ANTICIPATING SOCIAL DYNAMICS IN THE REDEVELOPMENT OF INDUSTRIAL BROWNFIELD SITES

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Introduction

The end of the twentieth century saw the development of specialist expertise in response to environmental degradation[1], initially at international level and subsequently, in successive stages, within regional and national legislative frameworks, enabling a wide range of issues to be identified and defined for the public and private stakeholders directly concerned. Among these, the discreet yet very real issue of land take has, for some twenty years, been regarded as a critical concern not only for land and property stakeholders, but also for political actors and civil society more broadly. Land take is defined as the long-term impairment of all or part of a soil's ecological functions – in particular its biological, hydrological and climatic functions – as well as its agronomic potential, as a result of its occupation or use. Conversely, and in response, land renaturation (or de-artificialisation) refers to actions or operations aimed at restoring or improving land functionality, resulting in the conversion of artificialised land back into non-artificialised land. Net land take is therefore defined as the balance between land take and soil renaturation observed within a given area and over a given period. The pace of land take in France is a major democratic issue, at the centre of deep debates within local territories and political parties, though rarely fully articulated in the public arena, despite its direct impacts on issues as serious as biodiversity loss, increased flood risk, localised climate warming, the reduction of agricultural land and the pollution of water resources.

These issues are now firmly on the political agenda, crystallised in a persistent acronym: ZAN – Zéro Artificialisation Nette (*Net Zero Land Take*). Introduced through the legislative framework of the 2021 Climate and Resilience Act, ZAN (or the ZAN objective) has crystallised debate across an entire segment of the national economy: the construction industry. Yet reflection on ZAN has been embedded for several years within successive spatial planning laws, and it was only the quantified targets that truly represented an opportunity to rethink territorial development. Unfortunately, the period following the implementation of the Act appears to have undermined its original ambition. To date, the TRACE Act, which fundamentally alters the very essence of ZAN – namely its quantified reduction targets and ecological ambitions – has been passed, leaving elected officials solely responsible for the future development of their territories, somewhere between voluntary engagement and outright abandonment. However, a unicorn has appeared in the somewhat turbulent landscape of land strategies: an unloved and undervalued asset, a form of land both close to everyone and largely invisible – brownfield land[2]. A wide array of contemporary economic and environmental challenges thus converge around the redevelopment of artificialised land, often referred to as "industrial brownfield sites": the nature of new activities, financial structuring, land scarcity, alignment of projects with local labour markets, the critical role of remediation works, the place of urban experimentation, and so on.
For several years now, redevelopment projects have given a second life to a range of so-called degraded land assets (Confluence in Lyon, Les Docks in Saint-Ouen, Euroméditerranée in Marseille, etc.). Too often overshadowed by major urban development schemes, these projects have nevertheless contributed to raising

1. Establishment of the U.S. Environmental Protection Agency in 1970 / Establishment of the French Ministry of the Environment in 1971 / Establishment of Greenpeace in 1971

2. Under the French Planning Code, a brownfield site is defined as "any built or unbuilt property or property right that is unused and whose condition, configuration or total or partial occupation does not allow for reuse without prior development or works" (https://artificialisation.developpement-durable.gouv.fr/).

awareness among planning and development stakeholders of the potential for reactivating such land, alongside the upskilling of a large number of companies and consultancies in the fields of contamination, remediation and demolition. Today, amid pressure on raw materials and increasingly stringent climate requirements, brownfield land, with its thousands of square metres of available space, presents a new profile, marked by a human legacy that lies at the intersection of opportunity, economic constraints and social appropriation.

Beyond placing environmental and economic issues in perspective, and without focusing on the highly visible (and minority) showcase cases where artificialised land is transformed through the conversion of industrial land capital into cultural and tourism capital, this working paper aims to offer a broader reflection on the influence of political, cultural and social factors on the redevelopment processes of industrial brownfield sites, and, in particular, to emphasise the importance of pairing these processes with problem framing and methodologies grounded in the social sciences and humanities (SSH). This makes it possible, on the one hand, to adopt socio-technical approaches that are consistent with their context and environment and, on the other hand, to avoid certain blind spots in the design of solutions, which invariably carry the risk of exacerbating social inequalities and/or environmental harm[3].

The first part sets out the ecological and economic challenges associated with reducing land take, highlighting the potentially crucial role of brownfield sites in this context. The second part draws on a further body of work from the social sciences and humanities to demonstrate the value of integrating these disciplines into reflection and forward-looking analysis relating to brownfield land. The final part mobilises existing research – still limited in volume – that seeks to adopt an integrated view of this subject, with a view to inspiring a genuinely interdisciplinary approach to the future of artificialised land redevelopment.

I - Brownfield land: an opportunity to (re)concile economic development and environmental objectives?

Land-use sobriety legislation in France aims to limit land take and preserve natural areas. Over the past two decades, successive governments have put forward measures calling for greater land-use restraint, leading to the identification of concrete areas for action.

I.1 - Land take: a public policy issue

It seems useful to recall some of the key provisions of the various pieces of legislation that have shaped the democratic landscape since the early 2000s.

First, the 2000 SRU Act (Solidarité et Renouvellement Urbains – Solidarity and Urban Renewal), as its name suggests, sought to better align human needs with urban development. The articles provided in particular for social housing quotas[4], the introduction of a Local Urban Plan (Plan Local d'Urbanisme, PLU) to replace the former

3. The reflections proposed here remain closely aligned with the future of these specific "places" that brownfield sites represent. This does not preclude the view that public policies should move towards economic, social and environmental decisions that promote, for example, the circular economy and the functional economy, and, more broadly, engage in a profound re-examination of growth itself.

4. Article 55 of the Act requires municipalities with more than 3,500 inhabitants (1,500 in the Île-de-France region)

Land Use Plan (Plan d'Occupation des Sols, POS), the promotion of more coherent urban planning, the strengthening of public transport, and the reduction of urban sprawl (Articles 28 to 30).

Subsequently, with a view to mitigating climate change, the 2010 Grenelle II Act called for the preparation of Territorial Climate-Energy Plans (Plans Climat-Énergie Territoriaux, PCET), in particular through Article 75, which made them mandatory for local authorities, and introduced new environmental standards for construction. Notably, Articles 1 to 4 strengthened requirements relating to the energy and environmental performance of buildings.

The 2014 ALUR Act (Accès au Logement et Urbanisme Rénové – Access to Housing and Reformed Urban Planning) also sought to promote urban densification, notably through three flagship measures:

- Introducing a rent control mechanism in high-pressure housing markets to curb price increases (Article 6);
- Abolishing the Floor Area Ratio (Coefficient d'Occupation des Sols, COS) and minimum plot size requirements in order to encourage urban densification (Article 157);
- Finally, strengthening transparency and regulation of property management bodies to improve the governance of multi-owned residential buildings (Articles 55 to 65).

The "Avoid, Reduce, Compensate" (ERC) regulatory framework was established in France under the Biodiversity Act of 8 August 2016. This Act introduced the ERC sequence for the management of environmental impacts arising from development and infrastructure projects. The purpose of this sequence is to ensure that, prior to any development likely to affect biodiversity, efforts are made first to avoid environmental damage, then, where avoidance is not possible, to reduce impacts, and finally to compensate for any residual impacts.

Subsequently, the 2018 ELAN Act (Évolution du Logement, de l'Aménagement et du Numérique – Housing, Planning and Digital Transformation) sought to simplify planning procedures (Articles 1 to 10 aim to accelerate construction projects by streamlining administrative processes), reform social housing (Articles 54 to 80 encourage the sale of social housing stock and reorganise the sector to improve efficiency) and facilitate the conversion of office premises into housing (Article 24 eases the change of use from offices to residential), three decades after such demands were first raised by social movements.

