportunity where the manufacturing, logistics and research sectors could participate.

### 6.2.3 Compound all available information

At this step a lot of data and information has been made available through the digital platform and the different events. The main challenge will be to process all this information in order to create a manual for the next circular regeneration projects. The manual is about translating the different experiences of the on-going regeneration projects into a practical methodology. It is somehow a refinement of the activation and development framework applied at the project scale.

As a lot of the information for the manual will come from the ID cards of the catalog, we will go through the different stages of the framework highlighting how the categories of the cards can provide the needed insights to develop the project manual.



## Chapter 6. Activating the Nodes while Consolidating the System

Manual Elements	Identify	Prepare	Activate	Consolidate
<b>Scale</b>	Examine at which scale the different resources are mostly valorized.	Explain the possible paths different initiatives can take depending on their scale.	Identify at which scale and with which resources the first projects were developed.	Explain how different initiatives are linked at different scales.
<b>Circularity</b>	Map where the most active initiatives are located. Indicate which resources have been valorized the most. Main type of activities happening at the different spaces.	Map the most frequent needs and aspirations and link them to the existing resources. Set out where most training has taken place as well as the tools and materials needed for it.	Give examples of successful chains of action that manage to match different spaces and resources. Enlist the different projects taking place according to the built environment phase they belong to.	Identify the most frequent barriers to consolidate a project or initiative. Provide already tested solutions to guarantee the continuity of a project.
<b>Costs</b>	Cost-benefit analysis to get access to the different resources.	Cost-benefit analysis of the training and reskilling activities.	Compare costs of the different initiatives highlighting where the main differences are (development, maintenance, resources).	Provide insights on how to collectively maintain the projects and how to reinvest the value created.
<b>Composition</b>	Compare success rate between bottom-up and top-down initiatives and the main challenges they have encountered.	Main partnerships that should be sought depending on the type of initiative and resources.	Describe the size and composition of the most successful local action groups.	Highlight main collaboration strategies as well as frequent conflicts.
<b>Impact</b>	Compare the impact of different types of resources in terms of environmental, economic and social benefits.	Describe what type of impacts the innovation and experimentation hubs have had on the different scales.	Explain the main measurement tools to map the progress of the different initiatives.	Highlight the main barriers to accurately measure the impact.



**7**

**Developing Evaluation and  
Improvement Mechanisms**

## Chapter 7. Developing Evaluation and Improvement Mechanisms

As we have already mentioned, the circular regeneration program is based on the development of a dynamic and open system. Although the system might have a natural capacity to adapt and improve, there are certain mechanisms that can work as catalysts to ensure the adaptability and continuity of the system. The framework entails two types of mechanisms that can work simultaneously. The first type are evaluation mechanisms, they are designed to help us assess the reach and impact of the program in its different levels, the projects, the nodes and the system. Subsequently, we can analyze this information and identify where the system is lacking and where it is thriving. The second type of mechanisms are improvement mechanisms. As the system depends on building up the local capacity, the mechanisms will be focused on this scale. Nevertheless, they seek to also guarantee the continuity of the system as a whole.

### 7.1 Fifth Stage: Evaluation Mechanisms

In chapter 3 we defined how the system was best organized in order to achieve certain characteristics. A distributed system was chosen as this would be the most efficient, effective, resilient, democratic and collaborative solution. Although the organization of the system might facilitate the achievement of these principles, each territory has its own development and processes, therefore we should not take for granted these principles and develop ways to assess how well the system in all its levels is performing. Two mechanisms will be developed, the first one is aimed at evaluating the reach of the system, how democratic and collaborative it is. The second one's goal is to assess the impact of the program, rather related to how effective and efficient it is in bringing about social, economic, environmental, urban and institutional changes. The overall resilience of the system will be assessed when these two mechanisms are put together.

#### 7.1.1 Evaluating the reach of the system

The circular regeneration framework is composed of different stages where people can participate and be engaged in the process. In other words there are different roles that citizens can take and this in turn influences their level of engagement. For example during the identification and preparing stage people might take the role of explorers helping to identify, discover or define a problem, another possible role is the one of an ideator in the activation phase or even a designer, conceptualizing and then developing a solution and lastly a diffuser actually implementing the solution.<sup>1</sup> Nevertheless in real life there may be limits for their participation: people may have no time, the information might be too confusing or complex, the processes might take too long therefore they lose interest, they might not see the direct benefits in participating. The other aspect affecting the reach of the system are the amount and type of networks the system is able to generate, if for example one node works mainly on

<sup>1</sup> Based on Nambisan, S., & Nambisan, P. (2013). Engaging Citizens in Co-Creation in Public Services: Lessons Learned and Best Practices. IBM Center for the Business of Government, collaboration across boundaries series. Retrieved 2020, from <https://www.researchgate.net/publication/278391463>

## 7.1 Fifth Stage: Evaluation Mechanisms

its own, then the accumulated knowledge and resources are kept in place and the system is weakened. Accordingly, the assessment of the reach of the system will measure two different aspects: the overall participation and engagement of the inhabitants and the level of collaboration in the different levels of the system.

