



**POLICY BRIEF 2022**

## **Walk on 3D:**

Paving Over Inequities in Infrastructure with 3D-Printed Sidewalks

*Élie Lubendo*

The LEVEL Youth Policy Program takes place on the traditional and unceded territories of the *xʷməθkʷəyəm* (Musqueam), *Sḵwx̱wú7mesh* (Squamish) & *səlilwətaɣ* (Tseil-Waututh) Coast Salish peoples.

#### GRAPHIC DESIGN

And Also Too

#### COVER ILLUSTRATION

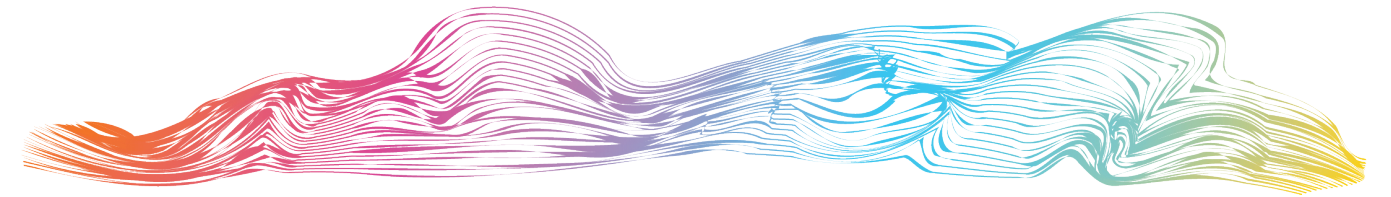
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Mike Wells

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# About the LEVEL Initiative

LEVEL is a youth engagement initiative of Vancouver Foundation that aims to address racial inequity. We do this by investing in the leadership capacity of Indigenous, racialized, immigrant, and refugee youth to create more opportunities throughout the non-profit and charitable sector.

Despite being the fastest-growing youth populations in British Columbia, Indigenous, immigrant, and refugee youth don't have the same opportunities as other young people. Race continues to be a factor that hinders their ability to have a say in decisions that impact their lives.

LEVEL empowers these youth by building their capacity to challenge and change those systems that hinder their ability to build a more just world.

### LEVEL consists of three pillars of work to advance racial equity

1. LEVEL Youth Policy Program
2. LEVEL Youth Organizing
3. LEVEL BIPOC Granting

### About the LEVEL Youth Policy Program (LEVEL YPP)

The LEVEL Youth Policy Program (LEVEL YPP) brings together young people between the ages of 19 and 29 from across British Columbia who identify as being Indigenous or racialized immigrants or refugees. Indigenous and racialized Newcomer youth are dispropor-

tionately impacted by certain public policies but are rarely included in the development and implementation of public policy process. The LEVEL YPP aims to provide these youth with equitable training and leadership opportunities to better navigate the public policy landscape, and to develop new tools and skills to influence, shape, and advocate for policy changes that are relevant in their own communities. Having young people directly involved in shaping policies that impact their lives is essential to creating systemic, meaningful change. The LEVEL YPP's training is grounded from and within Indigenous peoples' worldviews, which the program acknowledges, could vary from person-to-person or nation-to-nation. Indigenous worldviews place a large emphasis on connections to the land. This perspective views the land as sacred; where everything and everyone is related and connected; where the quality of the relationships formed are key in life; where what matters is the success and well-being of the community, and where there can be many truths as they are based on individual lived experiences.<sup>1</sup> As such, an important premise of this training is to centre and place a particular focus on the fact that the work that has gone into developing this training, as well as the training itself, has taken and will take place on unceded (never given away/stolen) territories of the *hə́nq 'əmin 'ə́m*-speaking Musqueam peoples, of the Halkomelem-speaking Tseil-Waututh peoples, and of the *sníchim*-speaking *Sḵwx̱wú7mesh* (Squamish) peoples.

