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This paper analyses some visual aspects of three Theory of Change maps, i.e. logic planning models used to explore and abstractly represent a potential change in a way that reflects a complex and systemic understanding of development. Theory of Change emerged in philanthropic initiatives and is based on two streams of work: evaluation and informed social practice. The Theory of Change maps analysed in this paper are created to support complex urban regeneration projects within the context of T-Factor, a four-year innovation action funded by the European Commission and taking place in six cities under regeneration across Europe. As such, these maps are primarily geared toward (a) representing fundamental systemic properties of the areas under regeneration and (b) envisioning how the coordinated action of several city stakeholders could drive urban change (and urban regeneration). Particularly, the paper will (a) study and compare the visual language through which these maps represent urban change and (b) propose ideas to expand how various dimensions of temporality are generally represented. The paper aims to articulate these temporal dimensions to provide those city stakeholders interested in adopting visual mapping to drive change in urban regeneration projects with tools to address the complexity they face.

Keywords: visual mapping; theory of change; urban regeneration; temporality

1   Introduction

Urban regeneration projects often address complex domains such as climate adaptation, the transformation of entire districts, city unemployment, access to resources and more (Abbasi et al., 2018). These kinds of 'wicked problems' (Buchanan, 1992) can only be approached by long-term interventions, often lasting 15-40 years. Such interventions involve many city stakeholders (e.g., local government bodies, policymakers, companies, citizens, NGOs and local communities) (Abbasi et al., 2018; Wang et al., 2021). The different perspectives of these stakeholders - each with their wants and needs (Fassi & Manzini, 2022) - are also potentially reflected in different ideas about the various temporalities connected to the intervention (e.g. what can we expect to happen over a given period;

or what kind of impact an intervention might have for the current city inhabitants or the future generations). Different views on temporality affect how the city regeneration projects are seen and appreciated and how the change can come about in the urban realm.

One method used in urban regeneration projects to structure an intervention is Theory of Change. Theory of Change was created in the 1990s as a logical planning model to explore and represent how a significant change can come about to reflect a complex development by pinpointing and addressing crucial elements (Simeone et al., 2021). In urban regeneration projects, Theory of Change is frequently employed to explain the connections between project and program activities, outputs, and outcomes (Stein & Valters, 2012). In a way, it represents how a course of action unfolds over time; however, Theory of Change maps rarely take into consideration that stakeholders might harbour very different views about temporality - e.g. thinking within different timeframes or considering (or not) long-term consequences of a specific intervention (Dawson, 2014). As such, they risk avoiding the full complexity that needs to be addressed in a regeneration plan.

In this paper, we suggest how Theory of Change mapping may problematise (i.e. undermine common sense or conventional understandings of a subject matter to gain new insights) and address the existence of numerous temporalities produced by various stakeholders. We will examine three visual approaches to Theory of Change utilised in T-Factor, an urban regeneration project supported by the European Commission. The paper's contribution consists of two parts: 1) a study of how Theory of Change can assist in identifying the multiple temporalities involved in an urban regeneration project, and 2) an analysis of how various visual representations of Theory of Change can aid in thinking through and communicating a pliable logic for the project that would take multiple temporalities in consideration.

2   Literature review

2.1   Theory of Change mapping

Theory of Change was developed in the 1990s as a logical planning model to investigate and evaluate a potential change in a way that reflects a comprehensive and systematic understanding of development (Stein & Valters, 2012). Since then, it has been used to picture various interventions intended to transform the current state of things into a preferred future. As a design tool, it can facilitate the success of projects involving institutions and citizens as a principal goal (Fassi & Sedini, 2018). There is a broad agreement that design projects that deal with contexts of interventions that are complex and unclear (Norman & Stappers, 2015), and that try to manage complexity by discovering more participatory ways of bargaining change (Flach, 2012; Tonkinwise, 2015; Wilkinson et al., 2021) can significantly benefit from a Theory of Change framework to inform a deep understanding of the dynamics of transformation (Irwin, 2018), particularly as a collaborative tool for problem mapping in a workshop setting (ibid).