The objective of land-use sobriety is also embedded in various legislative provisions of the Planning Code, from the principle of balance (Article L101-2 in 2016) to the explicit introduction of the concept of sobriety itself (Article L101-2-1 in 2021), including provisions relating to the consumption of natural, agricultural and forest land (espaces naturels, agricoles et forestiers – ENAF) set out in Article L141-3. The explicit pursuit of land-use sobriety is accompanied by a roadmap aligned with the recommendations of the Citizens' Convention on Climate (a 150-member assembly established in 2019 by the Economic, Social and Environmental Council – CESE), namely:

- Control of urban sprawl;
- Urban regeneration;
- Optimisation of density within built-up areas;
- Urban quality;
- The preservation and restoration of biodiversity and nature in urban areas;
- Protection of soils in natural, agricultural and forest areas;

to provide a minimum of 20% social housing, a threshold that was subsequently increased to 25%.

- The renaturation of artificialised land.

More recently, the 2021 Climate and Resilience Act marked a significant shift by, for the first time, setting quantified targets for reducing land consumption. Five key measures can be identified:

- Carbon neutrality by 2050[5]: the Act aims to reduce France's greenhouse gas emissions by 55% by 2030, in line with European commitments, and to achieve carbon neutrality by 2050.
- Combating land take: the Act introduces the concept of "Net Zero Land Take" (Zéro Artificialisation Nette – ZAN) by 2050, with an intermediate target of halving the consumption of natural, agricultural and forest land by 2031 compared with the previous decade.
- Strengthening the energy performance of buildings: the Act imposes stricter standards for new developments and provides for mandatory energy refurbishment of buildings classified as "energy-inefficient properties".
- Advertising regulation: restrictions are introduced on advertising for products with a high environmental footprint, particularly fossil fuels.
- Renewable energy development: the Act encourages the installation of photovoltaic panels on 30% of the roof area of commercial and industrial buildings, as well as on car parks and parking facilities.

I.2 - A relative slowdown in land take

Throughout these decades of land consumption, the Economic, Social and Environmental Council (CESE) has played an active role in shaping and promoting land policy in France.

Three key actions deserve particular attention[6]:

- In 2022, the CESE's "Territories, Agriculture and Food" Committee initiated a series of studies on land policy entitled "From soil to land, from functions to uses: what land policy?". This work included roundtable discussions and expert hearings to analyse issues related to land governance and to propose strategic policy directions.
- Following this work, at its plenary session of 25 January 2023, the CESE adopted an opinion setting out recommendations for a "coherent land policy", emphasising the need to reconcile urban development, the preservation of natural and agricultural areas, and housing affordability.
- To further inform its analysis, the CESE organised thematic working sessions bringing together a wide range of land and property stakeholders. These meetings made it possible to share experiences, identify current obstacles and co-develop solutions tailored to contemporary land-use challenges.

As a result, a number of policy recommendations were issued, such as "Amending the wording of Article L.110-1 of the Environmental Code to recognise soil as a constituent element of the nation's common heritage", and "In order to preserve the ecological, food-producing and agronomic functions of soils, strictly limiting the installation of photovoltaic panels to buildings, already artificialised surfaces,

5. https://www.ecologie.gouv.fr/sites/default/files/documents/SNBC-2%20synthe%CC%80se%20VF.pdf

6. https://www.lecese.fr/travaux-publies/du-sol-au-foncier-des-fonctions-aux-usages-quelle-politique-fonciere

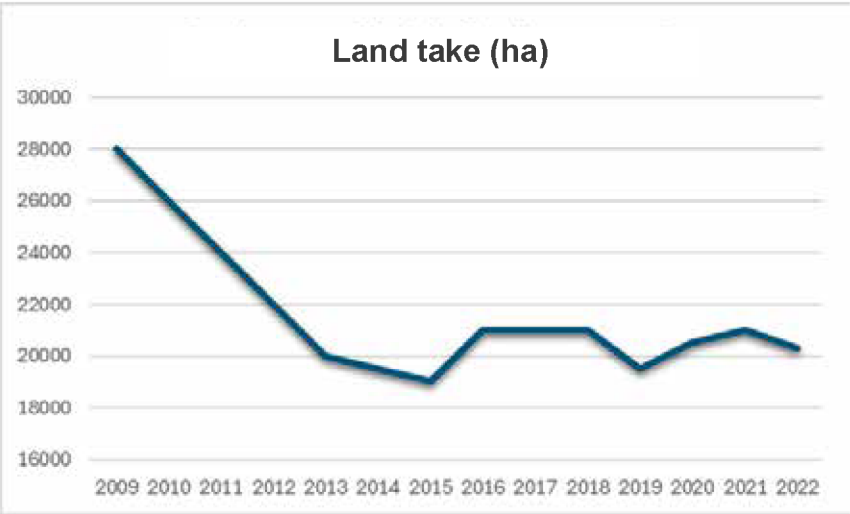
or genuine agrivoltaic projects as defined by ADEME[7]". All aspects are analysed to provide an accurate and comprehensive picture of the situation. As recalled by France's third constitutional assembly, after the National Assembly and the Senate: "The soil may be the most vital and, paradoxically, the least understood of all the constituent elements of terrestrial ecosystems."

The process of progressively introducing provisions that directly or indirectly limit land take nevertheless remains subject to criticism in public discourse. In response to the 2021 Act – with a particular focus on the ZAN objective – a TRACE Bill (Trajectoire de Réduction de l'Artificialisation Concertée avec les Élus locaux – Trajectory for the Reduction of Land Take Agreed with Local Elected Officials) was introduced by Senators Guislain Cambier and Jean-Baptiste Blanc[8], seeking to revise the land take reduction targets established by the 2021 Climate and Resilience Act. The bill is intended to address concerns and implementation difficulties relating to the pace of land take across local territories, but it raises significant concerns in light of ongoing environmental degradation.

Among the key provisions of the proposal are the following:

- Easing of land take reduction targets: the proposal amends the objectives set by the Climate and Resilience Act, notably by removing the intermediate target of halving land take by 2031.
- A revised accounting methodology: the proposal suggests revising the method used to calculate land take by focusing exclusively on the consumption of natural, agricultural and forest land (espaces naturels, agricoles et forestiers – ENAF), thereby excluding certain urban transformations from the calculation.
- Enhanced consultation with local elected officials: the proposal emphasises closer collaboration with local authorities to define land take reduction trajectories tailored to local conditions.

Alongside this break in the pace at which environmental issues are integrated into legal and economic frameworks, it can be observed that, after several years of marked decline in land consumption, the rate of land take has no longer decreased over the past decade.
The following chart draws on data available on the government website and illustrates the pace of land take in France, expressed in hectares consumed per year[9]:

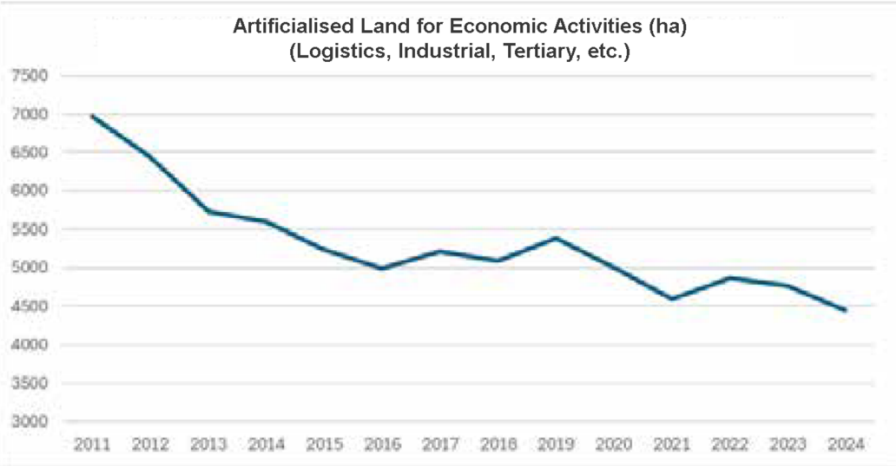


7. French Agency for Ecological Transition (ADEME) (https://www.ademe.fr/).

8. Adopted by the Senate at first reading on 18 March 2025, the bill was under consideration by the National Assembly at the time of writing these lines.