1. <https://www.ictinc.ca/blog/indigenous-peoples-worldviews-vs-western-worldviews>

# Biography

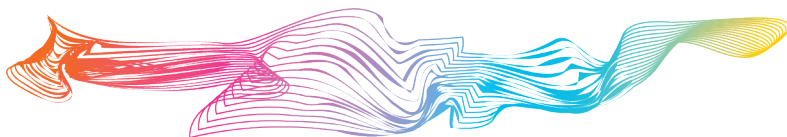
## Élie Lubendo



*Élie is a former refugee from the Democratic Republic of the Congo, who fled the Second Congo War in 1998, and has called Canada home ever since.*

*Élie's involvement with public policy began at McGill University, where he did his undergraduate studies in Labour Relations Management (Bachelor of Commerce). Élie is currently serving his second term on the City of Burnaby's Social Planning Committee where he pushed Burnaby City Council to proclaim the U.N. International Decade for People of African Descent. He also serves as the Vice-Chair of the Anti-Racism Subcommittee of the Social Planning Committee.*

*Élie is a passionate advocate of racial equity, community engagement, and transportation, who loves engaging with new projects and ideas that allow him to learn more about his community and how to meet their needs.*



# Executive Summary

*Who pays the ultimate price when infrastructure costs are deferred? When capital projects favour property owners and affluent neighbourhoods, what happens to low-income residents who must make do with insufficient investments in their communities?*

This policy proposal aims to study the relationship between inadequate infrastructure, urban planning, and the decision-making processes and funding formulas that create disparaging outcomes for low-income residents in the City of Burnaby—and what can be done about it.

On the surface, Burnaby is doing better than most cities when it comes to building infrastructure and community amenities. Financially, Burnaby is the healthiest municipality in British Columbia. With a population of around 250,000 people, the city boasts over \$1 billion in cash reserves.<sup>1</sup> Thanks to the SkyTrain primarily running through the city, Burnaby also has the best public transportation network in Metro Vancouver and has recently funded replacements for key community amenities, including a \$250 million community centre<sup>2</sup> and library, measured at 200,000 square feet.

Although Burnaby is a regional leader in infrastructure and community amenities, at a closer look, Burnaby, which was named Canada's best-run city by Maclean's inaugural surveys of Canadian municipalities in 2009,<sup>3</sup> has a troubling and persistent sidewalk problem.

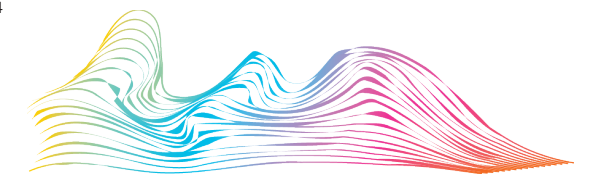
Even in town centres like Edmonds, there is a lack of sidewalks due to the power that property owners have in deciding whether sidewalks can be built on their streets. This

has resulted in years and years of roadside memorials that have resounded throughout the community, including the recent death of a 14-year-old girl killed by a dump truck in May 2022.<sup>4</sup>

As a result, sidewalks have become a public safety and campaign issue. Although Burnaby has made progress in addressing this infrastructure gap in recent years, there is a lot more that can be done. With the capabilities of emerging technologies like 3D printing, Burnaby is positioned to tackle this issue head-on. This policy proposal will explore and suggest how Burnaby can leverage 3D printing to create better sidewalks, while making the necessary policy changes to ensure that this tragic problem finally comes to an end.

## WHO GETS RIGHT OF WAY IN BURNABY?

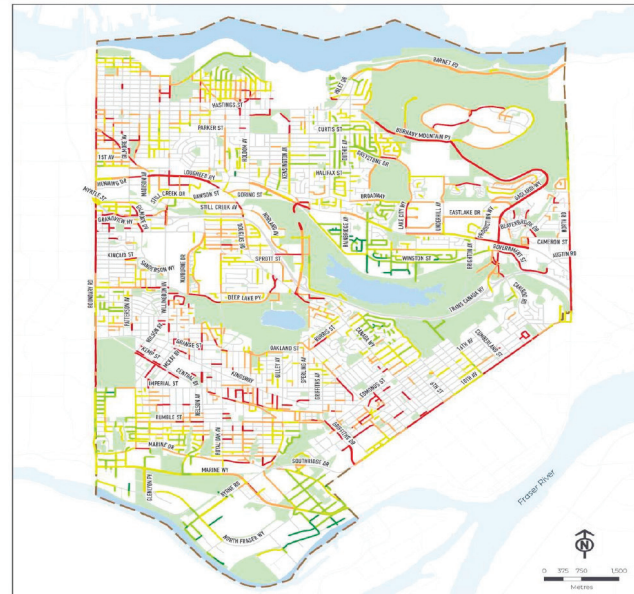
The Edmonds Town Centre, located in the southeast quadrant of Burnaby, is home to a community centre, a public library, several strip



