

URBAN
STRATEGIES
INC .

Sustainable Community Design

Vaughan Tomorrow
Background Paper
June 2008





**GO BY
STREETCAR**

**“When we try
to pick out anything
by itself, we find it
hitched to everything
else in the Universe.”**

– John Muir



About this Paper

This paper explores the concept of Sustainable Community Design with a focus on land use planning considerations. It begins with a discussion of possible definitions for Sustainable Community Design in Vaughan and acknowledges the good work the City is already doing in this regard. The policy context for further embracing sustainable land use practices is examined. The concept of Sustainable Community Design is broken down into key city building elements for further examination of how it may be applied to Vaughan, with examples of tools and implementation case studies. Finally the paper concludes with a number of bold proposals for Made in Vaughan approach to sustainable community design that could become the platform for the new Official Plan.

What is Sustainable Community Design?

Sustainable community design is not a new or radical idea – it is in fact more connected to the traditional way of organizing a community and is evident in the vestiges of the four original villages that have grown to become Vaughan: Maple, Woodbridge, Thornhill and Kleinberg developed organically around a main street with connections to the river valleys, woodlots and farmlands that literally “sustained” the inhabitants of those places. The design of sustainable communities requires more than a piecemeal approach to development. Indeed, well planned and designed cities become sustainable cities.

Sustainable community design often conjures images of green roofs and solar panels, and while these technologies are crucial components of sustainable communities, they are but pieces in a larger puzzle. Planning for sustainability requires a comprehensive approach to all elements of city building, which allows for the realization of synergies, and a harmonious interaction of constitutive elements. The way we move around the city, the infrastructure that makes the city hum, the public realm in which we interact and the process by which all these things come together are crucial city building elements which must be taken into consideration.

Sustainable community design:

- Looks at the total land resource and ensures that what is used for development is used effectively and efficiently and what is not used for development is appropriately protected and preserved.
- Is a way of planning, building and creating places for living and working that allows the community and its citizens to contribute to the on-going, long-term health of the city and the natural environment.
- Is about providing, not precluding, opportunities for those who live and work in the community to make choices that contribute to a lifestyle that has low impact on the environment.

sus·tain·a·ble, *adjective*

Capable of being continued with minimal long-term effect on the environment:

What is Vaughan doing now?



Hwy 27 and Rutherford Road in 1992 (top) and 2008 (bottom)

Vaughan has experienced rapid growth in the last 15 years, primarily in the form of large tracts of single –purpose uses (residential subdivisions separate from office parks separate from shopping plazas etc.) connected by extensive automobile infrastructure. Recently, however, there has been increasing awareness that the way the city has grown to date may not be the best model. In the future, Vaughan is expected to continue to grow, with the number of people living and working in the city expected to nearly double by 2031. As Vaughan grows, both the existing communities and new community land base becomes increasingly valuable and it will be critical to manage and to plan for these areas in a manner that ensures that in the future all of Vaughan’s citizens reside in a healthy, liveable community.

With the knowledge that past approaches can be improved upon and future goals are set high, efforts are already being made in many areas to address sustainability-related issues including intensification, waste reduction, and energy efficiency. The following initiatives demonstrate the current approach to sustainability in Vaughan.

At the community design level, the City has secured a commitment from the developers of Block 39 to produce what is being called the largest Energy Star new-homes project in Canada. Not only will these homes be more energy efficient but also more land efficient; the approved plan for the area calls for densities of 53 people and jobs/ hectare exceeding those of other Vaughan subdivisions (the average across the urban municipalities of York Region is 40 people/hectare)¹. The success of this project even led Vaughan Council to pass a policy that all new residential construction be built to Energy Star standards.

At the municipal services level, the Department of Public Works waste management policies have resulted in laudable levels of residential waste diversion, although there is still work to be done in the industrial/commercial/institutional sector. The banning of pesticides and use of Integrated Pest Management techniques on all City parkland is also commendable. Further, the City has begun to take green building seriously, leading the way for the private sector to follow, with the construction of the new Civic Centre and EMS/Fire station to LEED gold standards. Even cycling and walking have been acknowledged as valuable alternative modes of getting around, through the creation of a Pedestrian and Cycling Master Plan.

