

Article

Lost in Transition or Geared for the S-Curve? An Analysis of Flemish Transition Trajectories with a Focus on Energy Use and Buildings

Han Vandevyvere ^{1,†,*} and Frank Nevens ^{2,†}

¹ Unit Smart Energy & Built environment, Flemish Institute for Technological Research (VITO), Boeretang 200, BE 2400 Mol, Belgium

² VITO Transition Platform, Flemish Institute for Technological Research (VITO), Boeretang 200, BE 2400 Mol, Belgium; E-Mail: frank.nevens@vito.be

† These authors contributed equally to this work.

* Author to whom correspondence should be addressed; E-Mail: han.vandevyvere@vito.be; Tel.: +32-14-335-868.

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Abstract: In recent years, many cities have adopted action plans to become climate neutral in the coming decades. Hereby, a strong motivational factor has been the goal to realize a win-win situation in the long term: climate neutrality and sustainable functioning are not only beneficial for the environment, but are equally beneficial for society and for the economy if well-integrated trajectories are adopted. Nevertheless, as actors across the fields start to implement these plans, many practical obstacles have arisen. These barriers are typical of a systemic transition: dominant practices are characterized by path dependencies, vast institutional frameworks and vested interests that are hard to break through. At the same time, relevant initiatives typically show some elements of uncertainty and a long term return, factors that make it difficult to attract financial investments. The present article addresses the state of the art for current transition experiments in the region of Flanders, Belgium, focusing on actions related to energy and buildings in cities. A brief overview of the state of affairs in several cities and provinces is presented, and some important opportunities and bottlenecks are identified. The resultant findings are tested against the framework of transition theory and related literature on the subject. Subsequently, a set of possible strategies to overcome the above mentioned barriers is formulated. These strategies focus on effectively mobilizing actors and investments.

Keywords: urban transitions; climate neutrality; energy and buildings

1. Introduction

1.1. Transitions for Sustainable Development: An Eye on the City!

A major proportion of unsustainable environmental impacts related to human production and consumption patterns is generated in cities [1]; with a share of more than 70%, urban areas in the developed world are the primary source of greenhouse gas emissions [2,3]. At the same time, urban areas are increasingly considered as the obvious loci for policies and actions that have beneficial effects with regards to genuine progress on sustainable development in global environmental change [4,5]. Urban settings can be considered as “hubs” for extreme innovation [6,7] or as potential “motors” for sustainable development [8]. The specific issue of climate change seems to have reinforced this recognition of the urban environment as a critical sustainability action arena [9,10]. This context stresses the notion of “glocalisation” [11]: tackling global issues/problems from the agency embedded and accelerated in local communities that find themselves at a scale level that allows for influencing and steering the necessary behavioural changes of individuals [12].

Yet, although cities might be obvious loci for (e.g.,) climate change related action, also on that level a number of (often interwoven) barriers exist and hence create inertia. Addressing sustainability on a city level does not reduce the generic complexity nor the uncertainty that comes along with the multiple actors, interests, interactions and processes involved in it [6]. Hence, the quest for innovative practical, hands-on grips for urban “transition” practice [13] and for the development of the necessary facilitating skills and competences [14] that enable locally embedded processes towards the achievement of sustainability has been embarked on [15]. A specific element of the enabling local city scale is the ability for actually making (policy) decisions and community choices [16], e.g., in energy related building retrofit [17]. “We have now entered the century of the city”, and there is growing acknowledgement that cities can actually accelerate transitions to sustainability, “provided that new governance structures emerge to achieve this” [18].

1.2. Transition “Management” Approaches: An Enabling Approach for New Governance?

In their contemporary connotation, transitions are considered as societal processes of fundamental change in culture, structure and practices [19], explicitly connected to the objective of sustainable development [20]. Transitions are co-evolutionary processes between different structures and practices of societal systems and their subsystems [21,22]. Owing to these characteristics, transitions are long-term processes (transitions approach thinks in “generations”), guided by inspiring visions on desirable, sustainable system configurations. Research on transitions offers insights about processes, events and agents and their role in influencing or building-up on a transition as well as how processes, events and agents interact throughout a transition—eventually leading to an effective paradigm change, or by contrast, to a lock-in or even a system breakdown (Figure 1).

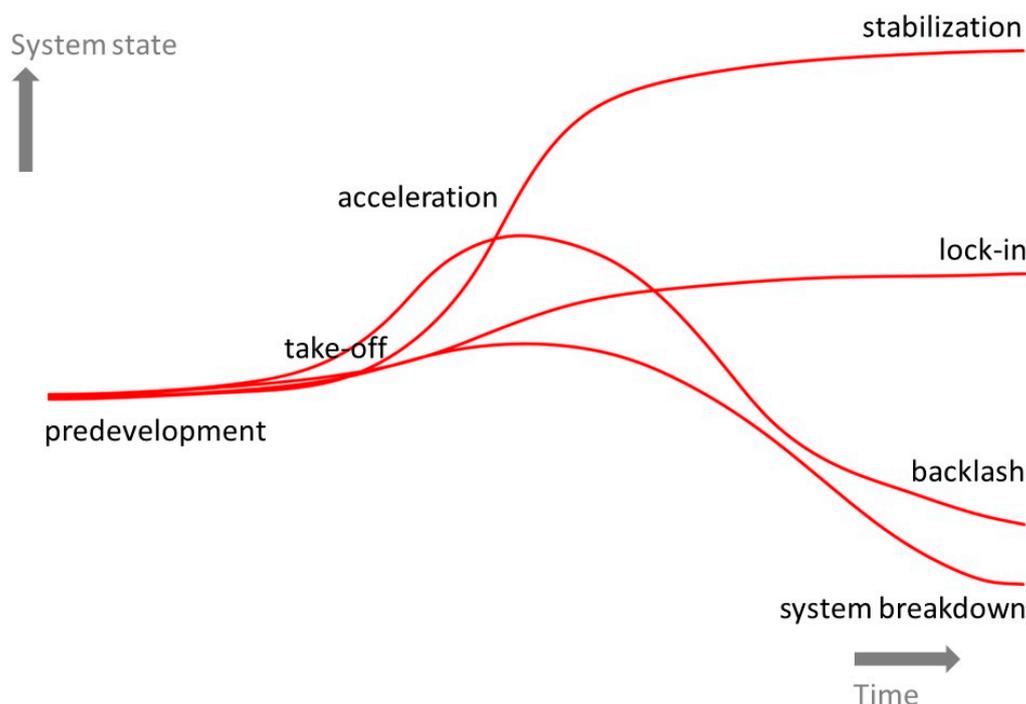


Figure 1. The multi-phase perspective on systemic transitions where an effective paradigm change leads towards stabilization in the form of a new, sustainable system configuration—a transition path following the “S-curve”. Alternatively, systems get stuck in a lock-in or even break down by failing to respond to the external and internal pressures that threaten them. Graph based on [23].