***Even in town centres like Edmonds, there is a lack of sidewalks due to the power that property owners have in deciding whether sidewalks can be built on their streets.***

malls, and is close to a SkyTrain station. So why is it lacking in sidewalks?

According to a Sidewalk Implementation Process report presented to Burnaby City Council in September 2021, the Edmonds Town Centre was recognized as the area with the highest equity need (as shown in the image).<sup>5</sup>The report also noted that “residents opposed to sidewalks often cite loss of parking, loss of landscaping, and increased maintenance as reasons for their opposition.” With the data on car collisions and pedestrian safety, one must ask: Why do the property rights of a property owner outweigh the safety and concerns of pedestrians?



**OVERALL NETWORK NEED**  
 Factor Score  
 ≥ 60  
 50 - 59  
 Municipal Boundary  
 Park  
 Water Feature

**Map of Sidewalk Equity Need in the City of Burnaby.**  
 Image by City of Burnaby.

This gap in policy has resulted in traffic fatalities involving youth over the last few years. In 2019, a 13-year-old boy was injured after a hit-and-run, a block away from the community centre.<sup>6</sup> In 2022, a 14-year-old new immigrant was killed by a dump truck on her way home from school. These were both streets where residents had been complaining for years that they were not safe.

Crumbling infrastructure creates barriers and inequities against the very people who are dependent on said infrastructure. If certain areas have a significantly greater concentration of decaying infrastructure than other areas in the same municipality, then there must be a reason why. One of the many reasons these infrastructure inequities persist is because of funding. The City of Burnaby heavily relies on developers and property owners to pay for sidewalks. The Kings’ Crossing development on Kingsway and Edmonds, and all the street and sidewalk changes that came along with it were paid for by Cressey Development Group. Even

though the intersection needed repairs and redesign for years, it wasn’t until Cressey paid up that anything changed.

We need technology that decreases the financial dependency that Burnaby has on developers and property owners. Without changing the funding formula, these types of fatalities will continue and persist—especially so because the current timeline of the sidewalk implementation process is projected to be complete (sidewalk network completion) around 2040.<sup>7</sup> When it comes to walking the walk on fixing infrastructure inequities, the City of Burnaby will need to be critical of the current financing framework and how it makes sidewalk development inaccessible.

# Background

*The process of 3D printing consists of using Computer-Aided Design (CAD) to direct hardware that deposits materials layer-by-layer to build a three-dimensional object.*

The key functionalities of 3D printing revolve around precision, repeatability, and speed. Recent breakthroughs in 3D printing have expanded the impact of the technology to a wide range of uses including rapid prototyping, prosthetics, and orthodontics. Although 3D printing may be widely known as a hobby for cheaply building tools and products, the technology is set to disrupt various major industries by the end of the decade. According to a report by consulting firm Smithers, by 2027 the global 3D printing industry will be worth US\$55.8 billion.<sup>8</sup>

In British Columbia, 3D printing has already been used in several ways:

- The City of Merritt is teaming up with UBC Okanagan to purchase a \$1.5 million 3D printer to replace flood-damaged homes.<sup>9</sup>
- UBC is researching the possibility of sperm production through 3D printing to combat male infertility.<sup>10</sup>
- FPIInnovations, in partnership with a local First Nation, is receiving \$450,000 to purchase a 3D printer through the BC Government’s CleanBC Building Innovation (CBBI) Fund.<sup>11</sup>

One of the other areas that has recently been affected by 3D-printing innovation is sidewalks. Although 3D-printed concrete is

already widely used for 3D-printed homes, 3D-printed concrete for sidewalks has received less attention than its housing counterpart.