Theory of Change can be perceived as an exercise of thinking through time. It describes the existing situation in terms of conditions and opportunities, the intended outcomes (What is the change you are hoping to bring forth?), and specifying what needs to be done to get from one to the other (What measures are required to bring about change?) (Rogers, 2014; Simeone et al., 2021). This structure mostly results in a coherent, linear storyline integrating the answers to these questions. There are

clear advantages to creating a coherent and linear representation of change, namely the opportunity to support communication and create clarity around the process (Zohar et al., 2022). However, this linearity risks creating a simplistic and univocal image and downplaying complexity. Indeed, Theory of Change was broadly criticised for being overly 'linear' and not sufficiently reflecting complex systems' actual behaviour (Ofek, 2017). It has also been criticised for not giving enough attention to the wider context in which the intervention is taking place and the nature of the interactions between the intervention and this wider context (Wilkinson et al., 2021).

In terms of graphic representation, little has been written on the design features of Theory of Change maps (Simeone et al., 2023). Although Theory of Change does not follow fixed and predefined visual standards, it is commonly visualised using charts and diagrams (Stein & Valters, 2012). With a linear tabular form that leaned on the aesthetics of natural science, the early Theory of Change maps were comparable to logic models in design (Davies, 2018; Simeone et al., 2021). These maps utilised the same logic of engineering diagrams, representing a process as a series of sequential instructions that must be followed to complete a task. Thus, the visual representation expressed neither the different world views of the various stakeholders nor the various temporalities embedded in the context. Although over the years, various attempts have been made to tackle the shortcomings of an overly "linear" manner of Theory of Change diagramming (Wilkinson et al., 2021), the multiple temporalities of city regeneration projects - and the related multiple, potentially conflicting views of the city stakeholders - remain largely unconsidered.

2.2   Temporality in Theory of Change mapping

Most maps are presented and perceived as having one temporality only (Ferdinand, 2019); this is also the case with most mapping techniques used in design (e.g. systems maps, stakeholders maps, actors network maps, Etc.). Theory of Change maps adapt the logic of a timeline, which is 'one of the central organising structures of the contemporary user interface' (Rosenberg et al., 1996, p. 246). Rosenberg et al. explain the popularity of this mode of representation concerning the sheer volume of information that places special emphasis on time as an axis of organisation. They claim that the context of the flat and ever-extending plane of the information displayed in a timeline offers stability. However, the benefits of a visual representation providing it could be questionable when it comes to representing an ever-changing reality, as a Theory of Change often does.

Most Theory of Change maps refer to a temporal unfolding from the current situation to a future state, presenting a time yet-to-come (Dawson, 2014), emphasising the period between the two (Rogers, 2014). However, beyond these general tenses, time is unspecified, as Dawsen (2014) mentioned: "There is a sense in which intuitive notions of time are sufficient and best left unquestioned. As such, time is often accepted as something without conscious thought; it is ever present, intuitively understood yet missing in action through conventional assumptions'' (p. 288). Relating to theories of change management, Dawson advocates for problematising the implicit conceptions of time that underlie, "as it is often assumed to be self-evident, rarely explained and often under-played" (ibid), and further states that "time is taken-for-granted and is often couched in progressive linear terms that mark a movement from what has gone (the past) to what is (the present) to what is to come" (p. 287). As a result, our ordinary notion of movement, episodes, sequences of activities, and temporal events is based on assumptions that do not go under the necessary scrutiny (Nguyen Huy, 2001).

Dawson defines two main temporal approaches in change theories: the first utilises objective forms of chronological time in terms of linear progression (as most Theory of Change maps do), measuring intervals between periods of stability and constructing incremental change with planned periods of interventions. The second approach attempts to capture the subjective time shaped by history, context and expectations. According to this approach, the subjectivities of human experience cannot be ignored or decontextualised as a movement forward does not represent instances of 'now' moments but "a nonlinear entanglement of past, present and future" (Dawson, 2014, p. 294). This approach implies a multiplicity of temporalities (polychronic) driven by the various stakeholders and their worldviews and contexts.