¹ *Importantly, the new provincial Growth Plan requires a combined minimum density for new communities of 50 people and jobs/ hectare. Given that employment densities are significantly lower than residential densities, to achieve this combined target, Vaughan will need to continue to plan at increased densities in new communities.*

There is also a growing excitement about the possibilities of transit and the uptake of the new Regional VIVA system is promising. The Vaughan Corporate Centre has been identified as a Mobility Hub candidate by Metrolinx and higher order transit services are being considered along Weston Road, Major Mackenzie Drive, Highway 7 and Yonge Street. Clearly better integration of transit and land use patterns will be key to managing mobility within the City.

But these initiatives alone are not sufficient to change Vaughan from a sprawling suburb to an environmentally, economically and socially sustainable community. At a minimum Vaughan must embrace good planning principles and implement them across the entire city. Good planning principles can ensure that neighbourhoods are walkable, transit supportive, with a variety of uses, forms and tenures to provide enjoyment to a variety of people and ages; and vibrant, welcoming public spaces. If there is desire, there is also the opportunity for Vaughan to take many more bold steps toward innovation and sustainable community design as it plans for the next 20 years. Indeed with the forecasted growth, the city building and environmental imperatives will need to be a key driver in shaping the future of Vaughan.

Townhouses address the street in Maple; The new Civic Centre will be a gathering place



Policy Context for a Sustainable Official Plan

The Planning Act, 1990 requires municipalities to prepare an Official Plan and keep it up to date. An Official Plan must contain “goals, objectives and policies ... to manage and direct physical change and the effects on the social, economic and natural environment of the municipality” (Planning Act 16.(1)). “Physical change” includes any way in which land is used, whether for buildings, roads, parks, or other infrastructure. It is interesting to note that the language in the legislation requires municipal Official Plans to include policies that manage the effects of this change on the three elements or “legs” of the sustainability stool: society, economy and environment. This effectively charges Vaughan with preparing an Official Plan that applies sustainability principles to land use, or one that is based on sustainable community design. New Provincial policies, such as Places to Grow: The Growth Plan for the Greater Golden Horseshoe, create additional requirements for cities in the Greater Golden Horseshoe, including Vaughan, to ensure the land use policies in their Official Plans are predicated on creating “communities that will be supported by the pillars of a strong economy, a clean and healthy environment and social equity” (Places to Grow, 1.1.2, p.9) – again requiring that sustainability principles be applied to city building and community design.

Sweden's new
sustainable waterfront
development,
Hammarby Sjostad



How will Vaughan become more sustainable?

With the new provincial policy context, the City of Vaughan has seized the opportunity to create a more sustainable planning framework for future growth. The City has started to address this by establishing the Vaughan Tomorrow Growth Management process and commissioning a series of Master Plans that will each be guided by a new Environmental Master Plan (EMP). The EMP will establish principles for sustainability that touch on all areas of the City's responsibility. These principles will guide decision making across the City and will define what actions the Corporation of the City of Vaughan can take to become a more sustainable entity. The EMP is well underway and a draft report is expected in the fall.

The next key component of the Vaughan Tomorrow process is the creation of a new Official Plan (OP) that will establish policies for how land is used in the City. Building on the environmental ethic that is being established for the City in the EMP, the policies in the OP will be based on the concept of sustainable community design.



Stephen Avenue
Pedestrian Mall,
Calgary AB

Designing Sustainable Communities

Sustainable community design can be understood and implemented at various scales. The Official Plan will address the elements that apply at the city scale. Here sustainable community design might include initiatives such as:

- The protection of agricultural lands and practices to keep food production close;
- A watershed approach to land use allocation: what out-take and treated inputs can the watershed naturally handle?
- Solid waste and recycling capacity within the city limits
- Integrated transit and mobility networks – transit in dedicated rights of way, bicycle facilities
- Reduced parking standards, pay for parking, disincentives to driving coupled with viable alternatives.

The Official Plan will also address some neighbourhood scale approaches to sustainable community design. These may also be incorporated into other plans such as Secondary Plans that provide more community level detail. At this scale SCD might translate into:

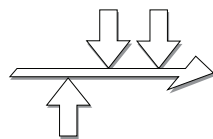
- Increased densities
- A greater mix of uses
- Urban design innovations – development addressing the street, creating public places
- Pedestrian and transit friendly street design
- Local transit provision connecting to wider network
- Geothermal heating, district energy

The development process also allows for the City to request or require certain sustainable community design development standards on individual sites such as:

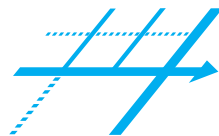
- Green building design – siting to take advantage of passive and active solar energy, incorporation of super-insulation materials and thermal mass.
- Recycled, locally sourced, renewable construction materials
- Porous pavement, xeriscaping

Elements of Sustainable Communities

Theselargescaleinitiativescanbemoreeasilyunderstoodby thinking about how they address sustainability in each of the key integrated city building elements:



Process,



Movement,



Public Realm,

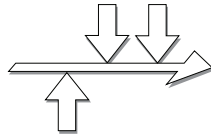


Land,



and Infrastructure

The new Official Plan for Vaughan will address each of these elements. To help illustrate, each of the elements are accompanied by tools for implementation and an example of where the tools have been implemented.