Based on such insights, transition “management” ambitions to empower and mobilize undercurrents of sustainable development by offering a coherent framework for systemic change [24]. Transition studies initially focused on system transformations such as energy systems or mobility systems with an increasing number of publications [25]. More recently, the application at regional and urban levels is being explored [13,26–30]. Recent scholarship on urban transitions has mainly argued for the meaningful application of transition conceptual models in urban contexts.

In view of these challenges, a concept such as Urban Transition Labs is considered as a usable “format” for city level relevant transition management; a format, however, that still has to live up to expectations and on which still a lot is to be learned [13].

1.3. More than a Promise? Evidence Based Critical View on Urban Transition Approaches

The objective of this paper is to scrutinize the actual effect of deliberate processes of transition-inspired initiatives that are undertaken in a number of Flemish cities (and one province). In this paper, we focus on three “claims” that arise from the scholars and practitioners of the transition (management) theory and practice:

- (a) *Drastic innovation, systemic innovation.* Transition management trajectories are envisaged to promote and/or reinforce systemic thinking. As such, it is expected that in a transition management or an Urban Transition Lab setting, more holistic, inter- and transdisciplinary problem definitions and, as such, solution pathways will emerge (e.g., [31]).

- (b) *Long term vision guided sustainability trajectories.* “Leitbilder” of sustainable future system configurations, co-created with a diversity of stakeholders and underpinned by fundamental values and guiding principles, act as devices for content as well as process-related connections and dynamics (e.g., [24]).
- (c) *Translating innovative practice into (new) mainstream practices.* Endogenizing transition-like thinking and working in mainstream practices of “regime actors” is seen as an important outcome of successful transition management trajectories. In fact, it is the ultimate result of changing practices, cultures, and structures [20].

We reflect on these three theory-based elements of claim in relation to the empiricism of the effective outcomes and impacts in the considered cases of real life processes of “urban transition (management)”, and this in the very specific light of sustainable energy use and building practices.

2. Methods and Materials

2.1. Case Study Research

We adopted a case study approach for the intent of building and extending theories [32] and to explore and better understand emerging contemporary phenomena or issues in their real world settings [33]. In Yin’s classification of case studies, we can say that our choice was the one of “Type 4” and “Type 6” case studies: multiple cases as descriptive as well as explanatory devices for the theory/concepts to build [34]. In a realm of the typically cyclic nature of transition processes, the studied cases encompassed at the same time a deductive observation/description of a preconceived conceptual approach (transitions and their “management”) and an empiricism-based inductive (by profound reflection) adoption and fine tuning of that very concept [35]. Following that rationale, we might say that we embraced the empiricism of real life cases as the input for elements of theory building; a heuristic that fits a generic methodology of grounded theory [36]. Thereby, we acknowledge the potential limitations of a single case study, with regards to the inductive generalizing potential of observations as well as to deductive theory confirmation [34]. However, at the same time and in such a context, a “limited number of cases” is not quintessential, since we are not dealing with mere “comparison”, “representativeness” and establishing statistically underpinned “evidence”. Another characteristic element of the adopted case study approach is the high degree of action-research [37]: combining research and effective (change) initiative and hence “learning-by-doing”. In that context, our studying of (a limited amount of) practice cases—in hindsight—also closely connects to an approach of “appreciative inquiry” in its focus on learning from those particular settings in which change and/or problem solving works well [38].

2.2. Cases: Urban Transition Actions in Flanders, Focused on Climate Change Mitigation

As of 2007, Flemish provinces and cities have started to put climate neutrality on the policy agenda. The city of Ghent (2007) and the province of Limburg (2008) pioneered this effort by setting up action plans and dedicated working processes, e.g., in the form of specific transition arenas. They were later joined by Leuven (2011) where a similar process was officially launched. Other cities engaged more implicitly by setting intermediate targets, for example through signing the EU Covenant of Mayors [39], or by mentioning climate neutrality as a long term goal in policy documents. In other cases yet, cities

engaged with a scope of action limited to the own communal organization, serving as a good starting point and as an inspiring example for their citizens and enterprises. Provinces took up the challenge as well. Where about half a decade ago far-reaching climate action was still regarded as a madman's project, at least the intention to realize it has now become mainstream. Peer pressure is, without any doubt, an important factor in this small revolution initiated by a minority of progressive actors. However, as concerned parties start also to understand what climate neutrality really implies, the contours of a challenging journey become more and more clear, and doubts start to creep into the minds. At this point, it is vital to understand what threatens the transition process, and what can keep it alive.

Within the spectrum of varying ambitions, cities and provinces that have dedicated human and financial resources to the transition efforts deserve special attention. In what follows we will discuss four representative cases of the latter approach. The analysis will be twofold: in terms of environmental aspects (Sections 2.1 and 2.2), and of process set up (Section 2.3).