Even though temporality is imminent to Theory of Change, it is under-studied in research and under-considered in practice. Temporality in Theory of Change is perceived as an objective form of chronological time (Dawson, 2014) regardless of its context, which downplays complexity in urban regeneration projects (e.g. by only considering human needs or by thinking from a short rather than long-term). The general approach to temporality is also expressed visually in how Theory of Change maps are designed. As long as temporal elements are not clearly defined, there is a risk that these mapping processes are not leveraged to their full potential. This paper intends to cast some light on these aspects by addressing the following research question: How can multiple dimensions of temporality be better addressed in Theory of Change through their visual representation? From within the perspective of design research and in line with the literature that argued for the need to use Theory of Change in design (Simeone et al., 2023), our study aims at developing actionable insights. Such insights can help design practitioners and researchers apply a more granular Theory of Change mapping in their projects.

3   Methodology

This paper adopts a case study approach as it examines a real-life phenomenon in depth to achieve a multi-faceted understanding of a complex issue within its environmental context. As a single case study, it will be described in detail and analysed to understand better 'how' and 'why' things happen (Crowe et al., 2011; Ridder, 2017**).**

The case is T-Factor, an urban regeneration project funded by the European Commission, focused on creating 'meanwhile activities' to harness the transformative potential of urban places undergoing regeneration. In T-Factor, 'meanwhile activities' are interventions in vacant buildings, plots, and underutilised spaces to create shared public value and rewire the area's social, cultural, and economic fabrics (definition taken from www.t-factor.eu). The project will last four years and involve six communities, i.e. a 'coming together' of participants with geographical proximity and place-based concerns (Dixon et al., 2022) in Amsterdam, Bilbao, Kaunas, London, Lisbon and Milan. Each works under an individual regeneration plan (i.e. different masterplans, periods and levels of maturity regarding the process) and involves multiple stakeholders. We chose T-Factor as the case of this exploration, as the project handles 'meanwhile' situations in urban regeneration framed and defined by time. Therefore, temporality is a key concept in T-Factor and is expected to play a critical role.

The authors of this paper participated in the design and implementation of T-Factor, where they contributed to developing one of the Theory of Change maps that will be analysed below. This internal stance allowed them to gather information and insights, mostly through participant and direct observation (Czarniawska, 2012). This information has been selectively analysed within the framework of this study to conclude how temporality has been addressed. The analysis used variables from visual design research, such as scale, texture, colour, hierarchy, layers, patterns, and spatial distribution (Lupton & Phillips, 2008).

4   The case study: Three approaches to Theory of Change

In this section, we examine three Theory of Change maps elaborated in T-Factor over two years through co-creation processes that see the interplay of various city stakeholders (citizens, NGOs, government representatives, and companies).
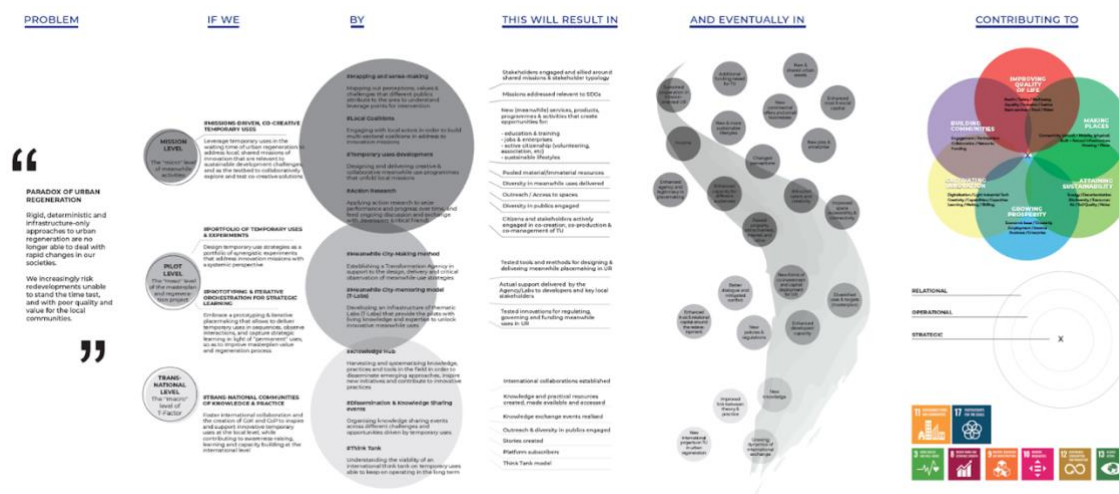
4.1   Approach 1

Figure 1: Theory of Change - approach 1. Visit https://miro.com/app/board/uXjVM4UJlx0=/?share_link_id=621643377587 to access figures in detail.