Process

Planning for sustainability covers more than simply specific buildings or systems. It must start at the community or regional scale. It must include how growth is planned, how people move around, how buildings are constructed and run, and how green space is designed and accessed. Planning for sustainability at this scale allows for better interaction between infrastructure systems and meaningful, early collaboration between all parties involved in the design process. Planning for sustainable communities requires the interaction between the local community, municipal stakeholders and design teams from the beginning and throughout the planning process. Thorough integration of infrastructure, public realm, development form, natural systems, community services and public health considerations is critical to the creation of sustainable communities. The planning and design process must seek inspirational and liveable community design concepts and deliver these with a sound understanding of lifecycle considerations including operation and management.



A community design charrette

Tools for a process to encourage sustainable community design include:



Integrated Design Process: IDP is a multi-disciplinary team approach to addressing technical requirements to achieve high performance sustainable development. It requires bringing all related disciplines to the table at the start of a development project so all processes can be accommodated as necessary and innovation and opportunity are not precluded by decisions made by the players in the early stages



Post development monitoring processes can be established to follow the goals of a given project throughout its life cycle and ensure sustainability targets are being met. This type of process could be mandated by the City through development agreements and carried out by developers and property managers.



Hosting a Community Dialogue: Developing a dialogue early with communities on long term land use plans will establish what the community desires at the outset and will allow for areas of disagreement and contention to be worked out when it is still feasible to amend plans and designs to reach consensus. A sense of ownership over the plans, general agreement on principles and support garnered at the early stages is more likely to result in a smoother long term process through implementation.



Waterfront Toronto

(a development corporation established by the City of Toronto, Province of Ontario and Federal Government) is requiring that developers commit to an Integrated Design Process (IDP) when bidding on the right to purchase and develop parcels in the West Don Lands. The IDP is a mandatory requirement in Waterfront Toronto's Green Building Requirements because of its proven success in achieving better outcomes than when a more traditional, linear approach is followed.



Hammarby Sjöstad, Sweden

the redevelopment of a former industrial site on Stockholm's waterfront, is a glowing example of sustainable community development: Once built-out it will be home to 20,000 residents and 350,000 m² (3.7 million square feet) of commercial space, in a new compact, transit, bicycle and pedestrian friendly precinct. While there are many laudable physical attributes that contribute to the project's sustainability, it is also employing an integrated systems approach to sustainable urban development, which ensures that environmental matters will be at the forefront during the planning and design stages as well as during tendering, construction and maintenance/operation phases. This also requires interdisciplinary coordination amongst city departments. Establishing the systems approach allowed the project stakeholders to agree that on the ground their goal was a development with performance measures that are "twice as good as today"; today's best practices must be improved by a factor of 2 to be implemented in the scheme. The early and broad collaboration of all disciplines allows for the creativity and innovation to make this ambitious goal a reality.



The Vaughan Tomorrow process

which this paper is a part of, was mandated by Vaughan City Council to include one of the most comprehensive community engagement programs the City has ever run. To date the process has included a public education component through the Speakers Series in which citizens were invited to listen to and ask questions of a panel of experts from around North America speak on a variety of city-building related topics, and interactive visioning workshops held in each of the local communities. In addition, Citizens Bulletins on key background papers are being produced to keep residents up to date throughout the process and the Vaughan Tomorrow website also includes many interactive features through which feedback on the process can be received.



Movement

Movement and transportation play defining roles in the development of all communities. How people arrive at – and move around in – a sustainable community may be significantly different from typical communities. Planning for sustainable movement includes consideration for transit, automobiles, pedestrians, cyclists, and people of all abilities.

All aspects of movement should be considered very early in the design phase of any city-building project. It is not simply a matter of placing sidewalks and bike lanes along roads, but critically informing the overall structure and functioning of the community the local and regional scale and ensuring that streets and transit stops are pedestrian priority areas.