### *Citizen participation and engagement*

While some of these metrics depend on keeping track of the number of people that participate in each step of the regeneration process as well as identifying in which phases of the built environment cycle participation is at its highest, other metrics will require the use of surveys and questionnaires to find out how people perceive themselves during the process. We will divide the indicators in qualitative and quantitative terms;

Systemic Levels	Quantitative indicators	Qualitative indicators
<b>Project</b>	<ul style="list-style-type: none"> <li>• Total number of participants in each project.</li> <li>• Project's intensity of engagement: people that have kept participating in the project during the whole process*.</li> <li>• Project's capacity of engagement: increase of participation rate during the process*.</li> </ul>	<ul style="list-style-type: none"> <li>• Participants' satisfaction with the project.</li> <li>• Participants' satisfaction with the co-creation process*.</li> <li>• Perceived affinity and belonging to the project.</li> </ul>
<b>Node</b>	<ul style="list-style-type: none"> <li>• Overall participation rate of neighborhood: total number of participants/total number of inhabitants</li> <li>• Participation rate at each stage of framework: identify/prepare/activate/consolidate</li> <li>• Participation rate by built environment phase.</li> <li>• Number of generated bottom-up activities (total and by phase)</li> </ul>	<ul style="list-style-type: none"> <li>• Perceived relevance of the inhabitant's participation for the regeneration of their neighborhood.</li> <li>• Perceived benefits from their participation in the regeneration process.</li> <li>• Perceived barriers to participate in the regeneration process.</li> </ul>
<b>System</b>	<ul style="list-style-type: none"> <li>• Median participation rate of nodes.</li> <li>• Lowest and highest participation rate.</li> <li>• Increase or decrease in participation rate across built environment phases and framework stages.</li> </ul>	<ul style="list-style-type: none"> <li>• Average perceived satisfaction with the program.</li> <li>• Average perceived affinity and belonging to the program.</li> <li>• Average approval of the program: perceived benefits outweighing barriers</li> </ul>

\* project's co-creation process: conception, design, development, implementation, maintenance, management.

## Chapter 7. Developing Evaluation and Improvement Mechanisms

### *Collaborative environment*

This indicator is based on the way people relate with each other as well as the mediums they have to enable or strengthen these relationships. We need to examine how actions shape and maintain these networks as well as the nature of their connections. We will therefore analyze first the type of ties or connections that exist inside the system based on the typology of ties proposed by Stephen P. Borgatti, et al<sup>2</sup>., and afterwards look at the characteristics of the network as a whole based on Gerald R. Salancik review essay on network theory of organization.<sup>3</sup>

Type of ties	Project ties	Nodal ties	Effect on collaborative environment
<b>Similarities</b>	<ul style="list-style-type: none"> <li>• Most interactions happening in the same neighborhood.</li> <li>• Interactions only with projects or initiatives concerned with the same resources.</li> <li>• Interactions only between people from the same housing complex.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactions only between nodes concerned with the same built environment phases.</li> <li>• Interactions only with neighboring nodes</li> </ul>	<ul style="list-style-type: none"> <li>• If the interaction is based on sharing a similar location, it might be beneficial in the short-term for the community but not in the long-term for the system. We can therefore derive there is local collaboration but not systemic collaboration.</li> <li>• If the interaction is based on sharing a similar approach (same phase/ same type of resources) we need to look at the location of the nodes in the system, this will indicate if there is centralized or distributed collaboration.</li> </ul>
<b>Social Relations</b>	<ul style="list-style-type: none"> <li>• Spontaneous interactions: the interaction emerges from a casual occurrence where two actors or more meet and decide to collaborate.</li> <li>• Sought interactions: the actors purposefully look to collaborate with one another and agree on it, this can be facilitated through the digital platform.</li> <li>• Forced interactions: An actor may not be willing or interested to collaborate, but is asked to do so by a member with more power, possibly an institutional actor.</li> </ul>		<ul style="list-style-type: none"> <li>• If most interactions are spontaneous or sought, this means the willingness to collaborate between the nodes and projects is high.</li> <li>• If most interactions are forced, we need to examine what are the barriers and identify possible incentives to promote more collaboration.</li> </ul>

<sup>2</sup> Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network Analysis in the Social Sciences. *Science*, 323(5916), 892–895. doi:10.1126/science.1165821

<sup>3</sup> Salancik, G. R., & Burt, R. S. (1995). WANTED: A Good Network Theory of Organization. *Administrative Science Quarterly*, 40(2), 345–349. doi:10.2307/2393642

## 7.1 Fifth Stage: Evaluation Mechanisms

<b>Interactions</b>	<p>Examines what entail these interactions and if they are positive or negative.</p> <ul style="list-style-type: none"> <li>Positive interactions: share valuable information, exchange resources, ask for advice, provide help, work together, give feedback to each other.</li> <li>Negative interactions: share fake or misleading information, extract resources, discourage the process of the other node, work against each other (ex. leaving the other without funds or people).</li> </ul>	<ul style="list-style-type: none"> <li>If most interactions are positive, the nodes are benefitting from interacting, which translates into a collaborative environment.</li> <li>If most interactions are negative, some nodes may be gaining more power while others are left even more fragile, this could translate into a competitive, predatory and parasitic environment, where the nodes might prefer to isolate themselves from the system.</li> </ul>
<b>Flows</b>	<ul style="list-style-type: none"> <li>Examines the output and input balances of each node, the different flows can be: information, beliefs and values, people, resources.</li> </ul>	<ul style="list-style-type: none"> <li>As nodes become more and more regenerative, the type of flows and the amount might change throughout time, nevertheless it is important to examine the evolution of the nodes to identify which nodes are mostly receivers and which ones are mostly senders as this might create imbalances in the system. Ideally a node would be both a sender and a receiver in a collaborative environment.</li> </ul>

<b>Network characteristics</b>	<b>Description</b>	<b>Effect on collaborative environment</b>
<b>Connectivity</b>	<p>Depends on how easy it is for other nodes or projects to interact with each other. If they can establish connections with whoever is part of the network very easily, the connectivity is high.</p>	<p>A high connectivity can increase the possibilities of collaboration for all the nodes, being favorable for creating a collaborative environment.</p>
<b>Network Size</b>	<p>We calculate on average how many connections do the projects and the nodes establish. We can also differentiate the nodes by the network size. There might be nodes that are very active therefore becoming more present and central in the network. We need to analyze if this centrality is good for the system or if it is concentrating too many resources and power.</p>	<p>If some nodes have a significantly larger network size than others, we need to identify if the type of ties are collaborative or parasitic. The network size might be an effect of the amount of successful practices or resources present at that node whereby other nodes want to learn from or receive from. However, the aim of the system is not to create centralities but to create strong interconnected nodes, therefore this type of situation should be monitored in order to avoid power imbalances and parasitic relations and foment new connections.</p>