This map communicates the overall logic of the T-Factor project (i.e. in order to address rapid changes and tackle rigid approaches to urban regeneration, a set of interventions clustered into thematic categories will be applied and this, in turn, will support some of the sustainable development goals). The map is meant to be used internally to clarify the logic among key project stakeholders and externally to inform the broad audience about the project's approach and strategy. The information is synthesised and organised through categories (i.e. micro-macro levels, Sustainable Development Goals, Etc.). The map functions as a 'black box', showing the results of (what we could imagine being) a negotiation process among stakeholders; it neither displays traces of the participatory process nor clarifies who the stakeholders involved in the project are (who are 'we'). As such, the overall challenge is not anchored to a viewpoint of a specific stakeholder or specific conditions of a geographic, social and cultural context.

In T-Factor, the period of the regeneration plans of the six pilots varied dramatically (between four to 48 years - see Figure 5). However, this aspect, as well as the state of the regeneration process and the

timing of the intervention made by T-Factor, do not appear on the map. The problem definition brings together impressions gathered in the past ('approaches to urban regeneration'), present ('rapid changes') and future (potential risks). The actions ('if we') refer to an unknown time (Is it during the T-Factor project? The regeneration period? At which stage?) and a hypothetical future. All in all, the temporalities remain undefined and abstract. The graphic representation of the future tense starts rather concretely by underlining the text (in the category 'this will result with'), continuing with a more abstract graphic form of a transparent wave ('and eventually in'), and resulting in a colourful graphic form ('contributing to'). This display gives the impression of a 'floating' set of ideas not anchored in time or space and unrelated to any external impact or influence.

4.2 Approach 2

This Theory of Change map was designed to be used by each pilot individually to internalise the Theory of Change logic, negotiate and define the local strategy among stakeholders and develop initial ideas for an activity plan. The map was handed out as an open (and empty) Miro board canvas for participatory workshops (Figure 2).

Figure 2: Theory of Change - second approach.

The maps were populated with three types of content related to different temporalities appearing in a non-linear order. The left column accommodates information about the situation during the

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preliminary research (i.e. problems and opportunities). The following columns display intentions regarding a general future (i.e. innovation missions and desirable situations) co-defined by the stakeholders in the present. Concrete ideas from past events are displayed (Figure 3) as inspiration for future activities.

Figure 3: Meanwhile activity cards - concrete ideas for interventions taken from the experience of other projects to inspire future interventions. On the right: Zoom into a single card.

Organising the information in a table format and displaying it on 'cards' has functional and symbolic implications. On a practical level, the table can accommodate multiple answers (and hence - viewpoints). Thus, it gives space to multiplicity and diversity. Symbolically, the clear structure contributes to the feeling of a controlled and constructed process by providing stakeholders with a precise sequence of actions and creating distinguished categories. To match the visual format of 'cards' and 'notes', the user must 'break down' the information into single elements. This fragmentation may mislead the impression that complex and interrelated matters could be divided, isolated and distinguished.