According to Mahmoud Reda Taha, Chair of the University of New Mexico’s Department of Civil, Construction, and Environmental Engineering:

“[I]t is possible to identify more durable, environmentally sustainable, and cost-effective approaches than are commonly used today.”

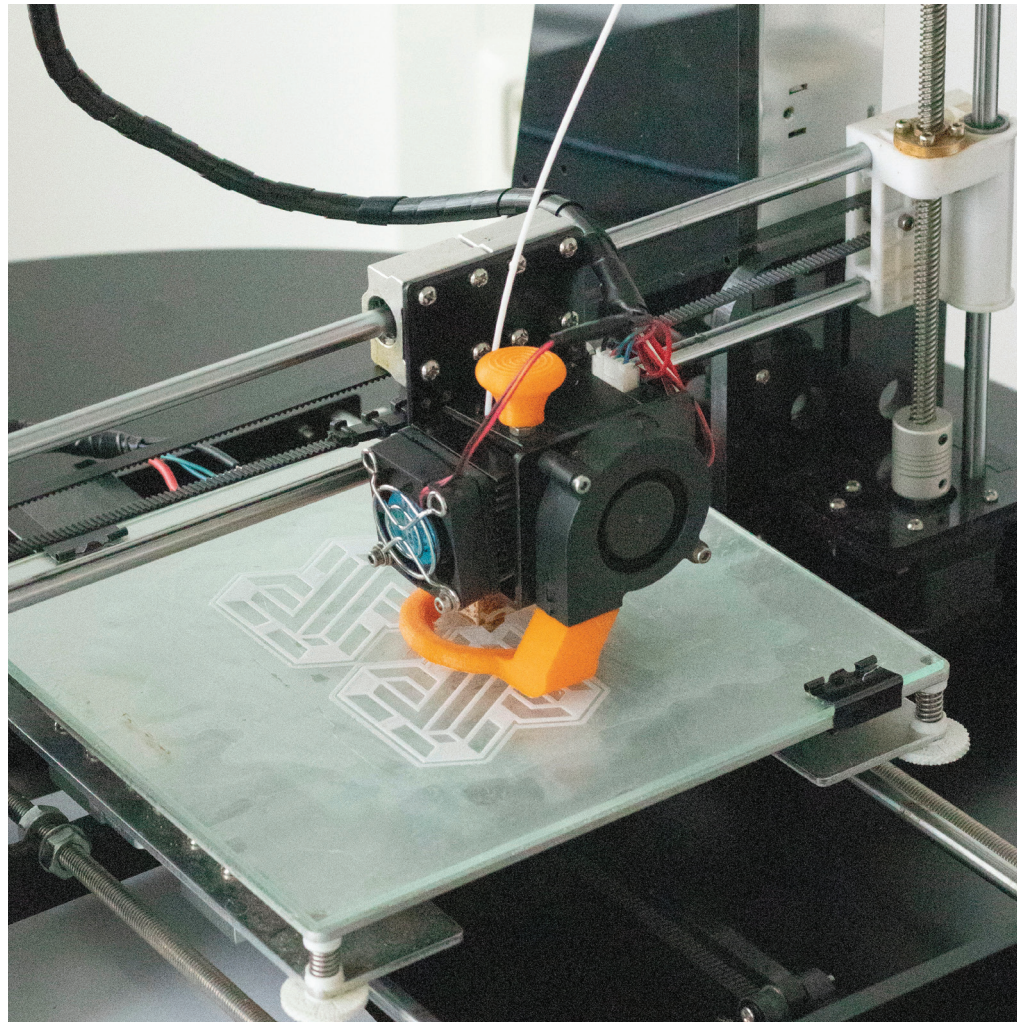
As presented to the American Concrete Institute, here are Dr. Taha’s key benefits to 3D-printed concrete sidewalks:<sup>12</sup>

- Sidewalks can be designed using recycled, less energy-intensive, and carbon-intensive materials.
- 3D printing provides flexibility and automation, as well as complex shapes and design geometries.
- 3D-printed concrete sidewalks can be built to have low heat storage (e.g. summer heat resulting in high temperatures).
- 3D-printed concrete sidewalks have a lower carbon footprint than traditional concrete.
- Other important properties of concrete sidewalks like shrinkage and freeze-thaw durability are currently being tested.