## Chapter 7. Developing Evaluation and Improvement Mechanisms

<b>Clique</b>	This means that certain projects or nodes have a preference to interact only with other nodes or projects. This means that they are not open for other interactions to take place limiting the connectivity of the whole system.	Although there might be natural preferences in the beginning, a persistent clique is not beneficial for a collaborative environment, as this means the system would start excluding certain nodes as well as creating isolated pairs of nodes.
<b>Structural Equivalence</b>	This is very related with the similarity aspect of the type of ties. It means that overall interactions are limited to similar nodes or similar projects. This in turn would also reduce the connectivity of the system as not all connections are possible.	In the beginning it might be beneficial to connect to similar projects or nodes as they might be going through the same kind of issues and processes and therefore the information one node produces might help the other to advance its own process.
<b>Blocks</b>	In this case there would be cluster formation inside the system, in other words groups of nodes that only interact with one another.	When information and resources are concentrated in certain areas, in some cases it might be more efficient but in others there might be a loss of potential connections. We would need to analyze the impact of these clusters on the system and the territory to know how beneficial or not they are.

### 7.1.2 Assessing the impact of the program

The program happens at different levels, the project scale, the node and the system as a whole. The projects may differ in their approach and conditions, therefore it is the aggregation of all the projects happening in the node that allow us to assess the effects and changes that the program is bringing about to the different neighborhoods. As the nodes nurture the system, once we know the impact of the program on each node, we can evaluate the overall impact of the program.

The thesis proposes an impact assessment tool composed out of five important dimensions where change is intended to happen: social, economic, environmental, urban and architectural, and institutional. Each dimension is composed by five objectives the program aims to reach. Each objective is accredited to the node if it complies to two evaluation criteria. This means we have a total of 50 evaluation criteria, giving us an overall impact score, but a score can also be given to each dimension made out of 10 evaluation criteria. We will present the assessment tool in the form of a table as this allows us to have a more simple overview of how the tool works.

## 7.1 Fifth Stage: Evaluation Mechanisms

Impact Assessment Tool				
Dimensions	Objectives	Evaluation Criteria	Score (0-no 1-yes)	
Social	Social Cohesion	High number of people participating & engaged in the project		
		Stronger networks & cooperation between different actors & sectors		
	Empowerment	Agency in decision making processes		
		Learning and application of new skills		
	Inclusiveness	Activities for different ages, social groups, ethnicities, minorities		
		Adapted training & support to take part in circular initiatives		
	Wellbeing	Improved quality of housing		
		Improved relations between inhabitants, local authorities & associations		
	Equality of Opportunities	Access to facilities, activities, workshops, events		
		Easy & open access to information		
	<b>Social Dimension Score</b>			
	Economic	Value Creation	Development of reuse, recycling & remanufacturing activities	
Increase in production, recovery and regeneration of material resources				
Job Growth		New hubs for experimentation & innovation in circular activities		
		New jobs generated by the participation of inhabitants in renovation activities		
Autonomy		Self-generated resources by the community to start circular projects and activities		
		Tools & workshops to increase self-renovation and circular regeneration skills		
Security		Income generated by circular activities		
		Accessible funds for innovation & experimentation		
Efficiency		Reduction in the use of polluting materials		
		Increase in materials savings from renovation practices		
<b>Economic Dimension Score</b>				
Environmental		Protection & Conservation	Inhabitants actively maintaining and taking care of green areas	
	No land-taking for construction			
	Regeneration & Recovery	Activation of underused or vacant spaces for circular activities		
		Increase of biodiversity & permeability in open areas		
	Care & Conscience	Active participation in sorting, reusing and recycling of materials		
		Reduced production of waste and energy consumption		
	Self-sufficiency	Implementation of sustainable techniques to produce or recover resources		
		Increase of circular facilities & services run by the inhabitants		
	Resilience	Responsible & sustainable management of natural resources		
		Extended life-cycle of structures, natural resources & materials		
<b>Environmental Dimension Score</b>				



## Chapter 7. Developing Evaluation and Improvement Mechanisms

Urban & Architectural	Flexibility	Structures that allow different land-uses to co-exist	
		Temporary uses in open spaces that allow experimentation	
	Adaptability	Modular layout of interior spaces that can be adapted to future needs of inhabitants	
		Reuse of existing spaces & materials for new functions & activities	
	Diversity	Local facilities & services adapted to the local needs	
		Different housing typologies that adapt to different types of households	
	Valorization of the Existing	Rehabilitation of building stock & optimization of energy performance with reused, recycled & sustainable materials	
		Rehabilitation of underused, misused & vacant spaces for circular activities or soil regeneration	
	Connectivity	Organization of events & workshops to discuss & exchange knowhow & information	
		Awareness of on-going activities & events by the inhabitants & local industries	
<b>Urban &amp; Architectural Dimension Score</b>			
Institutional	Enabling	Available funds for circular initiatives	
		Prioritizing skill formation of inhabitants	
	Distributive	Not centralizing funds & efforts in one initiative, but allowing many to flourish	
		Promoting initiatives where the inhabitants can collectively benefit from	
	Receptive	Initiating from the inhabitants needs and aspirations and involving them from the beginning	
		Being flexible to changes and new ideas, not imposing one model	
	Innovative	Introducing digital tools such as databases in order to map and enable information to be shared	
		Implementing new sustainable technologies in the renovation process	
	Visionary	Giving support to initiatives that have the potential to grow and become more circular	
		Building-up networks that can work together in sharing knowledge and creating better circular practices	
<b>Institutional Dimension Score</b>			
<b>Total Impact Score</b>			

## 7.1 Fifth Stage: Evaluation Mechanisms

The impact assessment tool can be made available through the digital platform. The ones responsible for completing it should be the local action groups and not the governmental institutions. The reason for this is that the tool is designed to help the local inhabitants to auto-evaluate their process and enable them to identify in which areas there is still progress to be made. Therefore the tool can be used at different periods of time and therefore it is natural that the nodes don't achieve a perfect score immediately. Even though the tool should be completed and employed by the local action groups, the governmental institutions should keep track of them and analyze the results for two main reasons. The first one is that their own performance is also being judged by the tool, they should specially pay attention to the institutional dimension of the table. The second reason is that the tool allows them to visualize how successful the program actually is in achieving its different goals and question if the program works as it is or if some things need to be modified or conceived differently.