4.3   Approach 3

The purpose of the map below (Figure 4) was to communicate the activity plan of a single pilot (Amsterdam) to an external audience based on the overall logic of the Theory of Change (as it appears in Figure 1). The map emphasises the pilots' future ambitions by naming potential interventions to be done over time. The data that populated the map was extracted from several canvases filled by the pilot stakeholders during a series of participatory workshops, including the Theory of Change map (Figure 2). The project coordinators synthesised and edited the information to create a straightforward narrative.
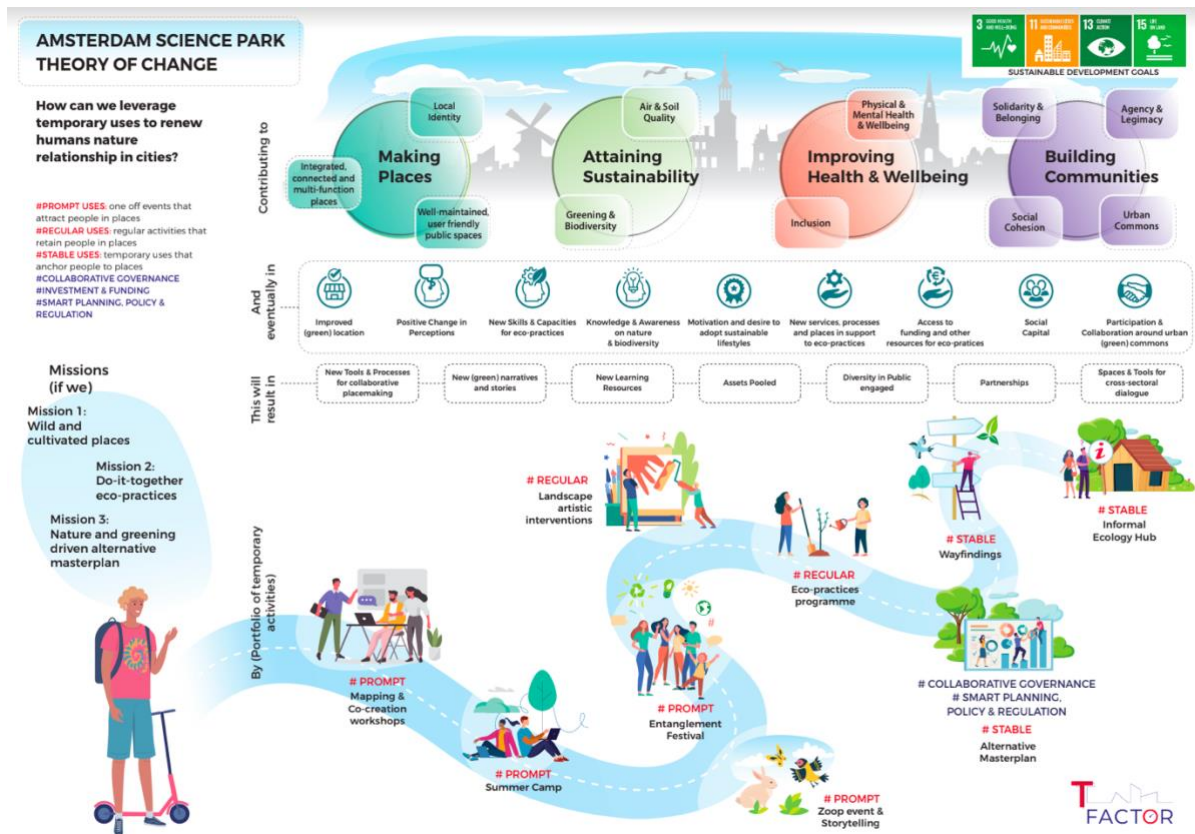
Figure 4: Theory of Change - third approach.

The map presents an illustrated narrative of a journey. The entry point to the composition is a young man's figure standing in the left-down corner under the title 'if we'. Facing the reading direction, he is about to go through a path stretching from left to right, following a timeline logic. Along the path, small illustrations of young people (and once even animals) doing something together represent the 'meanwhile activities' planned by the pilot, ending up with a small house representing the permanent. Above the path, four text layers describe the outputs, the outcomes and the general contribution of the planned actions. The composition indicates that these consequences will not occur only once all interventions are accomplished (as it is often the logic represented visually in Theory of Change maps) but will instead emerge in parallel to the work on the ground. However, the action-reaction logic remains undefined since the composition is not anchored to any table, cells or errors (as many Theory of Change maps do). Even though the illustration of the skyline and the stakeholders provides some ideas about the place (the city of Amsterdam) and the stakeholders involved (young European people), they stay within the frame of a generic representation. Time indications are lacking; therefore, it is unclear when things are expected to happen. The Sustainable Development Goals are mentioned as a reference on the top right, but how they relate to concrete actions remains unclear.