9. https://artificialisation.developpement-durable.gouv.fr/parution-des-donnees-consommation-despaces-2009-2023

Focus on the "Economic Activities" sector



These figures do indeed show a general downward trend in land consumption since 2009. However, this decline is less the result of deliberate environmental restraint than of the 2008 financial crisis and the subsequent economic slowdown (it is worth recalling that in 2009 the 2.6% fall in GDP marked the most severe recession since the post-war period). Since 2016, a relative level of stability has been observed at around 21,000 ha per year. This pace of land take is equivalent to converting five football pitches per hour into developable land.

I.3 - Brownfield sites: an ideal lever for reducing land take?

Land take in France was the subject, in 2017, of a Collective Scientific Assessment (Expertise Scientifique Collective – ESCo), commissioned by the ministries responsible for the environment and agriculture, in partnership with ADEME (Béchet et al., 2017). Conducted jointly by experts from IFSTTAR[10] and INRA[11], this study presents brownfield sites (whether industrial, commercial, rail-related or agricultural) as sites of challenge – notably in terms of environmental and/or landscape contamination – but also as sites of opportunity, particularly in the context of urban regeneration and the containment of urban sprawl.

A few years later, brownfield sites became the subject of a decree[12] clarifying the conditions for applying the definition of brownfield land set out in the Planning Code. Accordingly, Article L.111-26 provides for the identification of a brownfield site by taking into account, in particular, one or more of the following criteria:

- A high concentration of vacant dwellings or substandard housing;
- One or more vacant or degraded premises or facilities, in particular following the permanent cessation of activity;
- Identified contamination for which the liable party or site operator, their successor in title, or any party having assumed their obligations has disappeared or is insolvent;

10. French Institute of Science and Technology for Transport, Development and Networks - https://www.construction.univ-eiffel.fr/a-propos-des-6-etablissements/ifsttar

11. National Research Institute for Agriculture, Food and the Environment - https://www.inrae.fr/

12. Decree No. 2023-1259 of 26 December 2023.

- A significant cost associated with reuse, or a likely financial imbalance between acquisition and intervention costs, on the one hand, and the market value of the asset concerned or, where applicable, the value resulting from the intended change of use, on the other.

The legislator also sets out a framework applicable to redevelopment operations:
- Development or preparatory works prior to reuse, within the meaning of Article L.111-26, are understood to include interventions enabling the remediation, rehabilitation or transformation of the asset concerned;
- An activity authorised on a temporary basis prior to planned reuse does not call into question the classification of a site as a brownfield;
- Unbuilt land with an agricultural or forestry use or designation cannot be considered brownfield land within the meaning of the Code.

Changes in land use have also made it possible to identify sectors conducive to industrial and economic recovery:
- Redevelopment of industrial and urban brownfield sites: a growing number of projects aimed at rehabilitating former industrial and commercial sites in order to limit urban sprawl.
- Conversion of offices into housing: a process accelerated since the Covid-19 crisis and the rise of remote working.
- New requirements for logistics infrastructure: the development of warehouses and logistics platforms driven by the growth of e-commerce (Amazon and major retail groups).

In this context, work carried out by CEREMA (Centre for Studies and Expertise on Risks, Environment, Mobility and Urban Planning) led to the launch of the "Cartofriches" application - https://cartofriches.cerema.fr/cartofriches/. This application centralises field-based data, supporting project sponsors in the characterisation of brownfield sites (commercial, industrial and residential) and thereby unlocking the potential for reuse of these spaces with a view to reducing land take.

I.4 - Logistics platforms as a means of redeveloping brownfield sites

As a result, new economic perspectives are emerging around the reintroduction of activities on artificialised land, in particular logistics platforms located at the heart of contemporary transport and distribution systems (Strale, 2013). Through their increasing scale and proliferation, these facilities accompany the expansion of e-commerce, although this growth cannot be attributed to this single trend alone (Blanquart et al., 2019). In this respect, land requirements are intensifying with the arrival of new players and increased activity across established sectors (large-scale retail, industry, etc.). The French Federation of E-commerce and Distance Selling (FEVAD)[13] reported a 12.5% increase in the final quarter of 2024 compared with 2023, thereby confirming the renewed momentum of the sector in 2024 (further boosted by an "Olympic Games effect").

Logistics industry stakeholders have defined critical vacancy rate thresholds (i.e. unoccupied space) for logistics facilities[14]: a situation is deemed "very critical" below 5%, while a range between 5% and 8% reflects a tight market that constrains the full development of the regional ecosystem. In 2023, only two French regions fell within the 5% to 8% range (Centre-Val de Loire and Normandy),

13. https://www.fevad.com/

14. https://www.faq-logistique.com/CP20230328-AFILOG-Cartographie-Crise-Foncier.htm

only one region exceeded 8% (Hauts-de-France), while the remainder of the country recorded vacancy rates below 4%. As a result, brownfield sites emerge not only as a major lever for reducing land take from an environmental perspective, but also, in light of economic needs rooted within territories, as priority locations for the development of economic activities.

In addition to these land-use changes, and in order to facilitate initiatives to redevelop artificialised sites, the government launched a national reindustrialisation label in 2020 known as "Ready-to-Use Sites" ("Sites clés en main"). Co-led by the National Agency for Territorial Cohesion (ANCT) and the Directorate General for Enterprise (DGE), this industrial initiative aimed to foster the development of new industries by adapting land supply to evolving societal and economic standards (infrastructure, mobility, environmental performance and Industry 4.0[15]). Building on this approach, in 2023 the government launched the "Ready-to-Use Sites France 2030" scheme, aimed at accelerating the mobilisation of land. Two main objectives were announced:

- For investors: access to pre-qualified land offers enabling significant reductions in installation lead times;
- For developers and local authorities: pre-development works and support with administrative procedures, facilitating project delivery.

Against a backdrop of rising parcel volumes, pressure on land resources and agricultural constraints, brownfield sites represent both a development opportunity for industrial stakeholders and a land-use regulation lever balancing rapid urbanisation with environmental protection.

Finally, France's contaminated land and soil remediation sector represents a significant asset in the revitalisation of these sites, which are often incompatible with their intended future uses without prior intervention. This area constitutes a major development axis in France, with the contaminated land remediation market growing each year to reach €962 million in 2021[16].

I.5 - Impacts of spatial planning on biodiversity

Spatial planning, even when anticipated, carefully designed or standardised, consumes a significant share of natural, agricultural and forest land (ENAF). In parallel with this land consumption, the Avoid-Reduce-Compensate (ERC) methodology, first implemented in 1976, was strengthened in 2016. This approach *"aims to reconcile economic development with environmental objectives, serving as the guiding framework for integrating environmental considerations into planning documents and territorial development projects. For such projects, the objective is to avoid any damage to natural environments and the associated ecosystem services; failing that, to reduce such impacts; and, as a last resort, to compensate for them"*[17].

Like any economic logic, environmental compensation has, in recent years, emerged as an opportunity for land-based economic development. More specifically, environmental compensation aims to offset damage caused to

15. This paradigm is now being superseded by Industry 5.0, which repositions human beings and the environment as interacting with production tools, rather than being subordinated to them. From this perspective, attention to the working environment in its broadest sense takes on a new dimension.

16. https://www.statistiques.developpement-durable.gouv.fr/la-depense-de-protection-et-de-depollution-des-sols-et-des- eaux-en-2021

17. https://www.ofb.gouv.fr/mettre-en-oeuvre-la-sequence-eviter-reduire-compenser

the environment by development projects through the restoration or repair of natural spaces. To this end, specific tools and practices are used to assess and compare ecological losses and gains. These tools are based on processes of categorisation (classification of affected natural components), commensuration (quantitative assessment of losses and gains), and implementation (the delivery of compensatory measures). However, compensation is not synonymous with ecological neutrality. As early as 1986, Professor Jean Untermaier argued that "to compensate is to destroy while pretending to protect" (Untermaier, 1986, cited in Doussan, 2018: 162). These findings are echoed in numerous studies at both national and global levels, leading to a clear and unequivocal conclusion: fewer than 0.05% of compensation projects worldwide have been subject to any form of impact assessment[18]. In France, responsibility for evaluation and monitoring lies with the French Office for Biodiversity (Office Français de la Biodiversité – OFB), despite the significant pressures faced by the institution (recent social and political developments in France have further intensified these pressures[19]).