In order to visualize better the impact of the program on each node, the digital platform could process the information of the table creating a graphical scheme where the different objectives of each dimension are highlighted if they have been accomplished or dimmed if not. Each node would therefore have its own impact assessment scheme made accessible to everyone that has a profile in the digital platform.

In this scheme we can see that the node is accomplishing almost all objectives, but is still lacking in flexibility, equality of opportunities, care & conscience, security and perceives institutions as not distributive enough. Through the scheme the local action groups as well as the governmental institutions now know how to better target their on-going and future projects and initiatives.

A scheme could also be made at the system scale out of the aggregation of all the nodal schemes. We would have three levels of achievement for every objective. If more than 75% of the nodes has that objective fulfilled, the scheme would turn fully on that objective, if it is only 50% of all nodes, then the objective could be less intensely turned on and if it is less than 50%, the objective would be totally dimmed.



Figure 1. Impact Assessment scheme.

# Chapter 7. Developing Evaluation and Improvement Mechanisms



## 7.1 Fifth Stage: Evaluation Mechanisms

### 7.1.3 Analysis of fragilities and strengths

Both the reach and impact analysis should help us identify the main weaknesses, strengths, threats and opportunities of the program based on the five main characteristics defining the system: effectiveness, efficiency, collaboration, democracy and resilience. Therefore we will explain how these characteristics relate to the reach and impact analysis and what their analysis could mean for the development of the program.

#### *Effectiveness*

This can be derived out of the impact assessment tool. The effectiveness of the program in each node will depend on the amount of objectives that are being accomplished. Different scenarios are possible:

- If almost all objectives have been accomplished, then the program is highly effective and the process should continue as it is. Nonetheless, there is always room for improvement so the program could focus on consolidating the most successful projects and promoting and diffusing best practices.
- If there is an imbalance in the accomplishment of objectives, meaning the node is very successful in some dimensions but very lacking in others, then the program is partly effective and more thorough research should be done at the nodal scale to identify the main barriers. These could be very diverse, for example, it could be that almost no spaces are available to regenerate, that there are lacking skills, techniques or funds to recover or regenerate resources or that people have shown no interest in participating.
- If almost no objectives have been accomplished, this could mean the assessment has been done too soon and more time needs to pass before we can employ the assessment tool. If this is not the case, then the program is highly ineffective and major structural changes should be done to it. This could even entail the end of the program.

#### *Efficiency*

Closely related to the effectiveness of the program, but focuses more on the evolution of the program throughout time. It rather looks at how fast and how well the objectives are being accomplished. It therefore depends on the application of the impact assessment tool at different stages of the process. The possible scenarios are the following:

- If in the short-term almost all objectives are being accomplished, then the program is highly efficient in that node. The analysis stage could help us understand why the node is so successful. It might be that the resources were readily available, there were already

## Chapter 7. Developing Evaluation and Improvement Mechanisms

important circular initiatives in place or that the willingness to participate as well as the skills of the inhabitants were already very high. It could be interesting for the program to connect this node to less successful nodes so their knowledge and information could help the others advance faster.

- If in the mid-term the node is achieving a good amount of objectives, the efficiency of the system is as expected. The program is well-aware that circular regeneration is a process that takes time to activate and consolidate. We can then go more in detail to the type of objectives where the program is lacking and depending on their nature we might have to promote more certain projects or activities, organize more workshops or events for people to meet or learn new skills or connect the node to other nodes or actors.
- If in the long-term almost no objectives have been met, then the project is highly inefficient. If at the nodal scale almost all projects are failing, then it would be important to analyze why this is happening. Are the failings caused by local conditions or are they related to the way the program has been formulated. If the former is the case, and it is only happening in certain nodes, then we should give the nodes the possibility to exit the system and the program can continue, if the latter is the case and is a general result for the majority of the nodes, then the program is failing and needs to be reformulated or halted.

### *Collaboration*

In the reach analysis, we know how collaborative the system is depending on the type of ties that exist in the system as well as the characteristics of the network. Throughout our analysis, we have already highlighted what the effects on the environment can be, therefore we will synthesize the analysis in three possible scenarios:

- A highly collaborative system would mean the nodes are highly interconnected and benefit greatly from being part of the system. The ties are reciprocal in the way that all nodes are both senders and receivers of different types of flows thus information, resources, values and people can freely circulate across the system helping to increase the regenerative capacity of each node and therefore the system. The program and the way it is structured and organized as a system would be very successful.
- A partly collaborative system would mean that collaboration exists but is concentrated in certain parts of the system. The nodes that are interconnected benefit from the system, but the ones that are isolated might become more and more fragile as they cannot receive any types of flows. It is important the program is able to recognize these formations as soon as possible, so that the excluded nodes can be included again in the system and too rigid cluster formations are opened-up to the rest of the system.
- A non-collaborative environment could be one where only

## 7.1 Fifth Stage: Evaluation Mechanisms

certain connections are in place, but the interactions are rather negative, there could be strong competition for resources, sharing of misleading, incomplete or fake information or agreements between actors not to collaborate with other nodes. This could be very damaging for the program, as there would be no real benefit from being part of the system. This type of behaviour should be watched and avoided, otherwise the continuity and existence of the program could be under threat.