Not only does this technology have the capacity to build sidewalks at a faster pace, but it can also do so while creating a more sustainable form of sidewalk infrastructure. As the cost of infrastructure increases, and the



**Although 3D-printed concrete is already widely used for 3D-printed homes, 3D-printed concrete for sidewalks has received less attention than its housing counterpart.**



3D print in progress. Photo by New Data Services on Unsplash.

consequences of climate change rages on, the adoption of 3D-printed concrete sidewalks will play a major role in local government's climate change preparedness.

Unfortunately, that day has not arrived yet. Despite the research being available, 3D-printed concrete sidewalks have not yet been adopted. Given its ongoing sidewalk issue, there is an opportunity for the City of Burnaby to lead the adoption of 3D-printed concrete sidewalks in BC while seeking partnerships to capitalize on other forms of 3D printing innovation.



**As the cost of infrastructure increases, and the consequences of climate change rages on, the adoption of 3D-printed concrete sidewalks will play a major role in local government's climate change preparedness.**

# Policy Recommendations

## 1 Invest Early in 3D Printing.

It is crucial for the City of Burnaby to invest in 3D printing right away. Burnaby's fiscal resilience allows it to capitalize on this innovative opportunity in ways most local governments could never dream of. Rapid investments and partnerships to gain an early foothold in the industry, and make innovation breakthroughs earlier, are key. Through Simon Fraser University (SFU) and British Columbia Institute of Technology (BCIT) there is enough post-secondary capacity for partnering for research and development.

The City of Burnaby should also make feasibility studies on 3D printing, especially 3D-printed concrete sidewalks. A report summarizing the costs and benefits of various 3D printing innovations across sectors may help guide the city to take its local infrastructure to the next level. In the case of sidewalks, the City of Burnaby has an annual target of 30 km of sidewalks completed a year, with sidewalk network completion around 2040. How much more sidewalk could be developed on an annual basis with 3D printing? How quickly could the sidewalk network be completed using 3D-printed sidewalks?

Subsequently, Burnaby should lobby Metro Vancouver and the Union of BC Municipalities to form regional plans and committees on 3D printing to further study its utility.

All of this should be done with the goal to build Burnaby's first 3D-printed infrastructure in 2025 and expanding 3D printing capacity by 2030.

## 2 Democratize Street Infrastructure.

The City of Burnaby needs to review how it engages with residents regarding decision-making processes for infrastructure. In the case of sidewalks, the practice of solely asking property owners of a given street whether they want a sidewalk has evidently dangerous effects.

Similarly, to public hearings for new builds, residents who live in the vicinity of the street (or often use it) should have a say on whether it gets built. As for the cost: If residents who live near or often use a street were to be charged for a sidewalk, how would that change the funding formula, and how would that impact property owners' decisions? The City of Burnaby should look at the feasibility of charging an area a smaller fee or a set of individuals a higher fee to fund sidewalks.

One of the key problems with the sidewalk issue is that property owners' ability to essentially veto street improvements is undemocratic. The opinions of a property owner should not outweigh the needs of a community when debating a public good.

Another undemocratic local government issue is seen in traffic safety. The reason some of the traffic fatalities were so disheartening is that residents had been lobbying the city for years to fix the problem.<sup>13</sup> Community members were aware that these tragedies would eventually happen, but also that they were entirely avoidable. There needs to be reform at the traffic safety committee regarding residents lobbying for traffic improvements in their community.

An additional issue with sidewalk development and community consultation is the lack of comprehensive reporting and transparency on the issue. Given that the City of Burnaby has recognized the higher equity need for sidewalks in Edmonds Town Centre, the City of Burnaby's engineering department should release an Edmonds-specific sidewalks report outlining the following:

- **An outline of each street within the vicinity of the Edmonds Town Centre; with which streets do not have sidewalks.**
- **Comprehensive analysis and history as to why the specific streets do not have sidewalks and what housing types exist on those streets.**
- **A public record of which streets have received the most resistance to sidewalk development from property owners.**

Such a report would also be timely and beneficial for the City of Burnaby, as they are already looking at a new Kingsway and Edmonds conceptual plan.<sup>14</sup> This sidewalks report would help connect walkability gaps between the new conceptual plan and the rest of the Edmonds core.