Research conducted by scholars from the National Museum of Natural History (MNHN), the CNRS, Sorbonne University, AgroParisTech and Paris-Sud University, as part of a study on the Avoid-Reduce-Compensate (ERC) sequence (Weissgerber et al., 2019), analysed data from 24 infrastructure projects authorised by the State between 2012 and 2017, including 20 projects in the Occitanie region and five in the Hauts-de-France region[20].

The main findings of this study are as follows:

- Insufficiency or inadequacy of compensatory measures: in 80%[21] of the cases examined, environmental compensation measures were insufficiently demanding or inadequately tailored to the ecological impacts of the projects.
- Types of measures implemented: only 20% of projects involved genuine ecological restoration operations (17% concerned interventions on intensively farmed agricultural land and 3% on severely degraded areas); the remaining 80% were limited to the preservation of environments that were already (or still) of good ecological quality, without any real ecological enhancement.
- Quality of environmental impact assessments: impact assessments provided more detailed analyses of environmental impacts than of the compensatory measures proposed. Moreover, stakeholders involved (consultancies, project developers and public authorities) often opted for minimal compensation, frequently targeting existing natural environments (forests, woodland and grasslands), where ecological gains are lower than those achieved through the restoration of degraded habitats.
- Compensation data: limited data are available on the quality of sites proposed for compensation, making it difficult in this context to assess whether land take and biodiversity recovery have been adequately addressed.

The authors recommend improving the description and comparison of ecosystems affected by development projects and those proposed for compensation. This would enable a more accurate assessment of ecological losses and gains, thereby promoting more effective measures to avoid a net loss of biodiversity.

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18. https://www.agrobiosciences.org/environnement-120/article/les-compensations-ecologiques-sous-tensions

19. https://reporterre.net/Un-pas-de-plus-et-je-t-embroche-des-agents-de-l-OFB-racontent-les-violences-des https://www.liberation.fr/environnement/agriculture/degradations-sabotages-effractions-la-carte-de-la-cinquantaine-dac- tions-musclees-qui-ont-cible-lofb-depuis-debut-2024-20241129_LWBAXZDBCJHV5DA3JCN7BIVTK4/

20. https://www.environnement-magazine.fr/biodiversite/article/2019/09/06/125767/etude-les-mesures-compensa- tion-environnementale-seraient-pas-assez-exigeantes

21. https://reporterre.net/Grands-projets-destructeurs-l-esbroufe-de-la-compensation-ecologique

Overall, this study highlights the current challenges and shortcomings in the implementation of environmental compensation measures in France, underlining the need for more rigorous and better-adapted approaches to effectively safeguard biodiversity.

In summary, these processes raise questions both about the ability of project promoters to genuinely achieve ecological neutrality, and about the State's capacity to fulfil its role as regulator and overseer (for example, through the OFB's dual supervisory framework), as well as the potential excesses inherent in compensation mechanisms[22].

II - Brownfield sites as reflections of sociocultural processes at the heart of urban change

While environmental and economic challenges continue to struggle to align in a sustainable manner, despite the current sense of urgency, it is also apparent that human and sociocultural dimensions remain insufficiently addressed in policy and planning discussions. This is largely because they operate over the long term, through informal processes, and according to logics rooted in local political and cultural contexts that can vary significantly from one territory to another.
Despite limitations in the integration of economic and environmental issues, research in the social sciences and humanities (SSH) offers alternative perspectives on these challenges that are valuable for public decision-making.

II.1 - The neglect of the social sciences and humanities

Brownfield sites are a prominent feature of the "landscapes of the Anthropocene", understood as spaces that have become "ruins" or "negative commons" (Monnin, 2021; Bonnet et al., 2021). Nevertheless, many sites rooted in the industrial history of Western countries have seen their physical structures transformed through tertiary activities, most often associated with cultural, artistic or social uses, such as third places (tiers-lieux) (Le Nadant, Marinos[23]), as well as within the industrial cores of post-socialist cities such as Pančevo in Serbia (Jigoria-Oprea, Popa, 2017).

SSH research engaging with artificialised land has tended primarily to take the form of retrospective monographic studies, focusing on transformation processes in spaces categorised as post-industrial, as well as on conflicts between actors with an interest in their ownership, management or use. A growing environmental strand within sociology has yet to enable a fine-grained articulation of the different levels of relationships to objects, spaces and territories. As a result, the examples that shape shared representations – found both in SSH literature and in professional studies associated with reindustrialization – tend to focus on metropolitan spaces with high symbolic value. These include gentrified neighbourhoods in Brussels (Van Criekingen, 2008) or Lille (Cary & Delfini, 2019), La Belle de Mai in Marseille (Grésillon, 2011),

22. https://www.erudit.org/en/journals/vertigo/2018-v18-n2-vertigo04601/1059915ar.pdf

23. While the mining settlement, built entirely of red brick, was listed as a historic monument in the early twenty-first century, the production site is still in operation and pollution remains clearly visible.

the “Vallée de la Chimie in Greater Lyon” (Ameller et al., 2023), emblematic industrial-era regions such as the Ruhr (Browne, 2016) or Moselle (Trink, Pitance, 2022), or large-scale deindustrialisation processes in major cities, such as Naples (Parisi, 2011).

Beyond the environmental and economic dimensions discussed earlier, the social (or sociocultural) dimensions of urban space – at both local and broader scales – should be examined from the very outset of project conception and design. Social dimensions should no longer be approached merely as contingencies, or even as negative externalities (that is, indirect costs imposed by one party on another), once processes are already under way. This applies both for ethical reasons (economic activity cannot be generated without due consideration for the human environment) and for practical reasons (the potential for legal challenges by residents and local stakeholders can significantly undermine projects[24]). It is also necessary to take into account the limited role of rationality in shaping collective representations when engaging with macroeconomic or macro-ecological data at scale:

- Global: beyond cognitive biases and paralysing anxiety, a prevailing sense of distance from – or abstraction of – environmental risks dominates public perceptions (as illustrated by the failure to meet the objective of limiting global warming to 1.5 °C).
- Local: the perceived disconnect between overarching objectives and their associated standards on the one hand, and on-the-ground realities on the other, tends either to favour the most powerful stakeholders or to constrain projects out of fear of failure.

It therefore appears necessary to incorporate additional social mechanisms into the analysis in order to understand – through what is done or not (yet) done with regard to brownfield sites – the drivers of future projects that are environmentally, economically and socially sustainable. This requires reframing opportunity sites in relation to the sociocultural processes that lie at the heart of urban change.

II.2 – The effects of metropolitanisation

Not all cities experience the same dynamics or undergo identical processes of urban change. For nearly two decades, a substantial body of literature has highlighted the phenomenon of metropolitanisation, referring to the significant concentration of economic, social and cultural value in and around the major cities of a country or region. These effects extend to adjacent territories, generating both new opportunity dynamics and material and human flows, while simultaneously exacerbating certain inequalities (Saint-Julien, Le Goix, 2007; Galimberti et al., 2017), and even giving rise to new forms of socio-professional or generational segregation (Fusco, Scarella, 2011), at times affecting even relatively advantaged groups (Préteceille, 2006). An interesting – and somewhat counterintuitive – example that fully reflects the new sociocultural logics associated with metropolitanisation is provided by the Friche de la Belle de Mai (Grésillon, 2011). Established in 1992 in a former tobacco factory, it brings together more than 70 artistic and cultural organisations combining creative production spaces with public dissemination, and hosts several hundred events (workshops, festivals, etc.) each year. Its influence appears paradoxical in that it is better (re)known at national or international level than locally, with its cultural output being widely recognised

24. https://www.voxlog.fr/dossier/274_1/de-la-friche-a-l-entrepot-entre-complexite-et-exemplarite

while its mode of operation is perceived as “closed” at neighbourhood level. An overemphasis on culture-led regeneration has, moreover, given rise to critical movements, particularly in the United Kingdom (Luxembourg, 2013). Indeed, the cultural transformation of industrial sites often reflects a deliberate effort to repurpose them for populations largely disconnected from their original productive activities.