### *Democracy*

The first part of the reach analysis focuses on how participative and engaged the inhabitants actually are with the program. This allows us to know how democratic the system actually is in the sense that the program depends on the activeness and involvement of the community in order to thrive. In other words we not only seek the agreement or satisfaction of the inhabitants with the program and its process, but their actual active participation in the shaping, developing and maintenance of the program. We will therefore look at three possible scenarios:

- Participation and engagement is high during the whole process. From the beginning people are very enthusiastic about the program, they want to learn new skills and bring about plenty of ideas. They have organized themselves in different groups of action and are very engaged in the different stages of the process. Many bottom-up initiatives have emerged and they seek to establish strong connections with the community and the system as a whole. In this scenario, it would be important for us to also check the perceived institutional impact, if they manage to accomplish all objectives, the program is working very well, if some objectives aren't being met by the institutions, it would be rather on their side to seek for improvement and better support the communities.
- There are some core groups that are very participative and engaged, that benefit a lot from the program, but they cannot find enough support from the community. Certain bottom-up initiatives start to emerge, but after some time they start lacking resources, so they continue existing but their impact is very limited. In this case the institutions could develop more incentives for people to participate as well as develop a communication and awareness campaign where people can see more clearly the benefits they can get if they participate. Another strategy could be to invest and promote the few circular activities and try to connect them better with other actors and projects in other nodes, so that they can still remain relevant for the system and consolidate, it might be that until these initiatives are perceived as successful people will want to participate.
- There is some participation in the beginning but the program is not able to engage the inhabitants throughout the process.

## Chapter 7. Developing Evaluation and Improvement Mechanisms

Different actions are implemented by the institutions, but still no one shows interest in the program. If the willingness to participate is so low and only very few people are engaged, it might be better to allow these people to participate in other nodes, so they don't miss out on the opportunity, but the neighborhood might have to be excluded from the system.

### *Resilience*

The resilience of the system depends on the combination of the already mentioned four factors: the effectiveness, efficiency, participation and engagement, as well as the collaboration the program encompasses. All four factors need to be guaranteed in order for the program to continue. Although for each factor there are certain solutions that can be implemented in order to achieve a better outcome, the resilience of the system also depends on the improvement mechanisms that are available to the different nodal communities. These will be developed in the next section of the chapter.

## 7.2 Sixth Stage: Improvement Mechanisms

By definition a circular regeneration system should have the capacity to self-regenerate or self-improve itself. If we follow the premise that the nodes nurture the system, it is then at the nodal scale that these self-improvement mechanisms should take place. While each node regenerates, the system keeps track of their process as well as looks for ways to feed further their process. We therefore have not one mechanism in place, but two, one happening at each node and the other at the system level. We will start by explaining the nodal mechanisms and then pass to the system ones.

### 7.2.1 Manage, sustain and strengthen

As each node is given the tools and autonomy to determine its own circular regeneration process - the type of spaces and resources it valorizes, the actions and activities that will take place, the people or projects they want to connect with - it is a natural consequence that this empowerment and autonomy also comes with the responsibility of maintaining and improving their regeneration path. The question is what type of mechanisms should be developed in order to guarantee this.

Departing from the aim of the system to be resilient, democratic, collaborative, effective and efficient, the mechanism that best aligns with these goals is based on the theory of Fung and Wright that examines what they call Empowered, Deliberative Democracy (EDD). According to them "they have the potential to be radically democratic in their reliance on the participation and capacities of ordinary people, deliberative because they institute reason-based decision making, and empowered since they attempt to tie action to discussion." The authors recognize three general principles for this mechanism to take place: "(1) a focus on specific, tangible problems, (2) involvement of ordinary people affected by these problems and officials close to them, and (3) the deliberative development of solutions to these problems." (Fung & Wright, 2001)

The application of EDD to our program would mean that there needs to be a form of citizen organization that through deliberation can determine how to manage, sustain and strengthen the different projects and initiatives. The already appointed local action groups in the activation stage, responsible for developing and following-up the different projects, could organize local assemblies where either some representatives of each group could attend or all members. These assemblies could be organized routinely, for example once a month or whenever a problem emerges. It might be more effective to plan these assemblies routinely as the members could have time to prepare themselves and find common solutions for similar problems, in other words learnings and insights could be more easily shared than when only discussing an individual problem.



## Chapter 7. Developing Evaluation and Improvement Mechanisms

We will go through the different tasks the assemblies could take into their responsibility:

- **Manage:** it is natural that during the regeneration process problems and conflicts emerge, certain problems and conflicts might be easy to solve at the project scale by the local action group responsible for that project, but when conflicts and problems are actually becoming a barrier for the project to advance, the knowledge accumulated by the different local action groups can be made available in the assemblies as different members deliberate and seek for possible solutions. These solutions become consequently public assets readily applicable by any project confronted with the same issues.
- **Sustain:** Once activated, projects and initiatives need to be maintained. Each local action group is responsible for organizing the maintenance of their project or initiative. Many projects or initiatives in the node might share a similar approach or people might be involved in more than one initiative, this means that an overall maintenance strategy can be developed through the assemblies. There might be for example the possibility to designate local maintenance groups that are responsible for specific tasks, people could then learn different skills and get to know the different projects going-on in the node instead of only participating in one project.
- **Strengthen:** The assemblies can be interpreted as the core of the node where people are enabled to come together, find common practices and solutions and most importantly realize they are working for a common purpose. Hence, by commonly finding solutions to improve each individual project and initiative, the node itself is strengthened and the more sense the inhabitants will find in participating in the different assemblies.