4.4 Summary of key findings

The Theory of Change maps analysed in this paper fulfil different functions. Figures 1 and 4 are used for communication; both are narrative-based representations conveying the logic of the T-Factor interventions. Figure 1 serves as a manifest, a general description of the entire project's rationale, while Figure 4 describes what could or should happen in a single pilot in more detail. Figure 2 serves a different purpose by providing stakeholders with a framework to co-create a local activity plan. Here,

it is the process rather than the pre-defined content, meant to support stakeholders with recognising critical aspects, reasoning across different levels and making decisions accordingly. In other words, it is meant as a tool to 'think through' rather than 'talk about'.

Time is a key consideration in regeneration projects, as evident in the T-Factor website: "We argue that the time factor in urban regeneration can become a strategic asset" (https://www.t-factor.eu/about/). A more granular look into the work done in T-Factor's six pilot cities shows that temporality is not univocal but rather experienced differently by various stakeholders based on subjective experiences, different expectations and specific local contexts. For example, the regeneration process in the London pilot is expected to last around 30 years. Hence, the main stakeholders (Lendlease, the Department for Transport, Network Rail, Camden, HS2 and the Greater London Authority and Transport for London) set their strategic goals within this timeframe. At the same time, residents from vulnerable groups can not aim for 30 years but need ad-hoc solutions for current problems. While the overall concern of big stakeholders such as the network rail is likely to remain similar in 30 years (i.e. mobilising people), individual stakeholders could experience fundamental changes in their needs over the same timespan (e.g. from being concerned about employability and labour to being concerned about healthcare, social services, or loneliness). Amsterdam science park provides a different example of multi-layered temporality, where the time considered 'unused' for humans serves best animals and plants. While vibrant with student and work life during the daytime, the park is sparsely used after working hours and almost vacant at weekends and holidays. After 18:00, half of the area is closed off with a fence. Thus, the 'park hours' are during the daytime on weekdays. However, what results in isolation and unsafety among the residents greatly benefits animals inhabiting the area. This group of stakeholders is likely to be more active when humans are away. However, the three Theory of Change maps ignore this multiplicity and approach time as self-evident, unexplained and based on intuitive notions.

5   Discussion

In this paper, we explored the question: How can multiple dimensions of temporality be better addressed in Theory of Change through their visual representation? As temporality is an abstract and elusive concept, its multiple dimensions are often overlooked. Nevertheless, visualising these aspects in Theory of Change maps can articulate them and bring them to awareness. In the following figures, we propose some speculative reflections that suggest visual ways to make temporality more tangible.

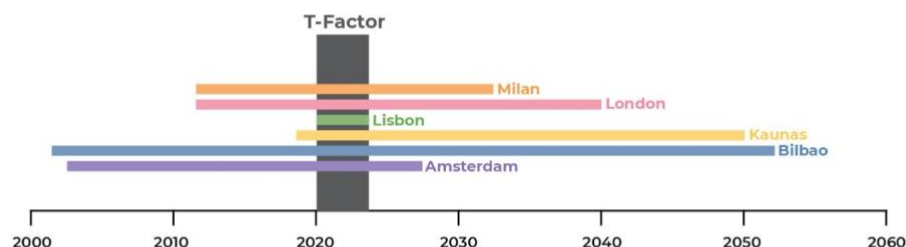### 5.1.1   Regeneration period vs intervention period

Figure 5: The various regeneration periods in T-Factor.

As mentioned, T-Factor operates regarding regeneration processes in six European sites. The regeneration period in each site differs, running between four and 50+ years (Figure 5); the whole length of these regeneration processes might affect the impact of T-Factor since the project will only run for four years. Another difference to be addressed in this context is the point in time when T-Factor is involved in the regeneration area. In cities where the regeneration processes started way before T-Factor and are at an advanced stage (e.g. Amsterdam), the conditions on site are likely to be more mature (e.g. in terms of collaboration among stakeholders, strategic focus, available resources). At the same time, many aspects of the regeneration process could already be defined, and hence, T-Factor's potential impact may be limited. An opposite situation can occur in relatively new regeneration processes (e.g. Kaunas). This temporal aspect, which seems to be rather impactful, is not visualised in the project's Theory of Change maps. A possible visualisation could be articulated in Figure 6.