At the same time, studies of self-managed spaces (sometimes established on brownfield sites) show that processes of reappropriation inevitably emerge in response to any tangible transformation of urban space. In some cases, competing actors emerge within this process of reappropriation, and their positions may evolve over time. For example, a Paris-based collective operating on a squatted site eventually stabilised its activities and became a professionalised and institutionalised structure, marked by multiple internal tensions (Dumont, Vivant, 2019).
This serves as a reminder that identifying a supposedly “key” informal actor from the perspective of regeneration project sponsors does not guarantee access to all relevant stakeholders.

More broadly, understanding what typically takes place on nearby brownfield sites can help anticipate uses, expectations and needs associated with their reindustrialisation, at a time when the initial impetus – and the subsequent redevelopment process – remains largely dominated by conventional economic actors. While some major industrial territories deeply affected by factory closures make job preservation an overriding priority, it can be assumed that lived experience and perceptions of the future vary within nearby populations – ranging from the distress associated with job losses, to opportunities for economic transformation, and even a desire to distance oneself from industrial culture. In practice, the valuation of a brownfield site cannot be reduced solely to its potential for economic redevelopment, but must incorporate a wider range of considerations.

II.3 – The dynamics of heritage-making

An ethnologist has recently carried out a comparative analysis of changes in the role of industrial heritage in the transformation of industrial brownfield sites (Gay, 2020). He identifies three major historical phases, the most recent of which coincides with the rise of the issues outlined above:

- Functionalist modernisation and default preservation (up to 1960): during this period, industrial brownfield sites were often perceived as obsolete spaces, remnants of a bygone era. Their redevelopment was primarily aimed at removing these vestiges to make way for modern infrastructure, with little or no regard for their heritage value.
- Opportunistic valorisation of heritage (from the 1980s): in the context of increasing territorial competition, planning and development stakeholders began to exploit industrial heritage as a distinctive asset. Historic architectural features were highlighted to strengthen local identity and attract investment, although this approach was often superficial and driven mainly by economic considerations.
- A more in-depth approach to heritage (since the 2000s):
  with the emergence of heightened sensitivity to industrial heritage and environmental issues, a more considered approach has developed. Planning and development stakeholders have increasingly collaborated with academic experts to better

understand and integrate the historical significance of industrial sites into regeneration projects. This approach seeks to transform industrial heritage from a mere "captured added value" into a strong planning argument, while continuing to pursue objectives of economic revitalisation and territorial attractiveness.

The concept of heritage-making has also emerged in economic sociology to describe the effects associated with the rehabilitation of former industrial spaces. In particular, sociologists have identified a form of "induced heritage-making", producing a "heritage effect" triggered by the establishment of new facilities, such as museums or cultural centres, or by the organisation of events (festivals, commemorations, etc.). Moreover, there are numerous cases in which environments that, until recently, were regarded as devoid of interest and destined for demolition – often former industrial production sites – are redeveloped and reoriented towards artistic or cultural activities capable of supporting event-led programming. Heritage-making, whether induced or spontaneous, can take place regardless of the age of a site or building, which may have been entirely rebuilt, extensively refurbished, or even newly constructed, as it is primarily grounded in the narrative associated with it – one that situates the place within a genealogy" (Boltanski, Esquerre, 2017: 38).

While this line of reasoning forms part of a critical perspective that need not be elaborated upon here[25], it may nonetheless be considered that, irrespective of the nature of the activities envisaged for the revitalisation of brownfield sites, heritage-making – whether institutional or more informal, for example when citizen, artistic or activist collectives occupy a site – is an unavoidable phenomenon. It therefore appears preferable to incorporate this dimension into the rehabilitation strategy rather than to confront it reactively at the project implementation stage. Above all, it is desirable to articulate heritage-making with the economic and environmental dimensions of a prospective project, particularly in contexts where processes of symbolic revalorisation are less likely to succeed, or where they risk being unilaterally appropriated by stakeholders who do not necessarily respect the industrial memory of the area concerned.

Heritage-making is indeed expressed through processes of memorialisation, particularly of the working class, whether at former workplaces themselves or within workers' housing estates ("cités ouvrières") (Duchêne et al., 2013). Some authors further observe that a decline in land value may be offset by an increase in market value linked to the reactivation of memorial objects and narratives (Bachimon, 2014). However, this approach carries the risk of favouring sites that are symbolically the most "profitable", thereby reproducing or exacerbating inequalities. More broadly, the role of narrative at the core of heritage-making and memorialisation invites rehabilitation projects to be conceived not only beyond the material, economic and short-term rationales underpinning many developments, but also with regard to unequal collective dispositions between sites. This, in turn, implies a political effort to ensure equitable access to heritage-making processes. This may involve, for example, the structuring of a tourism offer or the transmission of memory to younger generations through embodied space, monuments and local routes – elements animated

25. Conversely, commodification processes may lead to new socio-economic inequalities within affected populations, or to a contraction of informal freedoms of creation and grassroots reappropriation of urban space. Along similar lines, other authors highlight the paradox inherent in the redevelopment of spaces selected to serve as "showcases" of sustainability while concealing an industrial base that remains polluting, such as the eco-district located near the petrochemical plants of Rouen (Pandelle, 2020).

and symbolically reinforced through storytelling – such as the Musée de l'Homme et de l'Industrie (Écomusée Creusot Montceau). The issue of discourse – the narrative – thus emerges as central, revealing disparities in potential between industrial sites depending on how conducive their surrounding environments are to the circulation and accumulation of capital.

II.4 - The weight of collective representations

While recognition of industrial heritage has undoubtedly progressed, rehabilitation projects remain largely driven by economic rationales, sometimes at the expense of genuine social and cultural appropriation by local communities. As noted above, peri-urban brownfield sites that do not form part of a metropolitan territory (in the sense defined earlier) are likely to be subject to less "heritage-making pressure" than those associated with major cities and/or those that have already undergone processes of grassroots reappropriation. However, the creation of new logistics "nodes" inevitably raises questions about their relationship – whether of inclusion, cooperation or conflict – with the nearest metropolitan area. The space to be revitalised should not be reduced to purely functional dimensions simply because it lies outside a metropolitan context. In other words, it is the spatial environment as a whole that must be planned and designed, not merely the production site in isolation.
Invisible land parcels – what might be described as neglected micro-spaces or derelict interstitial areas – may be subject to inappropriate uses (drug consumption, prostitution), but they can also undermine the overall coherence of a project and fuel negative collective representations. This recalls the well-known "broken windows theory" (Wilson, Kelling, 1982), which uses the metaphor of an unrepaired broken window to illustrate how inaction in the face of even minor negative events can have far-reaching consequences for perceptions and feelings associated with a given environment: fostering a sense of decline, public neglect of a neighbourhood, or, as many criminologists have subsequently argued, heightened feelings of insecurity. Although this theory has since been nuanced, research has shown that perceptions of disorder can nonetheless generate negative psychosocial effects among residents, such as reduced self-esteem (Haney, 2007).

The mechanism underlying this perception – and its tangible effects – is not new. It is comparable to the phenomenon of agricultural land abandonment from the 1970s onwards, when technical modernisation generated significant productivity gains, leading to the abandonment of certain areas and the emergence of abandoned rural land (Janin, Andres, 2008). Its industrial counterpart emerged in the following decades: industrial decline generated urban brownfield sites, producing lasting negative effects (a sense of disorder), further compounded by forms of reappropriation that were not acceptable to all. In the urban context, "withdrawal" is defined through "natural forms of degradation accelerated by uses that can only fully develop within such vacant spaces" (Bachimon, 2014: 44). Recent research shows that heritage-making processes may fail, and that dereliction can persist, contributing to the emergence of "abandonment tourism" (one of the most prominent forms being urban exploration, or urbex). This phenomenon is sometimes perceived negatively by local residents, who experience it as a form of symbolic violence[26] (Le Gallou, 2023).