A first step in fixing emission reductions goals consists of establishing the current situation and assessing the related distance to target. In the four cases that we will analyze, *i.e.*, the province of Limburg (850,000 inh.) and the cities of Ghent (250,000 inh.), Leuven (100,000 inh.) and Antwerp (500,000 inh.), the concluded Baseline Emission Inventories show that emission patterns differ substantially. This is mainly due to the varying local importance of industry and energy production. In a knowledge economy like the one in Leuven, the latter sectors are minor contributors to the total emissions volume while in Ghent, one single, large steel production plant accounts for 66% of all emissions on the city territory, marginalizing the impact of its quarter million inhabitants. When filtering out these biasing effects of large industries, the shares of sectorial emissions can be summarized as in Table 1. The emissions considered are the direct and semi-direct ones (coinciding with scope 1 and 2 as defined in the Greenhouse Gas Protocol).

Table 1. Shares of the sectorial CO₂-emissions in the four study cases: province of Limburg and cities of Ghent, Leuven and Antwerp. Where numbers are not available, the sectorial contribution does not exist, has not been taken into account or resides entirely in the ETS (Emission Trading System).

Provinces or Cities Sectors *	Limburg 2008	Ghent 2007	Leuven 2010	Antwerp 2012
Households	29	23	32	28
Commerce & Services	8	15	26	24
<i>Subtotal buildings</i>	<i>37</i>	<i>38</i>	<i>58</i>	<i>52</i>
Transport	24	15	24	31
Industry	33	46	14	9
Agriculture & Nature	7	1	4	/
Energy production	/	/	~0	8

* excluding large single emitters (ETS) Sources: [40–43]; however for Ghent numbers from an unpublished update by Arcadis, including a reallocation of emissions, have been used instead.

The image for a province is somewhat different than for a city because of the impact of agriculture, even after including the benefits of carbon sinks present in forests. Residential and non-residential buildings together represent a major share of the GHG emissions: typically 40%–60%. Transport typically accounts for another 25%–30% of emissions; variations are largely influenced by different shares of industrial activity. Therefore, the urban core functions of buildings and transport constitute the most important

field of intervention towards climate mitigation, with buildings outclassing all other urban sectors. This holds in particular for a densely urbanized region like Flanders.

2.3. *Living and Building as a Focus Area*

From the previous it is clear that a major challenge thus lies in the reduction of households' "living" and building related emissions. For that, two major types of actions can be considered: (1) reducing the energy consumption through energy efficiency measures and (2) filling in the remaining energy demand with low carbon energy provision [44,45].

The mitigation plans that are being developed in the case locations distinguish the following major axes of intervention, logically corresponding with the main emission sources [40,42,46–48]. Note that these intervention fields also include indirect emissions, e.g., through consumption:

- (a) Built environment (residential + non-residential)
- (b) Transport and mobility
- (c) (Urban) nature, agriculture and local food production
- (d) Enterprise and industry
- (e) Renewable energy production
- (f) Consumption

Hereby, action lines (c) and (f) have a particular, direct mobilization potential as the costs of intervention in these fields can often be kept relatively small; action lines (a) and (b) by contrast require very substantial investments to realize noticeable emission reductions. Action line (e) can be considered an intermediate as renewable energy production is becoming more and more market compatible. However, this holds mainly for electricity and less for heat, which is often referred to as "the sleeping giant"—a domain of intervention needing an urgent increase of attention. Action line (d) receives varying attention depending on the local economic production patterns, and related investments cover a wide range of possibilities from small to large scale. Hereby, one needs also to consider that a major share of the (tertiary) economy takes place in the non-residential buildings sector and will thus be treated under this umbrella.

Within lines (a) and (b), the main types of action and related investment needed concern increasing the energy-efficiency of the existing building stock; providing for renewable energy-input generated in and on buildings or from external sources; and investing in the improvement and extension of urban infrastructures for public transport, green city distribution, biking, and walking.

Returning to our focus on buildings and energy, we see that buildings provide a major opportunity for emission reduction while many of the needed interventions, in particular the deep renovation of the existing building stock, require important efforts and investments. At the same time, a substantial share of retrofit measures has a negative cost when considered over their entire life cycle (e.g., [42]). This implies that once the upfront investment can be arranged for, there will be a net financial benefice in the long term.

For energy provision systems, similar conclusions hold. In order to realize deep emission cuts, substantial investments and major infrastructural projects are required, but expected future benefices, compared to business as usual, plead for such investments [42]. Moreover, these benefices increase when the growth rate of conventional energy prices rises. To be realistically achievable, near 100% renewable

energy provision must be paralleled by substantial energy efficiency measures. Worth mentioning is that cities will remain dependent on green energy imports for realizing their climate ambitions: it is virtually impossible to produce all needed renewable energy within the borders of the own territory, at least with the present state of technology and considering the high density of energy consumption in cities. This underlines the importance of a large scale energy transition or *Energiewende* (The German term for energy transition, and which is acquiring international resonance) that includes large scale installations such as offshore wind parks, hydropower installations, solar farms, and the related network infrastructures that support energy transport and distribution, in the context of our case studies at least at a European level.

2.4. Four Locations, Four Process Architectures

In all of the four case studies, the processes that were set up refer to the basic goal of a sustainability transition. Therefore, the strictly environmental perspective is always transcended in favour of an integrated sustainable development strategy. Transition management is thereby systematically referred to for methodological underpinning. Nevertheless, accents differ and every case can be considered as a unique experiment with regard to its setup. Later processes hereby try to learn from the experiences of the early adaptors. At the same time, a growing knowledge and support base emerges, e.g., through the work of the Flemish regional Policy Research Centre on Transitions for Sustainable Development [49]. In what follows, the four case studies are considered in more detail, respecting a chronological order.

2.4.1. The City of Ghent

In 2007, the city of Ghent adopted climate neutrality as an official policy goal [46]. For actual deployment of the concept, an explicit choice was made for a hands-on approach, with a “walking the talk” baseline. It implies analyzing, studying and discussing climate action on the one hand, while setting up practical experiments simultaneously, so that fruitful feedback loops between the two fields of action can emerge. In its analyses and scenario building, the city focuses on abatement cost curves for optimizing its spending on mitigation measures.