**Lack of Sidewalk on New Crosswalk on Kingsway and 19th.**  
Photo by Élie Lubendo.

### 3 Track Comprehensive Data on Traffic Fatalities.

Despite major traffic accidents that have rocked the Burnaby community these last few years, data on traffic fatalities, and plans to curb them, are seriously underwhelming.

In December 2021, the City of Burnaby adopted its Transportation Plan. The 140-page strategy highlights three focus points: Vision Zero, Mode Split, and Zero Emissions. Looking at Vision Zero, the City of Burnaby aims to eliminate all traffic fatalities and severe injuries by 2050:<sup>15</sup>

- **By 2030, Burnaby targets a 20% reduction in serious injuries or death from the 2019 baseline;**
- **By 2040, a 75% reduction; and**
- **A 100% reduction by 2050.**

The 2019 baseline stands at roughly 1,600 injuries or deaths per 100,000 population.<sup>16</sup> At the current population of 250,000 people that is roughly 4,000 injuries or deaths in 2019. According to Census 2021, the City of Burnaby grew its population from 232,755 in 2016 to 249,125 in 2021. Assuming a similar growth rate of 7.0%, Burnaby should reach a population of 285,000 by 2031. At a 20% reduction rate, the City of Burnaby projects 3,648 fatalities in 2031.

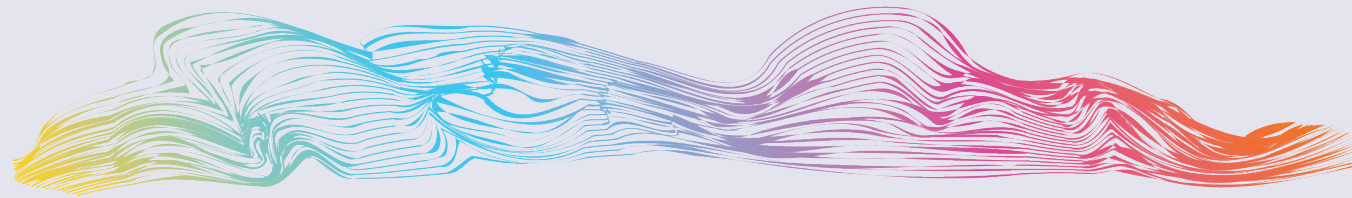
A decrease of 350 fatalities at the end of the decade is not much to be impressed by. Even more so because by 2040 the reduction rate will increase to 75%. The 20% reduction in 2030 seems negligent: Not only because of the enormous jump in 2040, but because the incremental reduction upholds the notion that these deaths are just numbers. No Vision Zero policy can be complete if its methodology does not reflect the urgency of saving lives.

As is, the data suggests that the fatality reduction of 2040 may be a by-product of decreasing car usage over time, rather than aggressive traffic reform. It remains to be seen how often the data will be reported. The transportation plan isn't clear on what measures are being undertaken specifically to ensure these fatality reductions. By the end of this year, the City of Burnaby will release its first year of data since adopting the plan.

With that stated, the Vision Zero data needs to be weighted for equity purposes. As we saw in Edmonds, the lack of sidewalks and the concentration of marginalized peoples in the area makes these fatalities a consequence of institutional discrimination. If Burnaby city staff can recognize that there is a higher equity need for sidewalks in Edmonds than elsewhere, why can't that same framework be applied to traffic fatalities?

Furthermore, Vision Zero should also have separate data on fatalities that involve minors to track the trend in the circumstances of these tragedies. Without comprehensive data collection and its publication, it is hard to see how Vision Zero will light the way forward to zero fatalities and how its policies affirm the dignity of the departed.

# Conclusion



While the City of Burnaby is widely regarded as one of the best municipalities in Canada, its current fiscal strength and recent infrastructure investments cannot hide its tragic sidewalk problem. It is a total policy failure that the area with the highest equity need for sidewalk development is also one of the most dangerous areas for pedestrians in the city.

