

# WHY A TYPOLOGY IS NEEDED FOR URBAN PLANNING:

## RECOMMENDATIONS FOR HOW URBAN PLANNING TOOLS CAN BE ADJUSTED TO ENABLE INDOOR FARMING IN WINNIPEG

Daniel Iskierski  
University of Manitoba  
Capstone Project  
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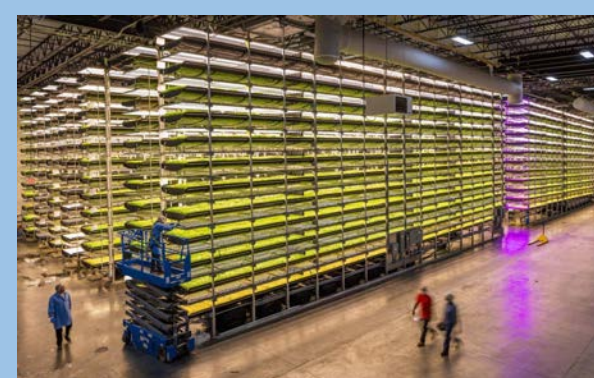
### Introduction

This Capstone Project focuses on the economic potential of urban agriculture with specific reference to indoor farming. The research examines precedent case studies of successful indoor farming operations and how lessons could be applied to the Winnipeg context. To create a more detailed description of indoor farming operations, a typology was developed that examines the techniques used for food production and what form such enterprises have taken elsewhere. Specifically, the research investigates current indoor farming operations and includes the types of indoor growing technologies and common urban locations. The information provided is from the perspective of urban planning meaning it examines how municipal regulations, of which planning has influence over, enable or inhibit indoor farming.

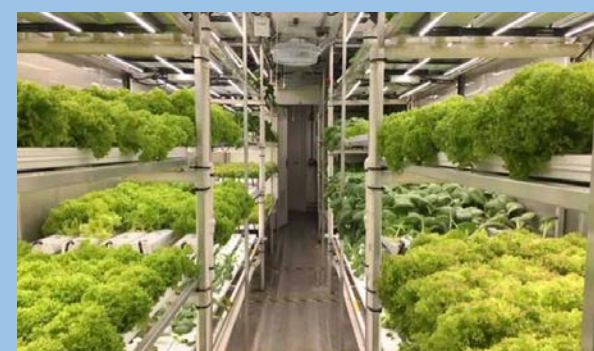
### Problem Statement

Indoor farming as a business activity or as a land use is not mentioned in *OurWinnipeg* and the only reference to food production is regarding community gardening for consumption or donation only. Within the city limits there is land zoned Agriculture which includes various activities as permitted under the Winnipeg Zoning By-laws 200-06. Land zoned Rural Residential also allows small-scale agricultural activities, however, there is no specific reference to urban agriculture or indoor farming activities and rural residential lots are typically in peri-urban locations. Accordingly, urban agriculture and indoor farming must operate in a grey zone throughout most of the city. To facilitate urban agriculture and indoor farming it would be beneficial for Winnipeg to include urban agriculture and indoor farming in its zoning bylaw. In order to do this, administration and elected officials need to know what types of indoor farming techniques and operations are commonplace so they can define them and examine where they could occur throughout the city.

### Case Studies



Source: AeroFarms



Source: CNSC



Source: Lufa Farms



Source: Buckminster Fuller Institute

#### AeroFarms, New Jersey

Operates nine vertical farms in the US and three overseas. Their market is focused on their locale and they also supply Whole Foods & Fresh Direct.

#### Rocket Greens, Churchill

Operates an indoor farm in a shipping container. Their market serves the community of Churchill.

#### Lufa Farms, Montreal

Operates four rooftop greenhouses that total over 300,000 ft<sup>2</sup> that use hydroponic technology. Their market is Greater Montreal with delivery/pickup service of packaged goods from other local producers.

#### The Plant, Chicago

Collaborative small business incubator for urban agricultural enterprises. Currently, there are over 20 operations within the host building that offer a range of products and services.

### Research Methods

Developing the typology involved classifying information from the existing literature on indoor farming, drawing from specification lists of indoor growing systems when necessary and analyzing four different indoor farming operations. The four indoor farming operations were chosen according to the following criteria: they each produce food for commercial purposes, they are successful, they operate in a four-season temperate climate in North America and they have employed techniques, technologies or operations consistent with those repeatedly read throughout the literature. Within each case study there is provided: background and context; information about the operations; conclusion; and lessons learned. At the end, a summary of the common lessons amongst all is provided to better understand the links between various enterprises and operations.