	Problems & Opportunities	Desirable situations (What is the future state that you would like to reach?)	Your innovation missions (What are the key improvements that you want to achieve to reach the desirable situation?)	Concrete meanwhile activities that you could implement to fulfil your innovation missions	Which impact theme of T-Factor is being fulfilled by your innovation missions?
2022			Mission 1 Mission 2		
2032			Mission 1 Mission 2 Mission 3		
2042			Mission 2 Mission 3 Mission 4		
2052					

Figure 6: Theory of Change map matching the schedule of the Bilbao pilot. The map relates to the overall timespan of the local regeneration process (until 2052) as the context. At the same time, it focuses on the activity done during the intervention of T-Factor (2020-2024). Thus, stakeholders can focus on the duration of the T-Factor intervention as part of a longer-term trajectory. Additionally, this segmentation can increase awareness of future unknowns.

5.1.2 The intensity of time: 'Active' time vs 'passive' time
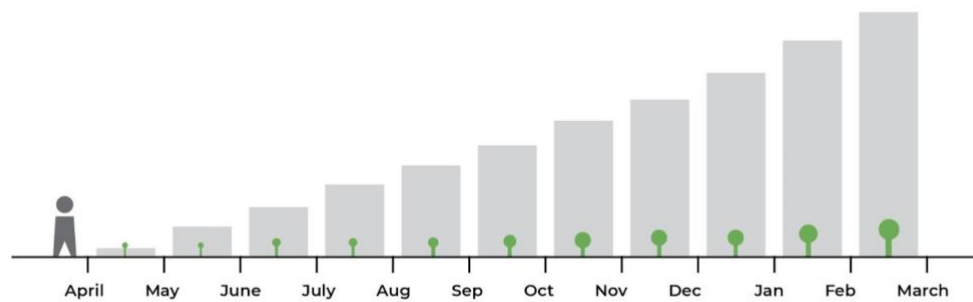
Figure 7: A progression of a tree's growth vs a house's building over the same period. While the building stage is subjected to human actions, the growing stage is subjected to natural forces.

How we experience time as human beings are often affected by the intensity of events over a certain period. Thus, a short and busy period could be felt like a long one and vice versa. In some cases, we can control this intensity by acting more frequently to promote a specific goal (e.g. building a new building or running a series of workshops). When using a Theory of Change map, we often imply this logic. However, regeneration processes do not only impact activities initiated by humans but also have an impact on the local natural ecosystems. When working with nature, we must take time with processes to match our schedule and strategy (Figure 7). As noted by a stakeholder from the Amsterdam pilot: "We figured out that green work is slow work". When change is at stake, it is necessary to keep in mind that the desirable outcomes (e.g. creating a green area in the city) do not only require an active approach and tangible resources such as money, assets and labour but also periods of passiveness, time and patience. A possible visualisation of the 'active' vs 'passive' approach to time could be represented in Figures 8 and 9.

Figure 8: Visualising time intensity in Theory of Change according to colour saturation

Figure 9: Visualising time intensity in Theory of Change according to colour saturation key. The potential meanwhile activities are categorised according to their immediate vs long-term impact. This distinction becomes important when evaluating potential impact over time and allows stakeholders to create an activity plan that addresses the near and far future.

5.1.3   Different time units

The representation of Theory of Change maps by a timeline implies a single sequence based on a univocal view of the past, present and future. However, how we think about and 'manage' time in our everyday life does not often follow this logic. Instead, our personal experience is mainly based on smaller and more defined units (i.e. hours, days, seasons, Etc.), depending on our subjective experience, context and individual needs. In the case of the Amsterdam pilot, for example, we can imagine the categories presented in Table 1.

