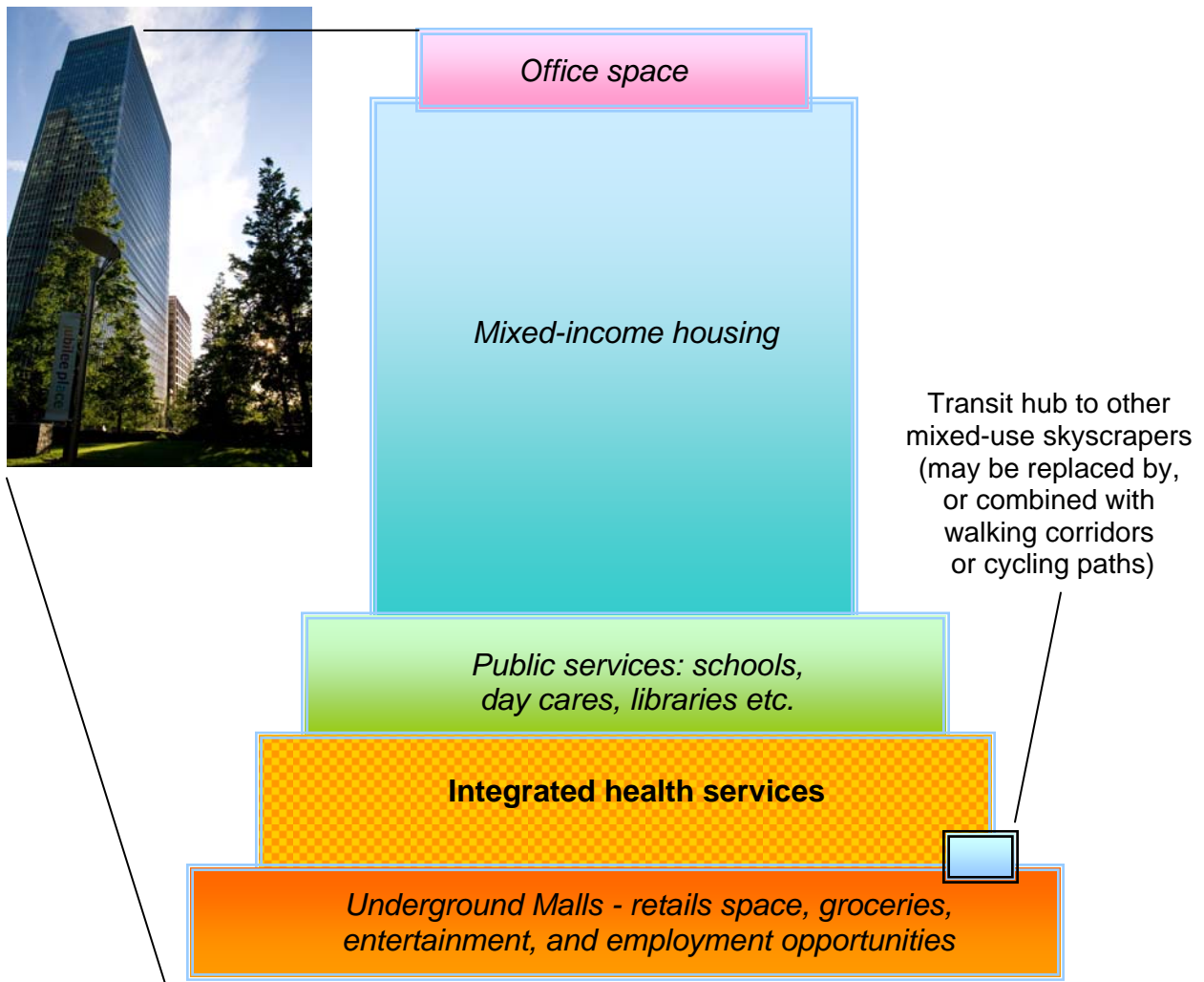


## Re-orienting the Built Environment: Contributions of 'Mixed-Use Skyscraper Systems' to Sustainable Healthcare

Mixed-use Skyscrapers (Figure 1) are an extremely dense form of the built environment. A cluster of such skyscrapers (linked by walking corridors, cycling paths, or public transit) forms a **Mixed-Use SKyscraper System (MUSKS)**. As a compact and mixed-use model, it minimizes land-use<sup>1</sup>, energy-use<sup>2</sup>, and carbon emissions<sup>3</sup> to promote environmental sustainability.

MUSKS can also contribute to sustainable health care in three major ways: 1) decreasing fragmentation, 2) addressing health disparities, and 3) synergistically promoting health.

**Figure 1: A Mixed-use Skyscraper**



Imagine if Canadian developments followed the MUSKS model as opposed to the sprawl model. What would the differences be today?