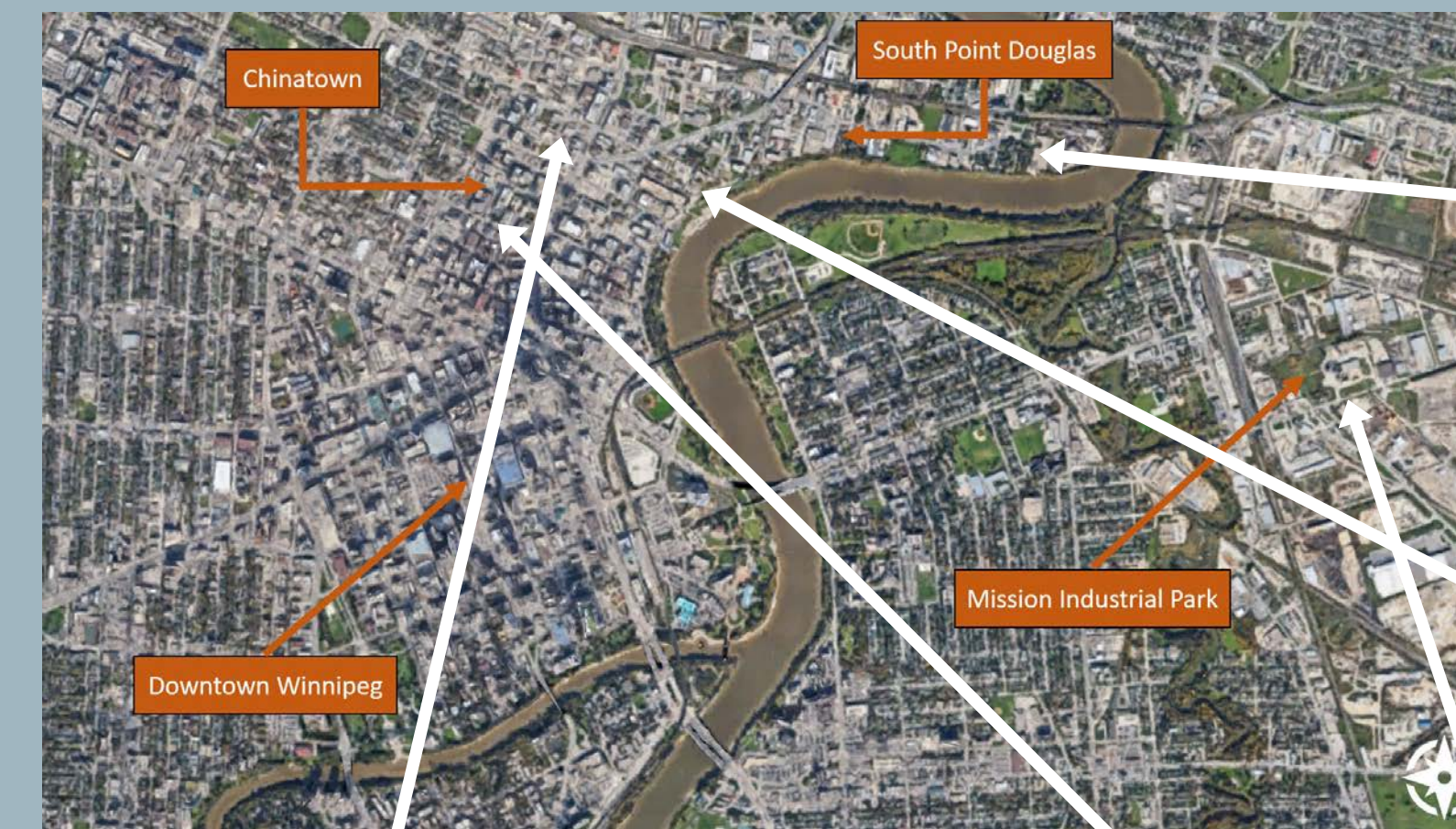
### Research Questions

1. What techniques and operations are commonly used for indoor farming?
2. What are the planning considerations to better accommodate indoor farming in Winnipeg?
3. How can Winnipeg adapt its regulatory framework to enable indoor farming?

### Case Studies: Lessons for Winnipeg

- Amending the zoning by-law to include indoor farming as a permissible use facilitates the establishment of indoor farming operations.
- Permissible uses should also include the allowance of agricultural buildings as a permissible use or structure.
- Common urban areas sought by indoor farming operations were industrial, big box commercial or office parks. These areas are/have:
  - Well connected by the transportation network
  - Back lanes or loading bay areas
  - Large warehouses, rooftops or flat areas suitable for (de)attached or rooftop greenhouses, vertical farms or modular farms.
  - Less consequences for light pollution
- Often sought underused industrial or commercial locations within older parts of the city.
- Enterprises often joined forces working in partnership, collaboration or seeking investors. Winnipeg has the Food Council, post-secondary institutions, not-for-profit organizations, emerging urban agriculturalists and an economic development agency.
- Innovative approaches like onsite composting or greywater recycling were difficult to establish because of costs and permitting – the planning, design and installation of district facilities that benefit multiple operations could be an opportunity to create an indoor farming district that operates with principles of waste reuse and circulation inherent in a circular economy approach.
- Identifying areas in the city where these types of enterprises are best situated could spur interest by focusing activities and investment.