Furthermore, given the demographics of the Edmonds core, the persistence of this problem solidifies systemic discrimination in the traffic design of the neighbourhood. The lack of sidewalks in Edmonds costs lives. And not just any lives. Edmonds has a greater portion of house-insecure residents, food-insecure residents, and low-income immigrants and refugees than its town center counterparts. This policy problem is a stain on Burnaby's reputation as an inclusive community. For a city whose population, according to Census 2016, is nearly two-thirds (63.6%) visible minorities,<sup>17</sup> it has a long way to go in reconciling its infrastructure inequities with equity-affirming policies.

To remedy this problem, it is crucial that the City of Burnaby adopt a 3D-printing strategy for its sidewalk implementation process right away. The current multi-decade timeline is far too long. How many more fatalities must there be before the city speeds up its sidewalk implementation process?

## ***It is crucial that the City of Burnaby adopt a 3D-printing strategy for its sidewalk implementation process right away.***

Additionally, in the future 3D-printed sidewalks will decrease Burnaby's financial dependency on developers and property owners to fund sidewalks by lowering costs. This financial dependency plays a key role in solidifying the dysfunctional nature of sidewalk development at the local level. Beyond that, the City of Burnaby should invest in other forms of 3D printing innovation and explore the benefits the technology has on other forms of infrastructure like roads and housing.

But even with the benefits of 3D printing, Burnaby will still have to fix its current sidewalk implementation process and policies. A lack of community consultation on street-specific walkability, as well as insufficient weighted data on traffic fatalities, have led to the current sidewalk conundrum. In reality, 3D printing alone cannot solve an issue that is not rooted in technology, but rather in political priority. Step-by-step investments in 3D-printed sidewalks can only go so far if the City of Burnaby does not re-prioritize its traffic safety policies and meet its marginalized communities halfway.

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## ACKNOWLEDGEMENTS

This policy proposal takes place on the ancestral, and unceded territory of the hənqəmiñəḥ and Skwxwú7mesh speaking peoples. This policy proposes a two-pronged approach to reducing the lack of sidewalks in the City of Burnaby. The first approach is through investments in 3D-printed concrete sidewalks as a long-term solution. The second is by reconciling how the lack of sidewalks came about as a consequence of policy—not as a coincidence—and by making suggestions to right that wrong.

I chose this policy topic because accessibility and lack of infrastructure are subject matters that have shaped many of the places that I have called home. Researching the reasons why and finding solutions to fix issues is a process that I find to be both enlightening and liberating. I am proud of having been a part of the 2022 cohort of the Vancouver Foundation LEVEL Youth Policy Program (LEVEL YPP). I am grateful to have met all the great individ-

uals who have embarked on this policy journey with me this year. From the incredibly knowledgeable and passionate mentors, to the amazingly supportive and patient support staff and facilitators, to my fellow participants, who regularly put themselves out there and stepped out of their comfort zones to empathize with others and learn from others' experiences. I would like to extend special thanks to Sharmarke Dubow for your words of wisdom and encouragement; to Okenge Yuma Morisho, for enthrusting me into this policy topic and expanding my understanding of municipal affairs; and finally, Amora Takawira for your kindness, guidance, and for how boldly you are willing to go above the call for those you care for.





*When it comes to walking  
the walk on fixing infrastructure  
inequities, the City of Burnaby will  
need to be critical of the current  
financing framework and how it  
makes sidewalk development  
inaccessible.*

Vancouver Foundation is Community Inspired. We are a community foundation that connects the generosity of donors with the energy, ideas, and time of people in the community. Together, we've been making meaningful and lasting impacts in neighborhoods and communities since 1943. We work with individuals, corporations, and charitable agencies to create permanent endowment funds and then use the income to support thousands of charities. We recognize that communities are complex and that collaboration between multiple stakeholders is needed to help everyone thrive and evolve. Vancouver Foundation brings together donors, non-profits and charities, government, media and academic institutions, local leaders, and passionate individuals to build meaningful and lasting change in the province of British Columbia. We see young people, their voices and experiences as part of that vision to building meaningful change.

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foundation