This latter observation supports the broader principle of integrating lived experiences

26. The concept of "symbolic violence", developed in the 1960s by French sociologists (Bourdieu, Passeron, 1970), refers to the euphemised constraints embedded in relations of social domination. These operate primarily through language rather than physical coercion, with their logics and arbitrary nature concealed to such an extent that mobilisation against them is hindered despite the suffering they produce, and they may even come to be perceived as "normal" and accepted.

and the needs of local populations into rehabilitation projects, in order to avoid reliance solely on the – albeit necessary – production of symbolic capital, which remains largely the prerogative of metropolitan areas. In this respect, the social dimension of brownfield rehabilitation projects may be understood as a meso-level, positioned between macro-scale environmental issues – often abstract in nature – and micro-scale economic considerations, based on quantified rationales that remain distant from the complexity of human relationships.
Human communities, regardless of their size or sphere of activity, continue to be structured around places, rites and symbols, and the proximate transformation of sites of significance requires a process of empowerment grounded in shared socio-cultural valorisation.

III - The complexity of anticipating the effects of rehabilitation

The redevelopment of urban brownfield sites – particularly contaminated sites – is attracting growing attention at the intersection of environmental, social and economic challenges. However, assessing the actual benefits of such transformations remains complex, as their impacts are diffuse, multidimensional and often poorly quantified. This observation invites a rethinking of evaluation methods and project approaches, with a stronger integration of the human, cultural and civic dimensions that shape local dynamics in and around urban brownfield sites. Accordingly, brownfield sites should no longer be regarded merely as spaces to be "revalorised", but as living territories that embody uses, memories and collective potential.

III.1 - Plurality of approaches and the space of perspectives

While many researchers underline the difficulty of assessing the benefits of brownfield redevelopment, economists have sought, in a recent literature review, to synthesise the full range of expected benefits associated with the redevelopment of a contaminated urban brownfield (Plottu, Tendero, 2017: 339-340), distinguishing between environmental, socio-health and economic domains. Beyond its technical contribution, this synthesis also highlights the ways in which certain domains are categorised and reduced, particularly in relation to the interface between the social sphere and the economy. Job creation, tourism attractiveness and leisure could equally be understood as socio-health benefits, both through the positive effects of access to employment on mental health and through the symbolic and social benefits generated by new cultural activities within the local environment. It is worth noting in this regard that, although art and culture are clearly associated with "tourism attractiveness and leisure", they are absent from the table, even though – as shown earlier – they constitute the primary domains through which metropolitan urban brownfield sites are initially reappropriated.

Table 1 – Expected Benefits of the Redevelopment of a Contaminated Urban Brownfield Site

	Expected benefits	Bibliographic references
Environmental benefits*	**Mitigation of climate change and protection of the atmosphere**	
	Reduction in urban sprawl	(CHRYSOCHOOU *et al.*, 2011)
	Reduction in CO_2 and greenhouse gas emissions	(MASHAYEKH *et al.*, 2012; NAGENGAST *et al.*, 2011; US EPA - ENVIRONMENTAL PROTECTION AGENCY, 2011b)
	Preservation of biodiversity, ecosystems and natural resources	
	Preservation of biodiversity and ecosystems	(ADEME, 2014; WESTPHAL *et al.*, 2004)
	Reduction of vulnerability to environmental risks	(PEARSALL, 2009)
Socio-health benefits*	**Human well-being and fulfilment**	
	Reduction of health risks	(ALBERINI *et al.*, 2012; LITT *et al.*, 2002)
	Improvement in perceived well-being and quality of life	(DE SOUSA, 2006; VANDERMOERE, 2008)
	Social cohesion and solidarity between territories and generations	
	Social interactions	(ATKINSON *et al.*, 2014; CHAKRAPANI and HERNANDEZ, 2012)
Economic benefits*	**Development dynamics based on responsible modes of production and consumption**	
	Land value uplift	(ALBERINI, 2007; CHATTOPADHYAY *et al.*, 2005; DE SOUSA *et al.*, 2009; GAMPER-RABINDRAN and TIMMINS, 2013; LETOMBE and ZUINDEAU, 2001; LINN, 2013; TONIN and TURVANI, 2014)
	Job creation	(HOWLAND, 2007)
	Reduction in energy consumption	(PAULL, 2009)
	Tourism attractiveness and leisure activities	(FAGNONI, 2004; KAZIMIERCZAK, 2012; MARTINAT *et al.*, 2014)
	Reduction in public infrastructure costs resulting from reduced urban sprawl	(AMEKUDZI and FOMUNUNG, 2004; CAMAGNI *et al.*, 2002; DE SOUSA, 2002)

Source: AUTHORS. * Cross-cutting bibliographic references: (CHILTON et al., 2013; MALEK and MATEV, 2014; US EPA - ENVIRONMENTAL PROTECTION AGENCY, 2011a)

ADEME published a study covering 95 contaminated brownfield redevelopment projects as part of its support programme following calls for projects issued between 2010 and 2016. While the main article (Château et al., 2019) presents technical findings largely focused on remediation – together with an insightful typology of contaminated soils – the final report (Château et al., 2022) identifies certain socio-economic impacts of these operations. These are assessed through indicators applied after remediation works, including levels of investment in development and construction, employment generated during construction and induced by subsequent operations, housing delivery, and local fiscal revenues. Presented primarily in raw and/or forecast form, the data do not allow impacts to be established in the strict sense of the term–namely, a net effect controlled through comparison or through the calculation of avoided costs (i.e. expenditure that would have been incurred had an action or programme not been implemented)–with respect to employment or housing[27]. Nevertheless, the authors highlight the conventional mechanism of net job creation associated with investment in development schemes (Château et al., 2022 : 80).

A qualitative component of the study (interviews with project owners) makes it possible to identify the socio-economic commitments undertaken as part of these operations, as well as concrete actions directed at local residents: “The establishment of neighbourhood committees, the organisation of meetings or public consultations, or the installation of information boards presenting the site’s history and the project timeline are common practices. Some initiatives are more atypical: interviews with residents conducted by sociology consultancies, the creation of housing and sustainable development centres, or the establishment of project houses. Overall, this level of involvement appears to be valued by local residents, as participation levels are high in most operations. It may also be noted that, at the conclusion of one development project, a building was intended to be delivered through self-promotion by a family” (Château et al., 2022 : 85). It is noteworthy that, in this data collection exercise, project owners are not approached as co-producers of the situations in question, even though their representations and actions also shape perceptions, levels of engagement, and individual and collective outcomes associated with the redevelopment process. This argues for the inclusion, within project design methodologies,

27. In parallel, ADEME has developed a tool entitled “BENEFRICHES” to assess the socio-economic impacts of projects, the components of which are available online: https://librairie.ademe.fr/changement-climatique-et-energie/3772-evaluer-les-benefices-socio-economiques-de-la-reconversion-de-friches-pour-lutter-contre-l-artificialisation-outil-benefriches.html. A reference framework for assessing the socio-economic benefits of brownfield redevelopment, which sets out, in particular, the issues at stake, relevant indicators and methodological guidance for each type of effect, including the creation of urban green space, the introduction of new uses, job creation and local economic spillovers.

of a reflexive approach – that is, the ability to step back from one's own practices and positions within a given context in order to identify their potential unconscious effects.

III.2 – Integrative dynamics: examples and perspectives

A brownfield site is not inherently destined to be replaced by a single-use development. One illustrative example is provided by the redevelopment of the former Kodak brownfield, rehabilitated following its acquisition by the Grand Chalon agglomeration: in 2024, 350 people were working on the site, generating 6,600 jobs[28]. Similarly, the former Vallourec foundry site between Anzin and Valenciennes is described as follows: "The industrial complex with a productive function was demolished to enable the development of a new district on the 25 hectares thus released. This new district includes residential areas, economic activities and spaces dedicated to leisure. One of the guiding principles of the development involves retaining certain landscape features, such as the office building of the former headquarters of the metallurgical company – that is, the industrial complex with a decision-making function." (Luxembourg, 2013).