The supporting organizational structure is a Climate Union (“Klimaatverbond”) [47] which can be considered as a working structure aimed at facilitating synergies within a framework of overall guidelines. The city authority manages the Climate Union, but seeks primarily to empower other actors such as enterprises, citizens, civil organizations and schools to undertake action. This resulted in a wide range of initiatives with multiple organizational formats. The city’s environmental service (“Milieudienst”) has the lead for overall coordination and planning of the Climate Union. At the beginning of the process, a transition “arena” of 15 frontrunners was set up to envision development scenarios. In transition management heuristics, this arena is the virtual room/network for long-term reflection and experimentation [20]. In the Ghent case, the transition arena eventually extended its functioning into a number of climate working groups that further elaborated on specific project ideas in order to identify key players and business cases for joint action. At present, climate working groups continue to be in function in the domains of mobility, energy, the cultural sector, food, local enterprise and the university. Some of them have evolved into independent non-profit organizations. The city actively supports initiatives, in particular through dedicated subsidies, co-financed projects (e.g., EU FP7), process support and (free) consultancy for citizens, for example concerning dwelling retrofit.

Ghent did not formulate a hard target date for climate neutrality, a decision which is illustrative for its pragmatic, co-creative approach. However, in a new policy plan, intermediate targets up to 2019 are determined, envisaged to be compatible with climate neutrality in 2050. Initial reduction targets go around 15%–20% in energy savings and emission cuts; a rate that seems suboptimal if a linear and structural climate neutrality 2050 change path is intended.

2.4.2. The Province of Limburg

In 2008 the province of Limburg set out for climate action with a strongly expert-based approach. A study was prepared by the Flemish Institute for Technological Research VITO [40] and presented to a sounding board with representatives from private and public companies, professional confederations, advisory bodies, knowledge institutions, and civil society organizations and non-governmental organizations (among which trade unions). This sounding board was eventually turned into Limburg's "Climate Parliament". Four action lines were set up: (a) a dedicated cleantech platform with 11 "do tanks" was founded, targeting the entrepreneurial world; (b) the 44 municipalities of the province were engaged in setting up climate plans, in the first place to fulfill their obligations under the EU Covenant of Mayors which they jointly accessed at the end of 2011; (c) citizens were called to become a climate or cleantech ambassador, and (d) the provincial authorities set out to manage their own organization towards climate neutrality serving as an example for wider society. In order to provide appropriate financing, the province also initiated the creation of a climate fund in which both citizens and organizations would be able to invest. However, up to present its launch has been put on hold, amongst others due to problems with its prospectus. Besides this fund, the local municipalities of the province have at their disposal their own investment company, Nuhma [50], that participates in projects with a focus on sustainability, energy and innovation.

Meanwhile, the provincial authority acknowledges that setting its climate neutrality target for 2020 was too ambitious. It dropped the deadline, but goes on supporting the dynamics that have been generated since 2008. In a similar vein, communication efforts have been scaled down and now focus on making inspiring local initiatives better known to the public at large. Nevertheless, the province continues organizing campaigns and collective actions, for example to promote building insulation or green residential heating installations. Thereby, the rather top-down approach calls on the strong sense of identity that inhabitants have with regard to their province—the so-called "Limburg feeling".

2.4.3. The City of Leuven

In 2011, the Leuven city administration initiated a climate action process that allowed learning already from experiences of the early adaptor cities, both nationally and internationally. It set up a process that structurally combined top down and bottom up approaches in order to secure the highest possible societal engagement. The first two years were mainly dedicated to assessing the current situation and developing feasible transition scenarios. Bottom up inputs were gathered from six thematic cells on respectively energy, built environment, mobility, agriculture and nature, consumption, and participation and transition. Top down inputs were obtained from a "G20" transition arena with 20 key decision makers of the city (Figure 2). In both cases, the respective members originated from all sectors of society (government, enterprise, civic society and knowledge institutions). The nerve centre for processing the

inputs and dressing up a resulting scenario report was provided by a scientific team from Leuven's university; a steering committee supervised the work.



Figure 2. “G20” Transition Arena meeting (left) and Round Table of the thematic cells (right) in Leuven, June 2012. © KU Leuven/Rob Stevens.

After delivering the report in 2013, a non-profit organization called “Leuven Climate Neutral 2030” was formally created to carry on the process [51]. For the legislation term 2013–2018, the city authorities grouped financial means into a dedicated budget cluster of climate action, which included the staffing of the non-profit organization for continuous steering and follow-up; this support was supplemented by co-financing private partners. At present and through the work of the non-profit, some 20 preferential projects have been formulated as transition experiments. Appropriate actor combinations and financing schemes are being identified. These projects or “building sites” cover all of the six initial thematic areas, and include renewable energy production and energy efficiency, up-scaled and collective building retrofit, multiple space use in buildings, mobility, quality of life (e.g., through “living streets”), urban agriculture, food, green infrastructures, urban mining, and process aspects such as introducing the concept of Gross National Happiness [52] in city accounting. From the initial report, it became apparent that 2030 is a very ambitious deadline for emission reductions of at least 80%. Therefore, a double horizon 2030–2050 has been suggested.

2.4.4. The City of Antwerp

With its “Stadslab 2050” [48], initiated in 2013, the city of Antwerp chose a living lab approach. Although the local authorities formulated sustainability and low carbon goals for 2050, they did not link the lab explicitly to pre-defined scenarios or targets. The Stadslab is mainly intended as a facilitator: an umbrella structure and working platform for all sustainability initiatives within the city, so that the effectiveness of the sustainability efforts can increase and that initiatives receive more support and public exposure. The main vehicle to do so is the organization of “meeting spaces”, events where actors from different sectors of society are brought together to develop projects according to specific thematic subjects. Up to now, such meeting spaces have been organized regarding green space and nature in the city, sustainable housing and retrofitting, (renewable) energy for the commercial city heart, and circular economy concepts for Antwerp's fashion industry. This has resulted in a wide variety of projects. Promising initiatives are eligible for process support. Within the Stadslab, the city officially partners up

with organizations and enterprises ranging from environmental non-governmental organizations to the port authorities—the latter being responsible for one of Europe’s most important industry clusters.

Meanwhile, the city has also developed an elaborate climate action plan that will be presented to the city council for approval. It will include sets of measures and strategies to finance them. As in many other cases, the time horizon for climate neutrality is 2050.