Sustainable movement is as much focused on the mode of travel as the placement of the origin and destination. Movement should also be considered within the limitations of climate, as local conditions play an important role in determining both modal and destination choices.

Ensuring people of all ages, walks of life and abilities have options for how they move within, to, and from their communities is a critical component of both the environmental benefit and social justice aspects of sustainable community design. Creating places that are safe and friendly environments to walk, bike, blade, take transit and drive will offer people true options for mobility.



LRT in downtown
Portland, OR

Tools for movement in sustainable community design include:



Sidewalks: Pedestrian friendly streets are critical to encouraging walking as a transportation mode of choice. Pedestrian friendly streets have wide sidewalks with street furniture, are buffered from vehicles by a landscaped strip or parking lane and are lined with a continuous street-wall of buildings with active uses at grade. The greatest walking cities in the world (New York, London, and Paris) are such because the streets provide reasons for people to be out on the sidewalks. This in turn, makes the streets interesting and safer. Simple sidewalks are also a tool that promotes healthy communities by addressing childhood obesity concerns and democratic communities by ensuring that all people, regardless of age or income have a safe option for getting around.



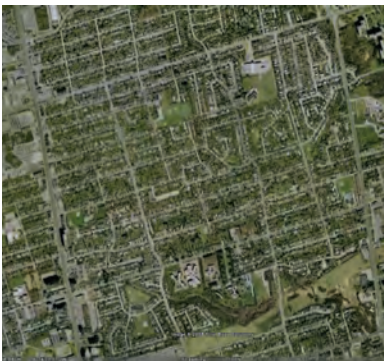
Public transit: An efficient and reliable transit system is required as a viable alternative to the private vehicle. Creating this efficiency and attractiveness is the responsibility of a number of players: Transit operators must be well funded in order to run the appropriate number of vehicles on enough routes to meet demand. Municipal and Regional authorities can support the basic functions of the system by designing streets with transit vehicle priority in mind, and by establishing the appropriate form and intensity of land use around major transit stops and along primary routes to create a critical mass of demand for the services.



Bicycle Routes: A continuous and connected off-road bicycle trail system can be used for both recreational and commuting cyclists. A network of on-road dedicated bicycle lanes will increase the attractiveness of that mode on major arterials by minimizing the potential for conflicts with fast moving vehicles. Well lit and sheltered bicycle parking facilities on both public and private property are also necessary to increase movement by bike.



“Complete streets”: Accommodating all of the above “alternative” transportation modes in the design of public streets is referred to as creating Complete Streets. As opposed to traditional street design, which focuses primarily on the automobile, Complete Street design focuses on the most vulnerable users of the street - pedestrians and cyclists. Complete Streets, designed effectively, act as part of the city’s social fabric, not solely as movement corridors. They provide a pleasant pedestrian experience, a safer experience for cyclist, less congestion to delay surface transit and adequate capacity for vehicles that is suitable for the context. Many states have some form of “complete street” legislation but cities are also taking up the cause: San Francisco CA, Boulder CO, Charlotte NC, Seattle WA, Chicago IL. See more at www.completestreets.org



Fine Grain of streets: Sustainable movement is not only about choosing modes that are less energy intensive than the private vehicle; the sustainability of a community is also impacted by the organization of the routes that those modes use. Typical suburban subdivisions have meandering streets that do not connect regularly to the arterial grid. It was thought that this street pattern would discourage drivers from infiltrating residential neighbourhoods, making them safer and more pleasant. However, experience has shown that these “spaghetti plate” road patterns actually encourage more driving by offering fewer route choices for vehicles and pedestrians; discouraging walking and funneling traffic to arterials. A more traditional grid offers drivers, pedestrians and cyclists a diversity of paths and disperses traffic over the entire area.



Transit-first policy: Serving new development with transit is often seen as a chicken and egg problem: Transit needs a critical mass of riders to make the route efficient to operate, but if there is no transit when people move in they will establish a routine of driving and a market for the service will not be established. A Transit-First policy can ensure that the long term benefits of good transit use habits outweigh the short term financial risk of running transit to a burgeoning area. Many municipalities are partnering with local transit authorities to establish Transit –First policies to ensure that the first occupants of a development will have effective transit service. This may not mean frequent service, or full size vehicles, but enough service to establish good habits.