The establishment of a new industrial or quasi-industrial activity within a given territory may appear misaligned with the needs of local populations. Beyond the issue of employment[29], it is legitimate to consider potential ancillary uses that could benefit local communities. Several avenues – whether or not linked to heritage-making processes – may be explored:

- Early-stage cooperation during technical phases, for example site de-risking, between project stakeholders and existing local actors (secondary and higher education institutions, vocational training providers, SMEs and micro-enterprises, etc.), in order to create opportunities such as action-research projects, internship placements, or the co-creation of synergistic activities;
- The provision of spaces within the new site to local organisations or collectives (for example, meeting rooms made available to associations), with a view both to optimising their use (economically and/or environmentally) and to activating them (socially and/or culturally)[30];
- Particular attention to the design and symbolic treatment of "landmark sites", understood as "places that symbolically express, through their representations and uses, a system of collective values or an ideology" (Debarbieux, 2003, cited in Luxembourg, 2013).

In policy discourse, these dimensions appear to be taken into account by the State, notably through the "ready-to-use sites" programme, which identifies sites "selected on the basis of several criteria: economic opportunity for the area concerned, connection to infrastructure (water, electricity, digital networks), logistical accessibility, and the presence of a local ecosystem comprising other businesses, universities or training institutions, an employment catchment area, etc. »[31]. However, some recent examples illustrate the risks associated with a lack of depth – and,

28. https://www.lemonde.fr/economie/article/2024/01/29/la-nouvelle-vie-des-friches-industrielles_6213604_3234.html

29. Even though, in recent years, the predominance of so-called adequationist logic has been called into question–that is, the view that, in most cases, a specific course of training prepares individuals for a specific job (without, however, elevating career fragmentation or labour flexibility to the status of a new norm).

30. For example, in the second half of the 2010s, the non-profit organisation Article 1 set up and managed a co-working space located in a CROUS canteen; the space was open every weekday afternoon after the final catering service.

31. https://www.economie.gouv.fr/actualites/foncier-industriel-rapport-accelerer-lidentification-50-nouveaux-sites-industriels#

above all, a lack of anticipation – in strategic planning. This is evident in the case of the Framatome site in Le Creusot, where the restructuring of activities was not deployed through a coherent strategy addressing craft skills, logistics (inbound and outbound flows), or training needs. Thus, criticism has been levelled at Framatome's short-term investment strategy, notably by the Cour des comptes in its January 2025 report on the EPR sector. The report underlines that hasty decisions, taken under pressure of deadlines and cost constraints, led to design flaws and significant delays, as observed on the Flamanville EPR construction site[32]. With regard to the focus of this analysis, land take was likewise carried out without an overarching and integrated strategic framework.

Some authors argue that brownfield rehabilitation should be embedded within a broader process of "green reindustrialisation", grounded in an "entrepreneurial iconomy[33]" at the core of the new industrial revolution (Saint-Étienne, 2024)–namely Industry 5.0, which is intended to integrate sustainability (in relation to natural resources, human capital, and beyond) directly into value creation. This notably involves greater recognition of the soft skills of organisational members (Armstrong, Torres Vergara, 2024), but this line of thinking could equally be extended to the competencies of future users and/or local residents of rehabilitated sites. From a macro-level perspective, soft skills – or non-technical transversal competences – may be defined as "resources and capacities at least partially distinct from personality traits, arising from experiential learning, described and articulated as competences that cannot be reduced to knowledge, technical skills or expertise, variably associated with emotional, social and/or methodological domains, and whose defining characteristic lies in their transferability across different professional or personal spheres, at multiple levels (individual, collective, environmental)" (Bauvet, 2022: 93). When this perspective is extended to territories as a whole, such competences emerge as sources of feedback, diagnostic insight and creativity, offering potential for both disruptive and incremental innovation (Debonneuil, Encaoua, 2014).

III.3 – From corporate social responsibility to societal initiative

Brownfield sites must be understood beyond their past or future functional roles, as their present condition is by no means synonymous with emptiness. Several authors, attentive to space as a "generator and support of social relations", examine the "dormant phase" of brownfield sites – that is, their effects within local social space and on the evolution of their asset value, particularly in urban contexts (Ambrosino, Andres, 2008). They warn decision-makers that "the reintegration of brownfield sites into a planned framework marks a strong reassertion of political action within these territories" (Ambrosino & Andres, 2008:50).

The history of industry is marked by alternative models (in whole or in part)

32. https://www.vie-publique.fr/files/rapport/pdf/296839.pdf

33. "Entrepreneurial iconomy – with an "I" standing for intelligence, IT, Internet, innovation and integration–is the outcome of three new forms of innovation, production, distribution and consumption. First, the economy of computing, the Internet and networked software […]. Second, the entrepreneurial economy of innovation, representing a capital and entrepreneurial transformation that has been accelerating over the past two decades. Finally, the service-based economy of useful effects, which can itself only be conceived through the use of new information and communication technologies, making it possible to create integrated bundles of goods and services managed in real time by powerful software interacting directly with the user. This constitutes an organisational and behavioural transformation reflecting a shift in practices that privileges cognitive over physical dimensions, and which has been broadly dominant for the past decade." (Saint-Étienne, 2024:56) While this concept has yet to find fully operational fields of application, its value lies in its capacity to synthesise issues that can be incorporated into upstream, in-depth reflection ahead of a rehabilitation process.

that have sought to reconcile economic activity with attention not only to working conditions and employment, but also to the broader living conditions of salaried workers[34]. However, spatial mobility combined with dominant short-term paradigms – flexibility, engagement-oriented management (sometimes excessively intensive at the point of hiring), and related practices – has tended to marginalise issues of workforce retention and well-being. Individuals are thus increasingly left to seek individual solutions, making it all the more difficult to address ecological challenges that depend on collective action and shared uses, whether through reconnecting sites to cities via green infrastructure[35], reducing car dependency, or pooling efforts around transport multimodality (shared car parks, funding the construction of bus shelters, etc.).

As a result, issues of engagement at work are closely intertwined with the resources available outside the workplace. Beyond employment conditions, employees have additional needs: transport accessibility, childcare solutions, and so forth. The provision of internal services of this kind could not only enhance workforce attractiveness but, where external access is also provided, could benefit the local population as well (for example, the creation of an on-site recycling facility or a company nursery offering places to residents of the municipality or adjoining IRIS areas within the revitalised territory). This does not, however, imply a return to a form of industrial paternalism, insofar as it would be essential that:

- on the one hand, such arrangements are not limited solely to the on-site workforce, nor impose any obligations that could be construed as a form of social control;
- on the other hand, activities are not exclusively indexed to the site's economic functions, but instead contribute to a broader objective of social, cultural and/or environmental common good (at least at the local scale).

Beyond adjusting potential project content to the anticipated needs of workers or the expressed demands of local residents, project sponsors could also support forms of societal initiative aimed at identifying local needs that might give rise to activities not initially planned – in other words, using the context of rehabilitation and the establishment of new activities to generate additional ones in a "disinterested" manner, distinct from the project's primary objectives. The aim is to confer a positive perception on the project through the benefits it delivers, taking into account a major principle of social psychology – the "prospect theory" – which shows that "losses" weigh more heavily than "costs" in decision-making processes and, more broadly, in the perception of situations (Kahneman, 2012).

34. The most developed example of this approach in France is the Familistère de Guise, created by Jean-Baptiste André Godin in the second half of the nineteenth century.