### 7.2.2 Coordinate and facilitate

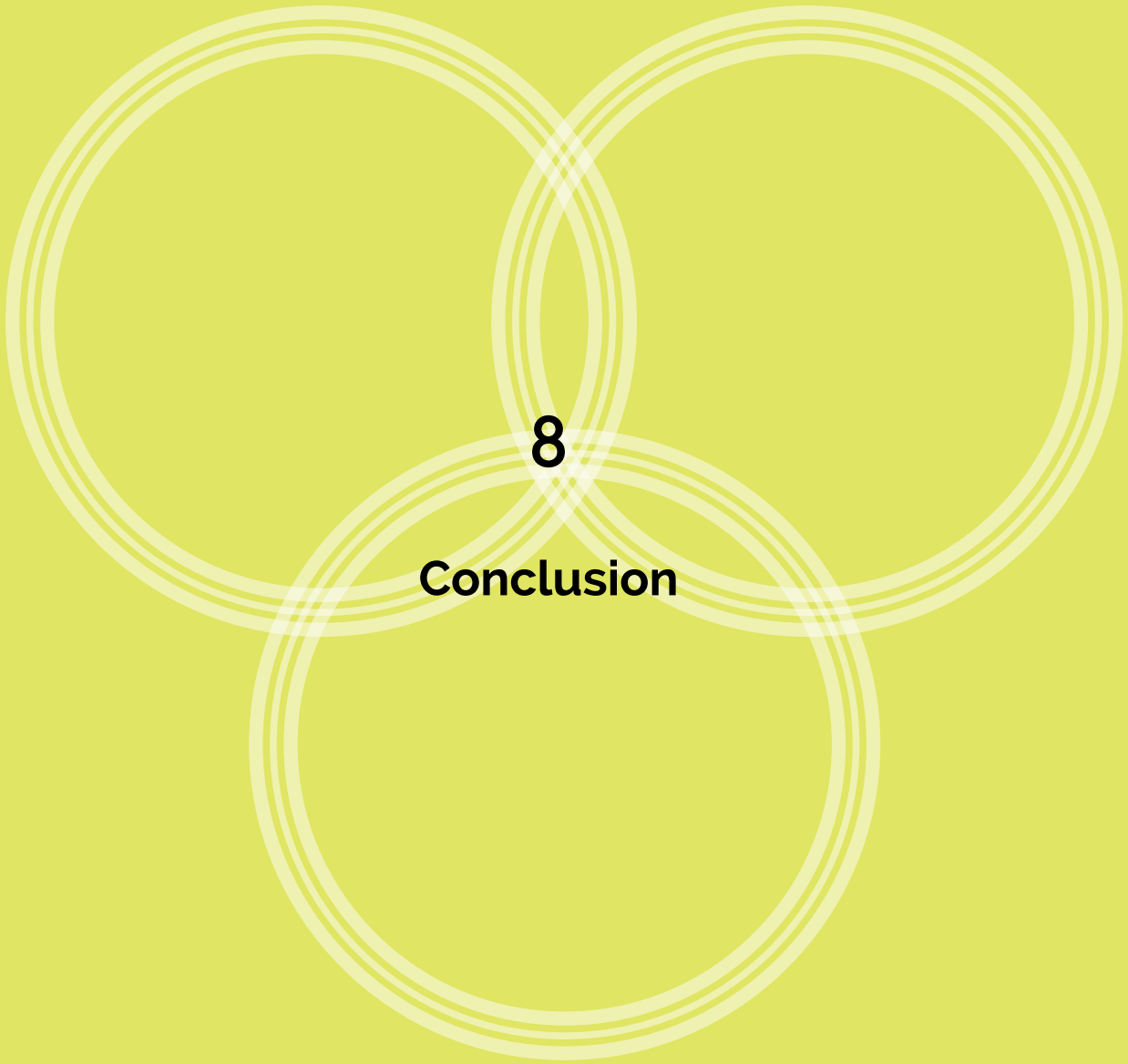
Following the EDD theory of Fung and Wright, although power and agency is given to the local action groups in order to manage, sustain and strengthen their regeneration process, there needs to also exist "Centralized Supervision and Coordination". Therefore we are talking of a coordinating central instance, for example in the case of the northern districts the MRU (Marseille Rénovation Urbaine), currently connected to the Metropolitan government. The task of this instance would be to "reinforce the quality of local democratic deliberation and problem solving in variety of ways: coordinating and distributing resources, solving problems that local units cannot address by themselves, rectifying pathological or incompetent decision making in failing groups, and diffusing innovations and learning across boundaries." (Fung & Wright, 2001)

Many of these tasks have already been explained in the consolidation stage of the framework, where through the digital platform best

## 7.2 Sixth Stage: Improvement Mechanisms

practices can be shared; connections between nodes and external actors are fostered and lastly information is compounded. This last step is not mentioned by Fung and Wright but relates to the fact the continuity of the program needs to be ensured after for example the MRU considers its work done.

The focus of the MRU is urban renovation, while the circular regeneration program extends its vision to the whole built environment cycle. Thus, there are good reasons to believe the MRU won't be able to continue the coordination and supervision of the program after a certain period of time. The program therefore develops its own mechanisms to ensure the MRU can transfer its responsibility to another instance. This instance may need to be created, or an existing instance could take over. The digital platform together with the local assemblies are mechanisms that depend on citizen participation to exist, but they are able to gather, compound and process the accumulated information and knowledge of the program. The new instance therefore should get direct access to the digital platform, as well as have meetings with the different assemblies to fully understand the progress and processes of the program. In this manner, the continuity of the program is ensured and the accumulated knowledge keeps on being valued and valorized.



**8**

**Conclusion**

## 8.1 Thesis summary

The thesis intends to propose a methodology to use urban renovation projects as opportunities to both improve in the long term the wellbeing of fragile populations and change the urban metabolism operating at the local and urban scale toward a less consuming, fairer cycle of material and spatial resources. Although it is meant to be a transposable framework that can be applied to different local contexts, its elaboration is situated, grounded in the reality of the northern periphery of Marseille. From the analysis of place-specific social, economic, physical and spatial conditions of the northern neighbourhoods, the work draws a broader proposal to transition to a more sustainable and inclusive production of urban space.