3. Results and Discussion

In this section, we elaborate on the findings on the building and energy use issues from our four cases (Section 2.3), and we connect them to the three specific aspects of transition approaches in focus (Section 1.3). In this, and in a sketched context of case study elements for grounded theory building, we construct a number of statements with regard to the encountered elements of transition acceleration or, on the contrary, transition hindrance. These statements are selected based on their appearance in all or at least a majority of the cases that were studied.

3.1. The General Context and Feeling of Systems’ Inertia and Resistance to Change

In spite of the, by now, common understanding and acknowledgement on the seriousness and urgency of the climate change issues and of the multiple evidences of pronounced engagement, there is a general feeling of slow and rather modest progress “on the field”: “... *the capability and capacity to actively mobilize the stakeholders necessary to steer complex long-term systems innovations across multiple socio-technical ‘regimes’ (housing, non-domestic buildings, urban infrastructure), scales (building, neighbourhood, cityregion), and domains (energy, water, resources use) coherently, and in a coordinated way, is currently extremely limited at a city scale*” [24]. This is also true in those cases in which an explicit “transition” approach is deployed, such as those examples that we described above. Even there, actual dynamics with tangible outcomes are rather modest. We acknowledge the inherent inertia and slow pace of processes of the kind of energy use and building practices in a context of climate neutrality. Yet, a logical central question remains: what is holding cities to engage faster and on a larger scale in vision guided, drastic and systemic change towards sustainable development (of which climate neutrality is one aspect)? In particular: is a transition management inspired view a way to accelerate urban transitions towards climate neutrality in specific and sustainable development in general?

3.2. Barriers for Acceleration of Urban Transitions in the Fields of Energy Use and Buildings

Based on the empiricism of the above mentioned cases of explicit transition-inspired trajectories, we boil down major elements of the observed inertia as follows:

(a) *Long term orientations and engagements* are often avoided owing to a typical short term concern with regard to

- financing: investments in renewable energy and/or profound building renovation show high upfront investments and relatively long payback periods, elements that are in stride with prevailing routines with low cut off for payback periods. The problem is very pertinent both for investing in (collective) renewable energy installations and for (collective) deep building renovation. Risk aversion and higher transaction costs by lack of knowledge and experience may add to the problem;

- policy cycles: short term legislative periods, with programs to be accounted for by next elections discourage long term objectives with respective postponed outcomes and rewards. As such, major challenges with regard to an item like climate change may be “claimed” and expressed in rather promotional goals, yet lacking actual execution in effective action. As a result, and notwithstanding the well-intended policy makers’ embracement of climate neutrality (and its coinciding promotion), coming down to the bare practicalities (investing, changing the rules,...) is strongly hampered by short term concerns.
- household concerns: costs like the ones of energy remain relatively low and constitute only a small share of overall costs. This is partly due to the fact that externalities are not (yet) included in cost prices and/or the incentives for probable future changes are off the radar of citizen households and their dwelling and energy use practices.

(b) *Drastic innovation* entails a reconsideration of aspects such as values and norms that underlie deeply entrenched routines of consumption, living and building, eating, *etc.* Natural resistance to change, social inertia, risk aversion and even psychological denial (as identified by Garrett Hardin, [53]) are effectively encountered, also in those settings where the necessary transitions are being considered. In that, economic dogmas, status symbols, aspirational ideals (for example, the single detached family house in a green suburb with two cars on the drive) are tacit, yet very determining psychological aspects that prevent “deep” change to happen and that even translate in a genuine aversion for change, since it is regarded as risky for or equal to “losing” (historical) achievements.

Moreover, mobilizing actors beyond the adoption of practices in the kind of “low hanging fruit” or piecemeal solutions (such as standard roof insulation) and towards engagement in “deep” action proves to be a major challenge. Example: how to engage of group of building owners and dwellers into a collective low/zero energy renovation scheme? A specific consequence of this rather incremental routine is the risk for sub-optimal lock-ins. For example, after the easy parts of investing in basic roof insulation, improved glazing and/or an efficient heating installation—fostering about 20%–30% energy/GHG reduction—owners may do very little in the next 15–30 years.

(c) *Systemic change* appeals for cross-domain/cross-turf actions which are not obvious in typically siloed organizations such as city administrations and scientific institutes. Profound inter- and transdisciplinary design and roll out of integrated solutions are not routine business. In many cases, there is even a major lack of knowledge on the relevant fundamentals of other domains and/or on the multiple links with their “own turf”. Typical policy failures of this kind are the lack of integration (policy silos, no horizontal approaches), a lack of relevant knowledge and capacity or competences on collaboration and co-creation. These deficiencies are strongly embedded in, and reinforced by rewarding and accountability systems that typically glorify domain-specific and short-term realizations. This observation confirms the statement that there is a strong resistance within existing structures against institutional change. Incremental changes are possible and even quite drastic reforms, but innovations that threaten the authority of core institutions will be prevented or translated into less radical forms [54].

(d) The availability of *technological solutions* for sustainability issues in the fields of energy and building is not immediately a major issue. Technological innovation is neither a bottleneck nor the most important in supporting transition efforts, because it is not considered as the one “silver bullet” that will solve the problems. Many of the technologies necessary for the low-carbon economy are already available

and economically viable. The essential topic is the way existing technologies are actually embedded (or rather “are not embedded”) in individual lives and in communities and societies.

(e) In many cases, obviously “trivial” *barriers* prevent systemic change to happen: legislative provisions or other regulations stand in the way of initiatives on profoundly innovative practices. The lack of basic knowledge, even when it is plenty and accessible, leaves concurrent potential initiatives unexploited. Typical examples of such regulatory barriers (sometimes referred to as “failures”) are rent regulations, energy subsidies, regulation of public investment and ownership of buildings, tax regulations, or spatial planning rules. Issues on intellectual property rights and data (e.g., in smart grids) hinder the kind of innovative approaches that would enable significant progress in a number of energy use/building issues. “Open innovation” and “peer-to-peer economy” enter the debates, yet the incumbent regimes actively prevent information from being spread and used (e.g., interdiction of publishing individual energy use (EPC or energy performance certificate) of individual households in Belgium). In this way, important data streams and their mobilization potential are being cut off.