## **1. Decreased fragmentation**

The contribution of MUSKS in this area can be categorized into three themes:

a) *Exploiting economies of scale.* Through concentrating populations, MUSKS reduce the need to establish numerous, small hospitals and clinics to serve populations of the same size. This lowers fixed costs: salaried labour, land, and building costs – which constitute a large percentage of hospital costs<sup>4</sup>. Additionally, through housing large populations, MUSKS ameliorate the problem of low volume and varied occupancy rates. The result is reduced direct, administration, and support costs<sup>5</sup>.

b) *Supporting health information integration.* MUSKS can help minimize health information wastage. As mentioned, clusters of small hospitals, clinics, and laboratories can be replaced by integrated health services in one location. This reduces the issue of repeated medical histories, registrations, and diagnostic tests – which are common sources of waste in fragmented systems<sup>6</sup>.

c) *Reducing transportation-related costs.* MUSKS as a compact built environment also reduce transportation-related costs, such as cost for ambulatory services and for procurement of non-local goods and equipment<sup>7</sup>. Furthermore, MUSKS enhance the feasibility of home care: in a mixed-use skyscraper, health professionals can possibly visit multiple patients by elevator travel alone – as opposed to spending numerous work hours travelling between scattered homes. This further boosts cost-effectiveness of MUSKS, as homecare in Canada can be cheaper than hospital care by over 70%<sup>8</sup>.

## **2. Reduced health disparities**

According to the Public Health Agency of Canada, “health disparities are health system cost drivers”<sup>9</sup>. MUSKS reduce health disparities to control health care costs.

As improved access to health care has been consistently recognized as an intervention for reducing health disparities<sup>10, 11, 12</sup>, MUSKS improve physical access to care by: 1) reducing travel cost, 2) reducing travel risk, and 3) reducing travel time and associated opportunity costs.

1) *Reducing cost.* Through integrating mixed-income housing with health services in the same building, MUSKS allow disadvantaged Canadians to travel to health care services at minimal costs. This reduces unnecessary delays and health complications for vulnerable groups, such as families in poverty who cannot afford to keep a vehicle, and seniors who can no longer operate a vehicle.

2) *Travel Risk.* MUSKS limit travelling more or less to an interior environment, thus protecting vulnerable Canadians from risks such as winter weather, busy traffic, and crime-ridden areas. An interior travel environment also means that it is safer to

navigate and access care for vulnerable groups such as developmentally-delayed individuals, or seniors with dementia. The result is fewer inhibitions to accessing care in a timely fashion.

3) *Travel Time and Opportunity Costs.* As a compact form, MUSKS minimize travel distances and eliminates the need for car-travel. This reduces wasted time in traffic congestion, coping with weather, and parking – ultimately increasing the convenience of scheduling appointments.

For Canadians who need to take time off work to seek care (e.g. single-parent working multiple part-time jobs), each hour spent travelling is accompanied by lost income. MUSKS reduce these opportunity costs from accessing care, to ensure greater equity between the wealthy and the working-poor.

### 3. Better Health

Finally, if MUSKS were implemented ten years ago, Canadians would also be healthier today – which reduces stress on the system. MUSKS synergistically promote health in the following ways:

a) *Eliminating need for private vehicles.* Through linking clusters of skyscrapers with walking corridors or cycling paths, MUSKS can 1) promote walking and active transport to increase physical activity<sup>13</sup>; 2) minimize traffic-related injuries<sup>14</sup>; and 3) reduce air pollution<sup>15</sup> – which is linked to reduced population-risk of heart disease<sup>16</sup>, respiratory illnesses<sup>17</sup>, and various cancers<sup>18</sup>.

2) *Protecting the environment:* MUSKS minimize land use and reduces sprawl, thus preserving agricultural land to improve food security<sup>19</sup>. Additionally, road infrastructure can be minimized – which reduces run-off and contributes to water security<sup>20</sup>. Finally, MUSKS shrink the urban heat island to help prevent heat-stroke incidents<sup>21</sup>.

3) *Providing proximity to nature:* Although MUSKS are extremely dense, they do not necessarily contribute to crowding. Through minimizing road infrastructure, MUSKS can create living environments shown in Figure 2. Compared to the sprawl model (Figure 3), MUSKS provides greater proximity to nature to promote mental health<sup>22</sup>.

**Figure 2: MUSKS landscape**



**Figure 3: Sprawl landscape**



## Cost Considerations

At first glance, MUSKS appear to be costly investments; however, when factoring into the billions spent on road infrastructure and maintenance in a sprawl model<sup>23</sup>, economic analysis shows that sprawl may actually cost *more*<sup>24</sup>. Secondly, peak-oil can render current car-dependent communities inhabitable<sup>25</sup>. MUSKS ensure that Canadian investment in developments produce habitable communities when an energy crisis hits – ultimately enhancing community-resiliency in a peak-oil economy.

## Conclusion

MUSKS perform three distinct functions which contribute to sustainable health care. Firstly, MUSKS condense populations to minimize wastage from diseconomies of scale, excess transportation costs, and fragmentation. Secondly, MUSKS improves access to care for vulnerable Canadians through reducing travel-related costs, risks, and time. Lastly, MUSKS promote health to reduce stress on the system.

Re-orienting Canadian development projects as MUSKS does not necessarily cost more than current investments in sprawl-development. Conclusively, transitioning to MUSKS is a cost-effective strategy that will enhance the sustainability of health care in Canada – and ensure long-term wellbeing of Canadian communities.

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