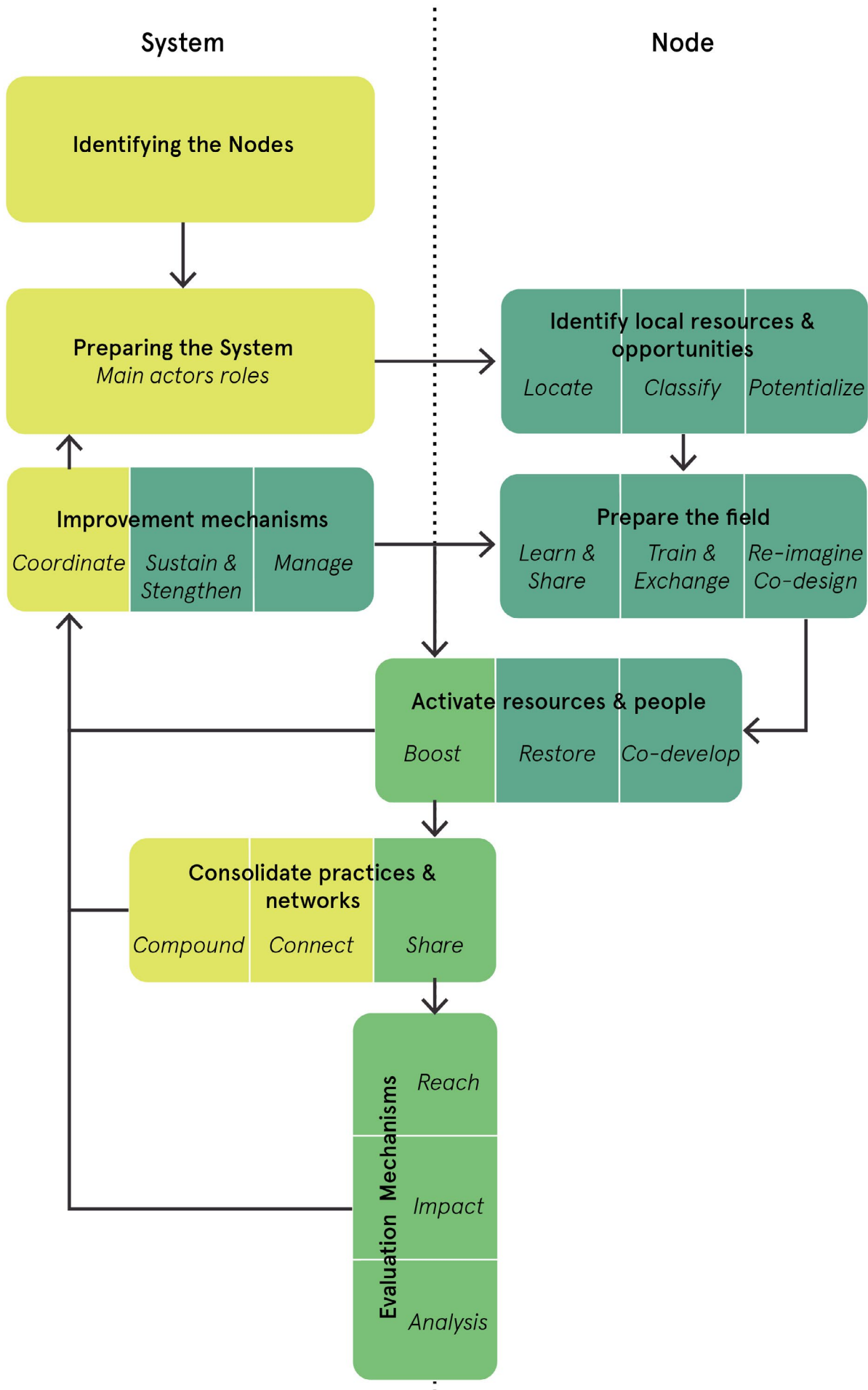
After understanding the fragile context of the renovation projects that take place in Marseille and the issues that stem from the current practices of urban renovation, the analysis of case studies allows to explore several approaches to renovation and urban circularity as well as examine different interplays between top-down, institutional and bottom-up initiatives.

The circular regeneration framework is a proposal that seeks to acknowledge the multiplicity of resources that are constantly mobilised in the transformation of cities. These resources are spaces, materials from construction materials to household waste, but also actors and people with their own skills, knowledge and networks. It is based on the idea that a territory is a system where the neighbourhoods are nodes that are the basic units of a meso transition. Each urban renovation project activates a node by impulsing a local experimentation of circular economy, after which the local experimentation nurtures the system toward a territorial-scale sustainable transition.

Therefore, the first step of the framework is to identify the nodes, meaning the neighbourhoods that are relevant to constitute a territorial network for circular regeneration. Once the nodes of the system have been identified, a governance structure able to lead and coordinate the operations should be designed. At the local level, the resources are located, classified and potentialized with respect to the opportunities identified. A phase of preparation of the field follows focused on the exchange of knowledge between institutions, local actors and people, so that the actors involved at the neighbourhood scale interact and are ready to cooperate in the regeneration project. The neighbourhood becomes a circular regeneration laboratory. In the following step, urban renovation institutions, local actors and inhabitants co-design a regeneration masterplan for the neighbourhood, where the inhabitants are the main actors of the



Figure 1. Circular Regeneration Framework - diagram



## 8.1 Thesis summary

project. At that stage, the project is interfaced with other projects of the network. The system structure allows feedback loops to capitalise knowledge acquired in each project and to feed the whole network with the cognitive resources acquired, for example skills or best practices. In addition to this, the material outputs and inputs of the system's projects are reused at the network level; for instance the waste produced in a demolition can be reused elsewhere for construction. The network therefore consolidates the nodes and the nodes nurture the network. Along with evaluation mechanisms that examine the reach and impact of the projects, improvement mechanisms operate through the coordination of regeneration projects at the territorial level, while at the local level conflicts and problems are managed and the projects are further sustained and strengthened.