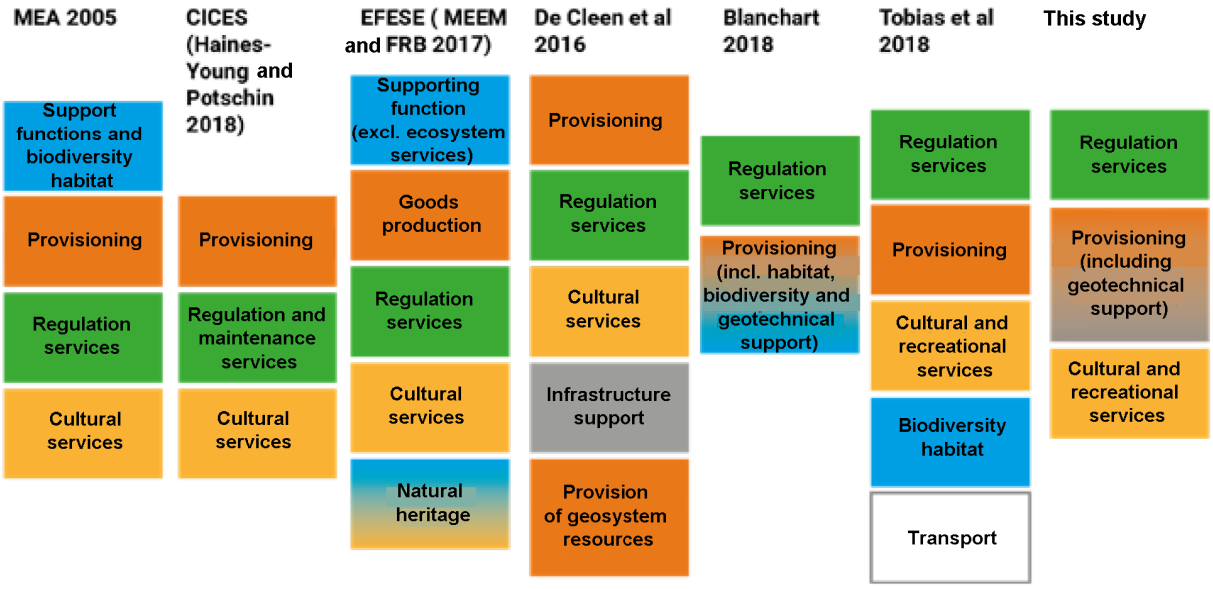
35. In urban planning, green infrastructure (trame verte) refers to a continuous network of natural, semi-natural or designed spaces intended to preserve biodiversity while enhancing residents' quality of life.

III.4 - Towards collaboration between engineering and the social sciences and humanities

There is relatively little research offering a forward-looking assessment of the expectations, benefits, and social, political[36] and cultural risks associated with the rehabilitation of industrial brownfield sites. This can no doubt be explained by at least two factors: first, because the period of vacancy and reappropriation largely escapes any comprehensive rationalisation; and second, because rehabilitation processes tend to focus primarily on technical, economic and legal constraints. These difficulties – particularly the lack of socio-economic criteria within decision-support processes, and the frequent confinement of information sources to expert-driven domains – are well documented (Hammond et al., 2021).

Some authors nevertheless propose methodologies that incorporate all or part of these dimensions:

- For example, economists have put forward a survey protocol to be implemented during the vacancy phase, involving a wide range of stakeholders (from technical operators to local residents) and drawing on social sciences and humanities methodologies tailored to each stage of project development: focus groups, exploratory surveys, experiments, questionnaires, etc. (Plottu, Tendero, 2017)[37].
- Geologists, for their part, advocate renewed attention to the concept of "ecosystem services" (ES), defined as the "benefits that individuals obtain directly or indirectly from ecosystems and their functions" (Monfort et al., 2020: 381). The authors therefore synthesise the main categories of ecosystem services, outlining a more or less extensive field of intervention (Monfort et al., 2020: 382), and propose a prospective assessment methodology[38]:



36. Here, the political category is understood in the sense of the political rather than politics, following an approach in which *the political* refers to shared affairs of collective concern, while *politics* relates more specifically to questions of power and to the bodies of knowledge and practices associated with it (Azoulay, 2014).

37. For a schematic overview and detailed elements, see Plottu, Tendero (2017: 343-346).

38. This study forms part of work conducted with the European Metropolis of Lille (MEL). The components of the assessment framework are set out in the article (Monfort et al., 2020: 386). The authors also refer to several seminal studies, notably one of the earliest quantitative frameworks developed to rank ecosystem services according to soil characteristics (Morel et al., 2015).

- Building on the most recent research, scientists have developed a method for public decision-makers to carry out an ex-ante economic assessment of the redevelopment of industrial brownfield sites within a given territory, offering a model that combines constrained optimisation with cost–benefit analysis. This model seeks to identify the optimal combination of redevelopment projects for a specific set of sites and conversion options, taking into account available resources and economic objectives, while also incorporating certain social dimensions (nuisance reduction, job creation), without, however, examining in depth the processes of reappropriation and creativity within the local population (Ameller et al., 2023).

Ultimately, it can be observed that socio-cultural issues may be connected to certain prospective methodologies without necessarily incorporating a qualitative approach which, by its very nature, requires moving beyond strictly accounting-based logics. These factors also explain why, although economic impact assessment methodologies provide robust insights into social dynamics, the ideal approach remains a combination of experimental rigour and qualitative observation: listening to – and, of course, including – the populations concerned is essential in order to understand their lived experience of changes and transformations in their environment (Banerjee, Duflo, 2011). This approach, inherent to impact assessment, offers no compelling reason not to be extended to any project that durably influences the environment of a population, whether at local, territorial or national scale.

Conclusion and outlook

This exploratory reflection calls on all stakeholders involved in brownfield regeneration projects to break away from institutional and/or professional silos which, in most cases, lead to parts of the population, territories, economic actors and/or natural or cultural heritage being overlooked at the decision-making stage. Yet a number of examples rooted in the circular economy demonstrate the potential for productive cooperation between traditional construction-sector actors and those of the social and solidarity economy (SSE), delivering tangible local economic and environmental benefits[39].

Both academic research and field-based practice reveal – each in their own inherently imperfect way – the complexity of contexts in which the cessation of an organised activity within a defined urban area can open up a wide range of possible trajectories. Brownfield land can become many different kinds of place, provided it is not reduced to a "non-place", understood as a "space of circulation, consumption and communication" devoid of any construction of identity, social ties or historical meaning among those who traverse it (Augé, 2010).

The reactivation of a brownfield site cannot be reduced to functional reuse alone, just as it is illusory to believe that an efficiency model can be fully designed in advance, given the rapid obsolescence and transformation of occupations and productive activities. In particular, brownfield sites cannot be conceived through the economic model of *greenfield* development. On the contrary, brownfield regeneration must be approached in a dual manner: on the one hand, through an engagement with complexity that requires an in-depth understanding of local populations (their history, their materially and symbolically lived experience – both negative and positive – and their aspirations); on the other, through open margins that preserve the capacity to generate meaning, whether in environmental, cultural, occupational, social, or innovation-related terms.

In conclusion, this paper proposes a dynamic synthesis of the key issues surrounding the regeneration of urban brownfield sites, structured around three major paired domains – environment/biodiversity, society/culture, and politics/economy – within which there is an urgent need, here as elsewhere, to reinvigorate approaches based on cooperation and inclusivity.

39. https://www.construction21.org/france/articles/h/l-ancrage-territorial-pour-un-reemploi-desirable.html

Synthesis



BROWNFIELD LAND: AN ECONOMIC, SOCIAL AND ENVIRONMENTAL SPACE

⊕ *Space for initiatives*
Collective memory
Influence on mobility
Reduction of the divide between metropolitan areas, towns and rural regions
⊖ *Conflicts of use*
Gentrification

⊕ *Biodiversity refuge*
Potential for ecological restoration
Reuse

⊖ *Environmental pollution*
Invasive species

⊕ *Potential for value enhancement*
Available funding
Circular economy
Functional economy

⊖ *Land speculation*
Economic disengagement and territorial political withdrawal
Extractivist economic model

ENVIRONMENT * BIODIVERSITY

Environmental crises influence public policies (e.g. climate legislation)

Natural resources shape economic choices (oil, forests, water)

Climate change affects ways of life and drives migration

Biodiversity loss leads to the disappearance of traditional knowledge and cultural ties

SOCIETY * CULTURE

Consumption patterns and value systems shape environmental pressure

Indigenous cultures and the life sciences contribute to biodiversity conservation

Support for third places or local culture relies on strong territorial anchoring

Temporary urbanism is a citizen-led sociocultural practice

POLITICS * ECONOMY

Economic models (capitalism, extractivism) drive deforestation and increase pollution

Agricultural and energy policies affect biodiversity

Projects imposed without consultation generate civic resistance

Gentrification is accompanied by the displacement of long-established, popular uses

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Thank you for reading

This white paper has been designed to provide a clear and practical perspective on anticipating the social dynamics surrounding the redevelopment of industrial brownfield sites.

It reflects our vision, our expertise, and the importance we place on every collaboration. At GSE, we believe that tailored support and solid technical expertise make all the difference.
Please do not hesitate to contact me to discuss this further.

Kind regards,

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