3.3. *Reflecting the State of the Art against the Framework of Transition Theory*

In this section, we scrutinize the earlier mentioned transition “management” claims with regard to the above elaborated observations that emerge from case settings where an explicit transition-inspired approach was developed.

(a) *Is drastic innovation/systemic innovation initiated?*

Yes.

Besides making explicit the very essential function of a specific societal system, establishing a coherent story on how such a system works is a meaningful device to show the links—in their nature and strength—between the different elements that are relevant. In that, involving the multiple actors in analyzing the system and shedding light on the matter can be considered as an effort that establishes mutual understanding and that yields new and refreshing insights with regards to systems’ mechanisms and future opportunities. Therefore, elements such as system analysis are welcomed in the establishment of inter- and transdisciplinary communities that acknowledge joint stakes in coping with major challenges and that develop shared ownership of problems as well as of solutions.

No.

Thinking in terms of systems and, to a point, understanding them, is a difficult task. There is not only “bounded rationality” that inhibits many people to cope with a certain level of holism and integrated representations; the specific professional and or private settings and organizations in which people function typically show a high degree of disciplinary, specialized approaches that fit in a general realm of effectiveness, efficiency and of “core businesses”. Added to a typical setting of competitiveness, a reflex routine of defending stakes, jargon, and achievements very often emerges in collaborative exercises on system understanding. A major element of “convincing” the added value of genuinely systemic approaches is the indication of the potential in mutually reinforcing dynamics that offer perspectives for win-win-win solutions that turn a perception of potential “losing” into a discourse of very probable advantages. Many efforts on systemic thinking prove to be laborious since they do not belong to a habitual

repertoire; a finding that stresses the relevance of purposeful introduction of system analysis tools in transition trajectories. Logically, the actual shift towards systemic action is an even more difficult task.

(b) Are sustainability trajectories guided by long term visions?

Yes.

Envisioning exercises invite reconsidering systems up to the very level of underlying values and normative principles; the typical long term horizon allows for such profound reconfiguration, without risking a “pitfall 20” (looking less than ± 20 years ahead and hence trying to connect to and re-adjust the incumbent system in its contemporary state). Envisioning as a specific format of foresight therefore proves to be inspiring for the essential characteristics of the systemic changes that are required with regard to issues such as sustainable energy use and building.

No.

Envisioning trajectories and their outcomes of desired future images and narratives very often turn out to be pleasant endeavors yet without further consequences, leading to a situation of ignorance on how to further deploy the vision into effective action. Visions tend to remain inert when they are not translatable to artefacts or real life examples (be it preliminary) that can already be observed or even applied. In fact, ongoing and successful sustainable initiatives “on the field” can on their turn inspire visions of desired future societal systems that would show the innovative practices, structures and cultures as mainstream characteristics. In this, an important lesson learned is that a strong connection between a future vision and an appreciative inquiry of example sustainable practices is a major precondition to attain a truly inspiring, guiding device, to which initiatives can then be aligned.

(c) Are radically innovative practices translated into (new) mainstream practices?

Yes.

“Translating” expresses that in order to actually initiate systemic change, experiences from the different typical transition activities have to be incorporated and multiplied in actions of the relevant system stakeholders. In that way, the lessons learned from experiments and envisioning efforts result in an effective and embedded process of change. This can only be realized if actors involved in transition processes are enough empowered to do this very translation. The experiences with the transition cases at least showed the potential for cognitive empowerment (understanding of complexity and behavioral options), political empowerment (establishing network ties and synergies) and psychological empowerment (developing intrinsic motivation), which are considered as conditions for involved stakeholders to become actual change agents.

No.

Developing within or at least close to “regime” structures and relations, transition initiatives very soon encounter the elements of power, trust and legitimacy when confronted with incumbent players, typically defending vested interests, very often “tolerating” alternative approaches, yet making sure that they remain harmless. The question that remains is how to cope with entrenched patterns of power in politics, in business, in financial matters, *etc.* This element of power is reflected in specific people, as well as in organizations and structures.

4. When It Comes to the Crunch: Solution Pathways to Initiate Acceleration

From the previous analysis, we formulate as a hypothesis that there is a primary, urgent need for finding solutions for two major bottlenecks in urban transition processes: mobilizing actors beyond “standard practice”, and creating feasible business cases through appropriate financial setups. We estimate that if these barriers can be overcome, other bottlenecks like legal frameworks and policy support will tend to follow in the slipstream. In other words, considered from an agency-structure perspective [55], we assume a breakthrough will occur when change-inclined actors gain empowered momentum and thus push the institutions to yield, and evolve towards new frameworks. In what follows, we will therefore concentrate on factors that may help to build the solutions for overcoming these two primary bottlenecks.

4.1. *Winning Them Over: Mobilizing Actors beyond Standard Practice*

Typical transition management elements like “arenas” or similar setups have the potential capacity of bringing together actors that usually do not meet or collaborate, and inciting them to understand challenges and reflect on a shared vision for the future. In the observed cases, this helps to build trust and subsequently to generate new ideas, coalitions and collaborations. However, once ideas have been launched, the hard work of implementation starts. In order to not slowly bleed to death, we think effective initiatives can be enhanced through a number of facilitating factors.

A continuous process guidance (and well considered process architecture) helps actors to venture in the unknown areas of new collaborations and new business models. Individual citizens need this kind of guidance, for example with the choices they make regarding investments in energy efficiency *versus* renewable energy production, and the possibilities for acting as a group. Connections to specialists in financing and/or experts in niche technologies and markets are needed for powerful coalitions that establish durably viable initiatives. Peer to peer networks can benefit from supportive platforms, amongst others through social media. New societal values are built in creative exchange through well-conceived discussion arenas.