## 8.2 Obtained results

“Toward circular regeneration” aims at providing a comprehensive framework for the introduction of resources optimization in the policy of urban renovation in fragile contexts. Although the framework aims at a general outreach, the methodology values a place-specific approach to understand how socioeconomic and urban fragility can be addressed with sustainable and innovative policies.

The work emphasises system thinking as a tool to initiate a transition at the level of a node, namely the neighbourhood, and to spread and strengthen the transition at the system level. Therefore, one of the key results is to identify the actors who can federate, coordinate and promote a transition toward a low-resources urban metabolism. In this model, the node nurtures the system. Whereas bottom-up initiatives are supposed to foster citizen participation in the neighbourhoods, institutions can coordinate projects across the territory and integrate experiences through feedback loops. In that way, the system of renovation projects is a neural network that allows continuous learning, improving and experimenting.

For this reason, the work is conceived as an open-ended process of innovation; the goal is to propose consistent guidelines to activate and develop transition processes. This excludes the determination of an end state. It is not possible to define precisely the fluxes of materials and the land uses in a circular neighbourhood, because the work acknowledges that place-specific dynamics should prevail in the design of projects and processes.

An originality of the approach is that it is people-centred and considers that urban renovation is an opportunity to address socio economic issues, especially unemployment. Indeed, living in a decent housing is a right enshrined in the French law since 2007, but the urban project brings two dimensions that cannot be solved by the sole landlords: the quality of the public realm, and the production of the space in a social and economic way. The framework combines on the one hand, the attempt to improve the quality of private and public spaces as a prerequisite for individuals to thrive in their communities, and on the other hand, the attempt to improve the socioeconomic conditions of inhabitants in the long term. The multilevel transition perspective is introduced with the purpose to shift the concern from the technical aspect of renovation to the socio-technical production of space. Acknowledging the interdependency between spaces, materials and people, the goal is to reach a dynamic equilibrium where the urban metabolism that consumes and produces resources is both frugal, meaning that it is less resource-intensive, and fairer, meaning that the benefits of urban processes and value creation go to all.

### 8.3 Research limits

The work is on the edge of a trade-off between the comprehensive dimension of the framework and the specificity of the approach. Its strength is to embrace and give coherence to themes that are usually considered in a dual way; the interface between regeneration of spaces and the empowerment of fragile communities has given birth to many projects of brownfield regeneration, while the design of circular-economy systems on a given territory is a part of innovation in territorial industrial and territorial ecology. But the triangle between fragility, urban renovation and circular economy still has to emerge in an explicit formulation. Nevertheless, the approach stresses the importance of local, long-term participatory processes in the nodes of the systems, that is to say the neighbourhoods, and the path-dependency of the process. The temporality of the study does not allow to develop further this aspect.

Another limit of the work is the difficulty to approach local economic actors such as Raedificare, and inhabitants, because of the sanitary situation. Therefore, assumptions have to be made on the interest from inhabitants to participate. In particular, the lack of data regarding materials existing in the built-up environment or to be employed in new constructions can only be solved by field work that was impossible to undertake due to the sanitary situation. Lack of data also concerns the urban renewal projects, since much data was gathered on official publications by MRU and later confirmed by interviewing actors. More field work would have been necessary to address this issue, but again for sanitary reasons this was not possible.

### 8.4 Future work

A further development of the thesis would be to actually implement the framework in one of the neighborhoods. This would depend naturally on field work and the collaboration of different associations, institutional actors already concerned with urban renovation and circular innovators already present in the neighborhood and the northern districts. Giorgia Andreoli<sup>1</sup>, the project leader of La Castellane-La Bricarde is at present trying to implement circular practices that allow the valorization of demolished waste in the renovation sites, although she has been confronted with a lack of institutional support and barely interest to innovate current practices.

Other interesting paths could be the further development of the digital platform as to how the interface could work, investigating all the potential links and metrics it could entail and its actual design. The design of the innovation and experimentation hubs could also be

<sup>1</sup> G. Andreoli, personal communication, 30 October, 2020.



## 8.4 Future work

interesting as to see how to implement in one building the different principles highlighted by the vision: the refurbishment of a site with reused, recycled and reusable materials, the co-creation processes that could take place, the combination of regenerative and social activities, the accessibility and connectivity of the place, its possible forms of ownership and governance and the tools it can provide to the population to experiment and innovate. These places could be interpreted as the labs within the Circular Regeneration Lab.

A more detailed analysis still needs to be made in both quantitative and qualitative terms to understand the local inhabitants and the actual conditions of the local resources. Regarding the inhabitants we need to further inquire on their actual interest and capacity to participate as well as the level of knowledge and awareness there already is on circular practices. Concerning the local resources, more technical data needs to be gathered in order to map the actual production and consumption patterns as well as to thoroughly understand the urban metabolism of the Northern districts.

Further research could also be made on studying each of the built environment phases. Specially the construction and rehabilitation phase may need a more complex network of facilities and spaces in order to achieve a full valorization of construction materials. This last aspect leads us to a last topic that can also be further investigated.

The thesis mainly focuses on the interaction between institutional, civil society actors and citizens in general, nevertheless the participation of the economic sector is also crucial to achieve a circular regeneration. From one side, we need to investigate further their needs, interests and stakes to make them active participants in the process. From the other side, we need to understand what type of resources and knowledge they can bring to the table. To conclude we must say that only by creating a common vision, collaboration will be fostered and an actual circular regeneration process will take place.

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