Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences
Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

### Personal information

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<thead>
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### Studio

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<tr>
<th>Name / Theme</th>
<th>Urban Metabolism</th>
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<tr>
<td>Teachers / tutors</td>
<td>Alex Wandl and Dominic Stead</td>
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<td>Argumentation of choice of the studio</td>
<td>I began my Master's degree at TU Delft interested in the broad topics of sustainability and resiliency. This was not without skepticism. After three years of professional experience in urban planning, it was clear that sustainability and resiliency have become broad terms, easily incorporated into various policy documents. Yet, the inclusion of sustainable values in policy has seemed to have little to no effect on development practice in Canada. Through my Master’s degree, I intended to research something more specific and concrete for possible solutions. Through my first year at TU Delft, I began to study and review Urban Metabolism, a field which calls to my knowledge and interest in spatial data, GIS software, resource management, regional research, and environmental technology. More importantly, it presented an opportunity to create a deeper understanding of sustainability through the analysis of urban ecosystems with quantifiable evidence of resource balances. Systems-thinking also provides a framework to identify the relationships between these balances and socio-economic conditions. Urban Metabolism is the most relevant studio for the framework I have set out for my studies. The Master’s thesis is composed of an in-depth flows analysis and regional solutions which are based on Urban Metabolism practices and methods.</td>
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### Graduation project

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<tr>
<th>Title of the graduation project</th>
<th>Suburban Metabolism in the Greater Toronto Region</th>
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<tr>
<td>Location: Greater Toronto Area, Ontario, Canada</td>
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<td><strong>The posed problem,</strong> Within its current and anticipated state, the Greater Toronto Region will face a rising ecological footprint (currently 8.40 global hectares) and a declining biocapacity due to population growth and suburban development practices. This has been unaided by a lacking provincial policy that has been unable to control such practices due to the large gap between provincial theory and municipal practice. Driving municipal practices are demanding consumer preferences leaning toward traditional suburban housing typologies in order to obtain/maintain individuals high-quality living standards.</td>
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<td><strong>research questions and</strong> How can a Regional Spatial Strategy bridge the gap between provincial policy and municipal allowances to plan sustainable suburban growth which will lower ecological footprint, increase biocapacity, and maintain a high quality of life in the Greater Toronto Region?</td>
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<td><strong>design assignment in which these result.</strong> In the Greater Toronto Region, the distance between provincial and municipal governance in spatial and political terms is vast. This has created a large gap between urban theory/policies set out by the Province of Ontario and the suburban development which is put into practice by municipalities and developers. Looking at this gap from a planning perspective offers an opportunity for the scale of <strong>regional design</strong> which provides a bridge between theory and practice. According to Neumana &amp; Zonneveld, Regional design takes place in a setting where an entire range of boundaries has become blurred, whether between spatial boundaries, actors, or other dynamics (2018). A regional design may create a more comprehensive vision where the existing structure of local and regional governments cannot match the complex interactions between locations (Neumana &amp; Zonneveld, 2018). Both are true for the Toronto Region. The choice of a regional plan was not only inspired by scale, but by the history of planning in the region. In fact, Toronto had moderated a regional planning department for development in the 1950s and 60s and the result, was a tightly linked municipal investment infrastructure with connecting sewer and water</td>
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supply systems (Hess et al., 2015). Some researchers argue that it was the Metro Toronto Regional Planning system which led Toronto to have moderately compact and planned suburbs in comparison to Canada’s American counterparts (White, 2014). Nonetheless, the metro regional planning department had diminished by the late 1960s due to political strides and development control fell into the hands of local municipalities. This research output seeks to return to regional planning and design. Considering the opportunities regarding the current context, and the proven successes of regional design in the past, a regional plan is seen as the most appropriate output to achieve the project goals.

**Process**

**Method description**

**Overall Approach & Methodology**
To conceptualize and frame the problem further, this research will follow the DPSIR framework. The DPSIR (drive-pressure-state-impact-response) provides an approach which may recognize the levels of indicators useful in analyzing the project through the lens of Urban Metabolism (Ferrão, & Fernandez, 2013). The DPSIR model is a flexible method often used to study complex phenomena like land-use-transportation- and environmental interaction (Ferrão, & Fernandez, 2013). The framework, in this case, is intended to make connections between the uncontrolled variable of population growth, and the controlled variable of Suburban Development. The Framework is intended to reveal the connections between development, growth, and the social-ecological challenges which they present when placed together. While the DPSIR method allows for the inclusion of many factors, it also provides a breakdown of certain systems which offers a lens to look through.