It is within this logic that an important role is to be awarded for local authorities: in facilitating the engagement of actors with a potential leadership role: visionary entrepreneurs, spontaneous community leaders, motivated experts or citizens with a story. A local inhabitant may show much more high-performance in convincing his neighbors to invest in energy efficiency than an alder(wo)man calling for action. However, also “policy entrepreneurs” showing leadership from within city administrations/policy are to be discovered, encouraged and provided with space and legitimacy. Local authorities can further provide for a public podium and highlight and disseminate the results of successful experiments.

Furthermore, local authorities can have a decisive input by adopting and supporting new governance models, respectively, new forms of public–private partnership. Many transition experiments arrive at a situation where they are required to prove their legitimacy or right of existence towards the “outer world”. However, as their setup is often innovative, there are no predefined institutions, legal frameworks or juridical structures that can accommodate them properly. Therefore, the restricting borders must be pushed or even trespassed. Local authorities can assist here in creating adaptive structures, providing legislative shelters for experimentation, and lobbying towards higher authorities (regional, national, and European in the case studies) to provide for the needed institutional and legal adjustments. There are many

examples of accidental factors like a legal clause absurdly causing the suspension of a promising experiment—not because the rule is bad *per se*, but because it was never conceived for the kind of setting in which the experiment takes place.

Good examples and successful experiments are instrumental in convincing the public at large that another, more sustainable way of working and living is possible and beneficial. People stick to their car or detached single family house until they can see, touch and feel the advantages of another concept of moving and living. Therefore, especially if budgets are limited, efforts should be targeted at well-considered demonstration cases that can function as a lever for future uptake by larger groups. Peer pressure helps to build momentum once successful initiatives start to build a reputation.

We find support for these findings in the research results of similar contexts [24,54,56–58]. For example, investigating the challenges of up-scaled urban retrofit, Dixon and Eames conclude that “...the biggest challenge for suburban adaptation is implementation. The realization of change is likely to require a better understanding of the problem by a range of stakeholders, a more supportive policy context, more resources and clearer responsibilities” [24]. Vision creation, intervening on social practices through a community-based approach and strong new governance models are identified as important supporting factors. Newton concludes that “to achieve precinct-scale redevelopment (...) innovation and change are required in urban planning schemes, project financing, medium-density design and visualization, construction and labour processes, and community engagement, among others” [56]. This statement confirms that most of the needed innovation is organizational and institutional. This goes far beyond current urban retrofit and remodeling practices, while the latter simply risk bringing cities into an underperforming lock-in induced by current path dependencies. New urban governance models require that authorities strike a new balance between hierarchical steering on the one hand and facilitation of bottom-up processes on the other hand [54]. Thriving local innovation networks add to a potential shift of the social and economic paradigms towards sustainable functioning [59].

Finally, landscape pressure may become an ally in efforts towards the intended changes. An example hereof is congestion becoming such a pressing issue that it ultimately helps to push people towards alternatives for suburban living and the related car dependency. Smart actors like the developer of the experimental Tweewaters brownfield redevelopment project in Leuven’s old town centre respond to this by fully playing the card of “urban convenience”. In the case of Tweewaters, this also led to the development of a smart home delivery box so that shopping trips become obsolete while you neither need to stay home nor go to a post point to pick up your goods. By retrospect, inhabitants are very enthusiastic about the system.

4.2. *Paying the Bills: Exploration of Upcoming Financing Mechanisms*

Since much of the innovation for sustainable urban development appears to take place outside the beaten tracks of the regular economy, new concepts for financing it must be developed to initiate and sustain it. As a matter of fact, new economic and value creation logics for such deep and structural innovations is a critical success factor.

Such new economic and financing models are just at the brink of happening and the “early adaptors” sometimes pay hard for the learning experience, as is illustrated in the discussion of the Green Deal in the UK [60]. In what follows, we aim at cautiously developing a taxonomy of emerging models, as we observed them in the case studies.

4.2.1. Grouped Acquisition

In this probably simplest model, and closest to traditional market mechanisms, users group their acquisition and thereby create a scale advantage that is rewarded with a reduction of the per unit price of the goods or services to be obtained. A famous example of such setup in Flanders is *Kyoto in het Pajottenland*, an initiative grouping hundreds of families to install roof insulation, wall insulation, high performance glazing, solar boilers and other renewable energy equipment [61]. If well-conceived, grouped initiatives actually realize the benefits of a strong bargaining position and better access to professional advice on the intended intervention. For the time being, this formula is worked out in “classics” like procurement of insulation materials. Yet, more particular deployment is emerging in initiatives like co-housing, where multiple households build a multi-family dwelling (and working) complex (Figure 3). Additionally, certain amenities are provided collectively, e.g., common laundry rooms or community spaces for celebrations and hosting guests. This model is inspired by (e.g.,) the *Baugruppe*, a scheme that is popular in Germany.



Figure 3. Cohousing project in Vinderhoute, near Ghent. Cohousing is swiftly gaining popularity in Flanders. © Cohousing Projects.

4.2.2. Cooperative Societies

Cooperatives are making a strong comeback. In Flanders, this statement stands since the region has had a strong mental legacy in the practice of cooperation. A main characteristic distinguishing the re-emerging contemporary cooperative mindset from regular financing is the explicit dedication to social goals. The financial incentive is directly linked to societal ones, because the investors/financers are the stakeholders or clients at the same time. Not only does this aspect reduce speculative financial behavior,

investors also accept a smaller financial yield since the other, joint impacts of the cooperative provide for additional, non-financial benefits. In Flanders, energy cooperatives (e.g., cooperatively investing in wind turbines) are probably the most common example for this revival. At least one important player in cooperative renewable energy generation is now also considering broadening the cooperation setting to include building retrofits.