Table 1. different time units correlated to various stakeholders in Amsterdam science park

Stakeholder	Relevant time unit
Students	Academic year (Sep-Jun)
Park management	Calendar year (Jan-Dec)
A volunteer in the permaculture garden	Seasons (spring to fall)
A person training after job hours	Afternoon (16-18)
A person visiting the park for a meeting	One day
A bird	Summer (April-September)

Considering these temporal elements can be key when creating an activity plan that aims to address the needs of various stakeholders. A visual representation of these elements can result in Figure 10.
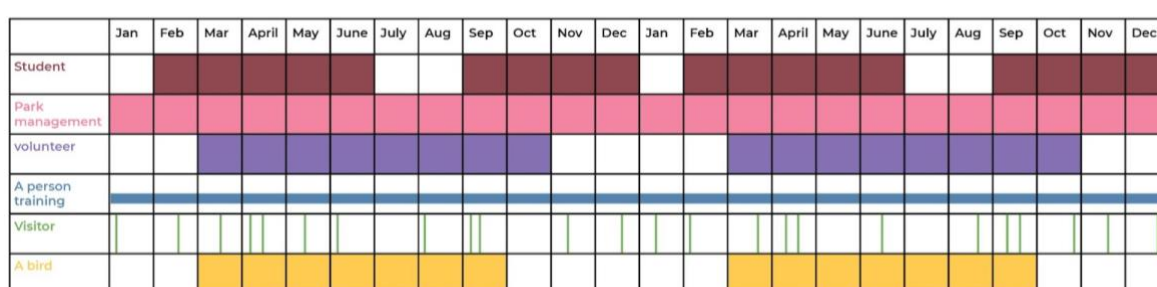

Figure 10 - Different time units that could be displayed in Theory of Change maps

By observing this visualisation, we can, for example, generate the insight that the park is under-used by humans over the summer. Considering the terminology of 'meanwhile', we can frame a regeneration intervention along the lines of: 'How may we leverage the summer period in the Amsterdam science park for the benefits of the multiple (non-human) species while humans are away?'. Alternatively: 'How may we attract students to volunteer in the permaculture garden when they are not studying?'. In both questions, visualising the various time units reveals some opportunities that can be developed into an activity plan for urban regeneration.

5.2 Contribution to research

This research aligns with those streams approaching design as an enabler for people 'to solve unexpected changes' (Fassi & Sedini, 2018), focusing on complex urban settings and calls for greater use of Theory of Change in design projects (Jones, 2014; Tonkinwise, 2015). When used within a designerly approach, Theory of Change can expand its potential to characterise, detail and navigate complexity in urban regeneration projects (Zohar et al., 2022). Therefore, it can facilitate the success of projects triggering generative and transformative actions and geared towards the involvement of diverse stakeholders such as institutions, communities and citizens (Fassi & Sedini, 2018). However, despite recognising the vital contribution of Theory of Change to design, its visual vocabulary is generally underdeveloped (Simeone et al., 2023) and should be further materialised.

Within this context, the contribution of this paper to design research is to present some considerations on how a better articulation of visual aspects connected to temporality can help map complex dynamics connected to urban regeneration. Most Theory of Change maps take time as unspecified and intuitively understood (Dawson, 2014), expressing it by the well-known convention of a timeline. However, in practice, stakeholders collectively utilising a Theory of Change framework to create agreement have diverse perceptions of time, depending on their context and subjective view (Dawson, 2014; Nguyen Huy, 2001). Therefore, they must discuss and negotiate them as a starting point (Davies, 2018; Stein & Valters, 2012). With no visual evidence of these differences, the various temporalities remain invisible and, therefore, overlooked.

This study proposes how to shape the transparent and illusive concept of time, fundamental to Theory of Change. The actionable insights proposed in the paper can help design practitioners and researchers alike in applying a more granular Theory of Change mapping in their projects. By making the various dimensions of time visible, the research supports city stakeholders in recognising frictions and opportunities to think through and thus address the full complexity of urban regeneration.

6 Conclusions

Although Theory of Change is a systematic mapping method, the term 'time' generally remains unquestioned and rarely explained. Considering this crucial aspect in regeneration processes as if it was self-evident can lead to ignoring the multiple dimensions of temporality at play in specific urban contexts. In this paper, we speculated on how temporalities can be articulated by tinkering with some visual representations. For now, these visual speculations remain on paper and untested on the ground. As such, we mark this research as preliminary.

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