**Methods**

**Literature Review**
The intention of the literature review is to gain a better understanding of the current (and past) discourse centred around suburban growth and anti-growth, as well as methods and theories used in urban metabolism studies to effectively analyze the flows of resources in regions/territories.

**Problem Analysis and Development**
The problem analysis and development is used to explore and solidify the initial problem statement, recognize assumptions and create an evidence-based focus. To achieve this the research I will first include data analysis, reviewing growth projections in the GTA, review ecological footprint data, biocapacity data, and data on current housing development.

**Descriptive Analysis**
The descriptive Analysis is intended to look deeper within the problem field with a more specified focus. The Descriptive Analysis will use the DPSIR framework as a basis for the collection and production of data and analysis. The Analysis will include Material Flows Analyses for the major
Contributors to ecological footprint: housing, food, and transport and make connections between the flows and growth and development in the region as well as socio-economic effects from the systems.

**Design Study**
The intention of the design study is to begin approaching solutions to the regional challenges in the GTA. The design study will include a library of best practices of successful developments and policies which will inform possible solutions in the GTA. In order to identify the elements of the best practices which are applicable to the region, design experiments will be conducted. These design experiments will supply knowledge for the creation of the regional strategy. Using the elements from the regional strategy, local intervention studies will be developed to provide exemplary examples for using the planning principles established in the study.

**Evaluation and Reflection**
To identify the successful or lacking elements of the research project, a review of the research compared to the research questions and research aim will be conducted. This step will decide whether to move backwards and improve based on the research framework, or provide future steps for ongoing research.

**Literature and general practical preference**

**Post-Suburbia**
It is evident that suburbs have been changing. Internationally, many suburban areas have gone through a significant evolution from the process of dispersal to densification, increasing the complexity and diversity of different regions (Charmes & Keil, 2015). Such settlements, which have fallen under various terms such as, ‘ex-urbs’ (Soja, 2000), edge cities’ (Fishman, 1987), and ‘technoburbs’ (Lang, 2003), have been signals of new suburban morphologies. Many of which have been classified within the umbrella of ‘post-suburban’ (Phelps & Wood, 2010). In the European context, Wandl, Nadin, Zonneveld and Rooij (2014) used the term Territories-in-Between (TiB) in order to include the concepts laid out within Zwischenstadt (Sieverts, 2003) città diffusa(I) (Indovina, 1990), anae-hernd perfekte peripherie (CH) (Campi, Bucher, & Zardini, 2000), peri-urbanité(F) (Le Jeannic & Vidalenc, 1997) (Wandl, 2017). Such forms of settlements have changed the traditional geographical features of concentric cities and moved towards more polycentric, fragmented urbanisms, blurring the lines between urban and suburban regions (Charmes & Keil, 2015).

**The Density and Sustainability Paradigm**
Densification has been a critical part of the movement towards ‘new’ or ‘post-’ suburbanization. Densification has been a particular instrument which has been used to identify and classify changes within the suburban landscape. While the shift towards densifying these settlements has multiple contributors, urban planning trends which promote ‘compactness’ and ‘intensification’ have considerably affected such change. These trends have been dominating the contemporary planning discourse with the main objective of combatting suburban sprawl, which has been widely accepted as a large contributor to climate change and ‘unsustainable’ living. The consistent relationship between sprawl and climate change within contemporary planning discussion has contributed to one common assumption: that density equals sustainability. Yet, while density seems to be embedded in our 21st-century planning culture, there are various inconsistencies between dense developments and sustainable living, specifically in the GTA.

Within Canada and the GTA, density in the name of the environment has the ability to discredit NIMBYisms and slow local challenges against development. It seems that if one is against growth, one is against the planet. This continuous use of density as a means for any urban growth has created a
justification for growth coalitions and limited the discussion on sustainable suburbs. It is clear that
the direct relationship between sustainability and density has been moderately discredited through
recent research. In order to maintain a proper discussion around the sustainable future of suburban
or post-suburban areas, planners must first develop a realistic discourse around them. Discussion
must move beyond a ‘density first’ approach and analyse several factors of sustainability and livability
to better understand actions to be taken with future growth. This is not to say that the ‘compactness’
which has been attempted through Sustainable Development, New Urbanism, and Smart Growth
visions is entirely irrelevant, but combinations of values and the resolution of sustainability conflicts
could eventually create sustainability within planning practices.