4.2.3. Special Purpose Vehicles and Energy Performance Contracting

To tackle the organizational, juridical and financial complexity of urban building or remodeling projects, dedicated “vehicles” are being created. Their central value proposition is that of “unburdening” the end user/payer. The latter decides to pay for interventions in his/her energy use practices and/or dwelling, but the whole process from study work to the final execution and sometimes even periodic maintenance is left to professional parties within the vehicle. The end user pays for the final outcomes, the compensation (what he/she pays) is merely result-based. As with grouped acquisition, multiple co-benefits can emerge and complex projects increase their chances of successful deployment. Energy performance contracting (EPC) may be considered as a specific type of such unburdening purpose vehicles. At present, it is however battered by the problem of payback times (or internal rates of return): deep building retrofit often comes with payback times of 20, 30 or more years while EPC companies rather keep to financing schemes with pay back horizons of around 10 years maximum. Only relying on large structural investors such as pension funds may eventually bring a solution for this problem.

A very specific type of special purpose vehicles are Community Land Trusts (CLTs). By keeping building lots’ property in a trust and clients only buying the dwelling, CLTs intend to decouple housing acquisition from (expensive) ground speculation and in that way provide affordable dwellings. Investments in renewable energy solutions and/or energy efficiency measures have then more chance to be deployed.

It is clear that the special purpose vehicles we mention include a specific element of group initiative, indicating a generic idea that promising setups for complex, extensive or drastic urban remodeling projects can be realized if there is a willingness to go beyond the scale of individual building projects.

4.2.4. Funds and Bonds

The setup of a fund or bond system allows to group financial means into a larger pool with, as for cooperative societies, a dedicated goal. In our case, the fund or bonds serve a goal that is compatible with (specific) sustainable development ambitions. Examples are climate funds, climate bonds or social impact bonds. Among the potential benefits of this setup are the possibility to finance less rentable projects (or more socially oriented interventions) with the yields of the most rentable projects within the same portfolio; and the opportunity to create a revolving fund that sustains and expands itself in time. A major bottleneck, as appears from the problems with the climate fund for Limburg, is related to the prospectus. The risk profile of the investments may be hard to assess or actors lack knowledge and experience in the field, causing the initiative to be judged too uncertain. This holds in particular for investments in energy efficiency, where it is very difficult to predict the energy savings beforehand, for example, due to the much feared rebound effect.

4.2.5. Combined Solutions

Other scenarios are under consideration, e.g., where initial financing is organized through classical banking products, and the investment is consequently taken over by a cooperative society or fund when the intervention is up and running.

Combined solutions can tackle the two bottlenecks we identified in one single effort. One line of thought is related to deep urban remodeling, e.g., by densifying the urban tissue. The idea behind this concept is that much of the current (sub)urban tissue is of a low density type, and often also of poor energy performance and/or of an outdated architectural form. It would then be better, considered altogether, to erase entire urban sectors and to replace them with high quality, high density new-build projects bringing together all the advantages of sustainable urbanization forms. The economic profit margin basically lays in the densification and upgrading: the total value of the grouped assets increases substantially, providing an incentive for the initial owners to venture into such a complex operation. Temporary relocation and other concerns may equally be accommodated through the increased financial value of the new end situation. If the original owners prefer not to live in the new setting, they can sell their share in the project. To date, we have no knowledge of such setup being brought into practice, but other scholars have developed the same conceptual framework. As such, Newton has studied the possibilities of densifying Australian suburbs [56]. He envisages a GIS-supported process to group individual owners and stakeholders, leading to the identification of contiguous “greyfield” clusters that could be redeveloped in one up-scaled intervention. *“Each of the precinct models could provide a basis for re-envisioning the provision of high-quality community open space, improved social amenity, infrastructure upgrades and higher residential yields which are impractical for single-lot redevelopments” ... “A new urban renewal organization with a mandate for greyfield as well as brownfield development, impervious to political cycles and transcending municipal boundaries, could administer such redevelopment, having a role in land acquisition and consolidation, reducing redevelopment uncertainty at a metropolitan level, and maintaining long-term strategic objectives.”* In other words, this type of operation could be sustained by urban development companies that receive a public mandate for their functioning. Newton simultaneously considers the financing challenge, stating that *“for instance, at an institutional level, development bonds could be used to finance land consolidation and infrastructure improvements, which may help to overcome local opposition to consolidation. Other financial structures could involve superannuation funds, tax increment financing, or land tax and stamp duty rebates. Greyfield residential precincts could also attract community finance models in which homeowners and local stakeholders contribute capital and assets for shared neighbourhood outcomes.”*

5. Conclusions

In the present article, we have confronted observations from a series of climate neutrality initiatives in Flanders, Belgium, with theoretical insights from transition theory, and with scholarly analyses of similar processes in other countries.

Referring to transition theory, we find evidence of the well-documented systems’ inertia and resistance to change, both on the institutional level and on the deeper level of value systems and behavioral routines. This implies that concrete transition initiatives are often hampered by barriers of different types, ranging

from legal bottlenecks over political concerns to problems of mobilizing people and means, in particular financing. Short term agendas hereby typically hamper the realization of long term goals, even if the vital importance of the latter is being recognized. For our focus on buildings and energy in particular, similar findings have been observed and described for other countries and case studies [6,7,54,56,57,60]. This adds evidence for general tendencies that can be observed independently of local conditions.

The balance sheet is, however, not strictly negative. Even if we see the predictable transition barriers in action, there is at the same time a tangible shift in both discourse and mobilization for action to be noted over the last decade. Initiatives that were unimaginable 10 years ago now effectively get a start—attracting more and more enthusiast frontrunners, but also getting the attention of the mainstream debate.

We consequently observe that, with regard to the analyzed case studies, many ongoing transition initiatives have arrived at a crucial stage of implementation. Here, the outcome is all but sure: there may be breakthroughs, but also structural reorientations for the good or for the bad, lock-ins or even straightforward failures. In the light of these crucial cross roads, we have nevertheless been able to formulate an initial appreciation of emerging solution pathways in two fields: mobilization of actors beyond standard practices and alternative financial setups. We find echoes of these suggested solution pathways in similar research for other geographical contexts. However, only further evidence from emerging practices over the coming years will prove their real feasibility.

Author Contributions

Each co-author contributed equally to the reported research in terms of conception and design, acquisition and analysis and interpretation of data. The corresponding author was the main responsible for drafting and revising the article. All authors contributed to the final approval of the version to be published of the paper.

Conflicts of Interest

The authors declare no conflict of interest.

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