### Potential Indoor Farming Sites in Winnipeg's Inner City



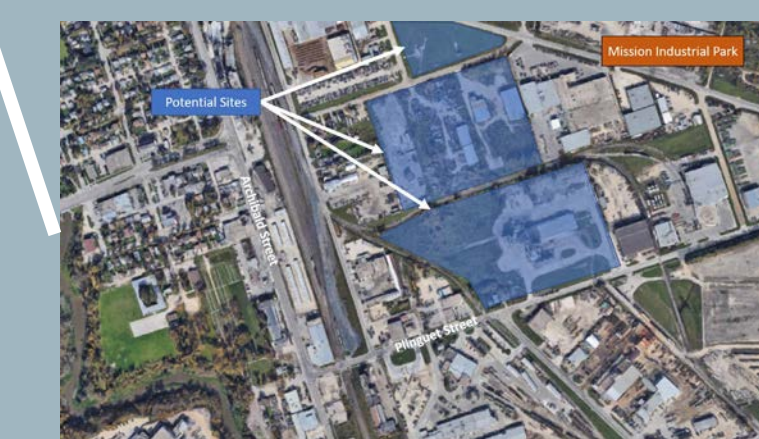
#### Chinatown

Integrating indoor farming operations into vacant or underused space in Chinatown could help to revitalize the area and offer new patrons for restaurants as well as a local food supply.



#### Exchange District

Partnering with Red River College to establish a food hub adjacent to the new Innovation Centre and close to their culinary arts program could spur innovation in local indoor farming.



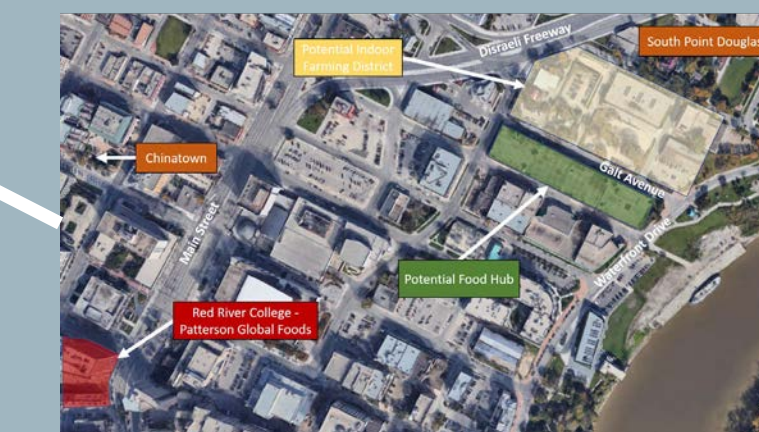
#### Mission Industrial Park

Large vacant lots and underused warehouse spaces could be repurposed for indoor farming operations like (de)attached greenhouses or plant factory.



#### South Point Douglas

Industrial space currently used by trucking/logistics companies would be a good location for an indoor farming district.



#### East Exchange District

Adaptive reuse of historic warehouses could create a food hub with space to the north to further expand into an indoor farming district.

#### Photo Credits

Adapted from Google Maps.

### Types of Indoor Farming Operations

**Modular Farm** – completely controlled indoor growing environment within a container that can be relatively easily moved around or between sites.

**Plant Factory** – completely controlled indoor growing environment within a building.

**Rooftop Greenhouse** – partially controlled indoor growing environment within a greenhouse situated on a rooftop that is supplemented with artificial lighting at times of day or season when incoming solar gain is insufficient for plant growth. HVAC and water systems can be integrated with the building to benefit both spaces.

**Attached or Detached Greenhouse** – a partially controlled indoor growing environment that is supplemented with artificial lighting at times of day or season where incoming solar gain is insufficient for plant growth. Structural components of the building are flexible meaning it could be attached to a building or standalone however the operation is well insulated and able to produce food year-round.

### Types of Indoor Farming Techniques

**Hydroponics** – Soilless growing technique that uses water to provide nutrients.

**Aeroponics** – Similar to hydroponics using aerosolized water.

**Aquaponics** – Aquaponics is the combination of hydro/aeroponic technology with aquaculture (the raising of fish in tanks).

### Recommendations

Key recommendations include continuing the collaborative work between the Winnipeg Food Council and existing urban agriculturalists, establishing parts of the city where indoor farming would be encouraged, defining indoor farming within the zoning bylaw and amending the zoning bylaw to include indoor farming as a permissible use in select areas of the city.

### Conclusion

This research examined indoor farming techniques and operations and developed a typology of essential and secondary considerations that provided a basis for some potential changes to the regulatory framework in Winnipeg. Recommendations were also made on other ways to incentivize the indoor farming industry and create partnerships with other organizations, levels of government, post-secondary institutions and private enterprises. This is not an exhaustive list but rather a starting point for enabling this sector. As the City of Winnipeg begins to adapt its regulations and policies so too will the needs of the sector. In consideration of this the City could welcome industry feedback and regularly assess its regulatory framework and change its policies as necessary.

There are some short term and long-term approaches that the Winnipeg Food Council and the City Departments like Water & Waste & Planning, Property & Development can do to encourage urban indoor farming. Like any successful project, administrative and political champions are crucial.