**The Sustainability Livability Conflict Prism**

Goschalk states that the three pillars of sustainability are missing an aspect of ‘livability’ which is
espoused by a number of advocates in urban theory (2004).

> “Livability operates at the level of the everyday physical environment and focuses on
> placemaking (Bohl, 2002). Within the livability arena are both the two-dimensional
> conceptual aspects emphasized by sustainable development (economy, ecology, and equity)
> and the three-dimensional aspects of public space, movement systems, and building design.
> In other words, the livability vision expands the sustainability mix to include land use design
> aspects, ranging down to the micro scale of the block, street, and building, as well as up to
> the macro scale of the city, metropolis, and region.” (Goschalk, p.6, 2004)

Goschalk's iteration of the sustainability conflict triangle offers a method to include livability, often
used within theories advocating for density, such as New Urbanism and Smart Growth. Figure 3
reveals the Goschalk diagram as a prism rather than a triangle, assessing the conflicts through the
lens of livability within sustainability.

![Figure 3: The sustainability/livability prism: Value conflict and gaps Goschalk, 2004](image)

The prism adds three additional conflicts and tensions between livability and sustainability. The
‘growth management conflict’ rises from competing ideas that unmanaged developments, such as
practices of dispersal, either provide high-quality living environments or will always hinder the
development of social equity in projects (Goschalk, 2004). Tensions between livability and ecology
are part of the ‘green cities conflict’, which involves arguments around whether cities are capable of
incorporating ecological sustainability at all, as opposed to limiting city development and preserving
the existing natural environment (Campbell, 1996). Lastly, the livability and equity axis exposes a
‘gentrification conflict’ stemming from competing beliefs on whether poorer neighbourhoods should be preserved or redeveloped and improved to attract middle and upper-class populations (Goschalk, 2004).

Intensification, Compactness, and Sprawl

Many theories, specifically those within the 20th century, focus on the limitation of sprawl in cities. Springing up from these theories were policies which governments used to inhibit outwards growth. In North America, the most practiced frameworks included Sustainable Development, Smart Growth, and New Urbanism.

Sustainable Development

Sustainable development, a seemingly immense theory has found its way into many policies across the country. The interest in this practice began to influence planning approaches in Canada and Europe after the publication of the Brundtland Commission report (Grant, 2009). “Though theorists presented differing interpretations of sustainability (e.g., Rees, 1990; Van der Ryn & Calthorpe, 1986), in planning documents and discourse sustainability rapidly became a mantra” (Grant, p. 3, 2009). Generally, the discussion centred around creating compact form, increasing sustainable transport options, creating healthy living environments, affordable housing, and creating environmental responsibility (Grant, 2009). Such vast practices and concepts were fused with other theories and policies in the 1990s, eventually fusing with the ideas of Smart Growth and New Urbanism (Grant, 2009).

Smart Growth

The concept of Smart Growth began to emerge in the 1990s in American planning circles and gained a strong momentum in U.S. states (Eidelman, 2010). Its origins stemmed from a series of documents developed by the American Planning Association and the Natural Resources Defense Council (Ewing & Meakins & Bjarnson, Grace & Hilton, 2011). The term “smart growth” originally was a response to the “no growth” slogan from environmentalists who were protesting urban expansion, especially suburban growth. The solution was to preserve open and natural areas, redevelop and densify in core areas, and promote mixed land uses and town centres in less urban areas (Ewing, et al., 2011). The principles of Smart Growth were intended as the name infers to - control suburbia which threatened to grow into natural, agricultural and open space. By 2001, Canadian public figures and newspaper coverage began to clasp onto the idea of smart growth (Eidelman, 2010). By this time in Ontario, public awareness of urban sprawl had grown substantially and public concerns of environmental degradation, long commute times, and traffic congestion all added to the need for a new strategy (Eidelman, 2010). Following this discussion, the government used incentives like density bonuses or grants, reports, and manuals, and adopted a Places to Grow legislation in 2006.

New Urbanism

New Urbanism is another ‘recent’ development in planning which became popularized in North America for the development/redevelopment of suburban neighbourhoods. It is closely related to Traditional Neighbourhood Design and Smart Growth with a different focus point. New Urbanism uses design principles which were common before automobiles dominated urban form (Ewing, et al., 2011). At its core, it promotes sustainable transport, increased density, better connectivity, and enhancing the central core of neighbourhoods (Ewing, et al., 2011). Though similar to smart growth, New Urbanism is framed through an aesthetic approach, often implementing its principles through form-based code and increasing the vibrancy of neighbourhood centres. Its precursors include the development of seaside Florida and drew proponents substantially related to the works of Jane Jacobs and was pioneered by Duany and Plater-Zybrek (Grant, 2009). By 1993 these ideas merged at the Congress for the New Urbanism. The Ontario government used several strategies to promote new urbanist values, as the province was involved in projects like Cornell (in the GTA) and was also linked to the Places to Grow legislation in 2006.
The sustainability/livability prism creates a better framework to analyze the complexity of achieving sustainable development through densification and intensification theories. As New Urbanism, Smart Growth, and Sustainable Development all inherently support creating livable as well as sustainable communities through different methods. None of these theories have been capable of resolving all six conflicts, nor have they attempted to achieve all four goals of sustainability/liveability (Goschalk, 2004). All three approaches oppose sprawl as a common enemy but have different planning strategies to manage it and fall within different sections of the sustainability prism.

**Reflection**

1. There is a gap in research and theory on Canadian suburban development which takes a complex, systems-thinking approach to the ‘infinite’ expansion of peripheral regions. An Urban Metabolism study on the GTA may create a new understanding of the relationship between urban growth and the consumption/production balance of resources. Providing quantifiable evidence on the urgency for system change may assist in creating a framework for growth and resource management systems for the region. When complete, the study should offer quantifiable evidence that recognizes the urgency to change the future methods of growth in suburban areas in North America, using the balance of production and consumption of resources as a basis. It is also intended to expand the knowledge of Urban Metabolism applications and theories through new contexts and goals.

The exploration of systems within suburban areas should ideally expand the practice and theories of Urban Metabolism in the TU Delft Urbanism program through a new context. Taking the theories often implemented on the Dutch system, and finding the applicable elements to the Canadian system may reveal some factors from UM which can be seen as universal.

2. The issue of suburban sprawl in the Greater Toronto and Hamilton Area (GTA) has been increasing the pressures of land consumption, infrastructure development, resource consumption, and population growth over the past 50 years. The same can be said for many peripheral regions of Canada’s urban areas. In 2011, two-thirds of the population of Canada lived in some form of suburban neighbourhood, and for the GTA a larger percentage of 86% (Gordon, 2013). Though this growth continues, the vast expansions of automobile-dependent neighbourhoods have shown to have prolonged effects on resource consumption, carbon emissions, ecosystem devastation, declining health rates, social segregation, and the destruction of available agricultural land in Ontario.

Yet these problems are not new. Neither are the solutions. Suburbs have been the centre of angst for many contemporary urban planners in North America for over thirty years (Grant, 2009). This has been the motivation for theories such as New Urbanism, Smart Growth, and Sustainable Development, three ideologies which have already been integrated into Provincial and Municipal Policies in Ontario. Most of which are focused on general themes of traditional aesthetics and densities of suburban development and most of which have failed to change the form of suburban development in Ontario.

It is well known that massive shifts of planetary systems and urbanized population growth will require more efficient and resilient uses of land and resources. The future well-being of both settlements and ecosystems rely on the management of these assets. This realization is yet to be seen in the current development of suburban areas in the GTA. As the expansion of the Toronto periphery continues, the region is responsible for providing more infrastructure, amenities, and materials on an increasing amount of land. This inefficient system of human settlement has been
based on a period of resource abundance. Now, this structure has the ability to intensify the effects of climate change on residents by the inability for municipalities to provide services in times of crisis or reform. The intent of the thesis is to provide insights and solutions which may alleviate the pressures of future systems, and create a more sustainable framework for growth considering the existing consumption of resources. Ideally, the study will have applicable solutions for other North American cities, facing similar challenges with suburban sprawl.

Key Literature