Transit Oriented Development (TOD) and Mobility Hubs: Public transit works best when there is a critical mass of riders going between concentrated destinations. In a suburban context it is not always easy to achieve critical mass at the home-ends of many trips, but the system can be improved by strategically taking advantage of activity nodes. High density, mixed-use, transit oriented developments incorporating residential, institutional, retail, or cultural amenities can provide the necessary draw to achieve the critical mass necessary for flourishing mobility hubs where multiple modes of movement intersect.



Bremen, Germany, a city of 540,000, is the oft-cited example of a truly integrated and balanced transportation system. The municipal government oversees and coordinates the integration strategy which brings together cycling support facilities, car-sharing and taxis at key hubs throughout the city. Information about fares and routes using any of the available modes is provided at electronic kiosks throughout the city. In support of each of these modes the City has integrated cycling into its standard transportation planning routine and provides secure bike parking, rental, repair and other bicycle support at the Central Station. It has also actively encouraged a private car sharing company to establish a presence in the city and is offering developers the incentive of a reduced parking standard for including shared-vehicles as part of new residential developments. Bikes are permitted on transit, which is given priority on city streets. Close communication between private and public sector partners and building the program over time has resulted in Bremen boasting that over 60% of trips are made by alternative modes (cycling, public transit and walking).



Land

Sustainable community design must respond appropriately to a range of urban contexts including the creation of complete new greenfield communities, reurbanizing suburban communities and capturing brownfield and infill development opportunities to create complete, vibrant and contemporary places to live, work and visit. The way we use and design our land resource has some of the most significant and tangible impacts on sustainable community design.

Sustainable community design is based on boldly integrating any of the following land-use tools, among many other approaches



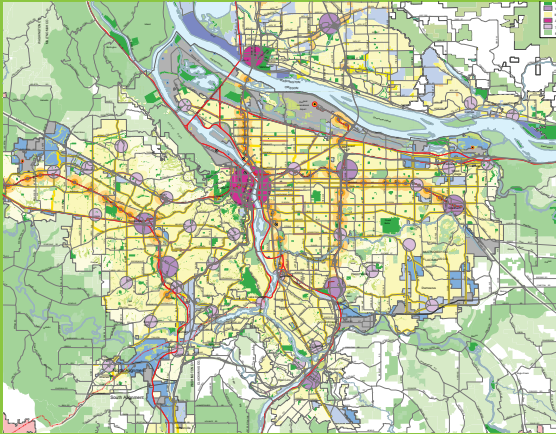
Density: density is a measure of the intensity of land use based on its area and the amount of activity, and is a proxy for efficiency. Achieving higher densities means we are doing more with less land, freeing up land for other uses or allowing it to be protected for the future. Higher density development (also known as compact development) belongs in places where the hard and soft infrastructure exists to support it. Most of the world's most beloved and livable cities exhibit higher densities than are typical in suburban areas such as Vaughan.



Complete Communities/Mixed Use: higher densities go hand in hand with a mix of uses to form “complete communities.” Communities that have a full complement of live, work, shop and play options are more sustainable than single use areas of any intensity because the daily needs of occupants can be met in the area, reducing the need for driving to other single use areas. These communities are friendly to people in all stages, and from all walks of life, because they offer a lifestyle that does not require a car. This is particularly important for the growing segment of the population that does not drive, namely seniors and youth. In addition, when many people live work and play in the same place, the result is a hub of casual interaction between strangers and friends, which engenders the social bonds necessary for sustainable community. Traditional communities, older cities, quaint towns and villages, exhibit a natural completeness or mix of uses. This approach is not a new way of doing things but rather a revival of a time-worn practice.



Mix of forms: While striving to achieve more efficient land use, it is also important to ensure that the needs of a wide spectrum of the population can be met on the land. Residential development in a sustainable community requires a variety of housing forms and tenures that will keep people in the community through all stages of life. Apartment-style units are generally smaller and therefore more affordable than single family homes and offer a less demanding lifestyle, attractive to young professionals and seniors. These, along with other forms such as townhouses, stacked townhouses and granny flats create opportunities to welcome all walks of life and result in a more visually interesting and diverse City.



Portland , Oregon

The City of Portland is perhaps the most frequently discussed North American example of sustainable urban land management. Its primary claim to fame lies with the establishment, in 1979, of a solid Urban Growth Boundary (UGB). This boundary acts to bar urban land uses from spreading into the countryside. The establishment of a regional urban governance structure, known as Metro, to manage growth within the Portland area, serves to reinforce this boundary. Through a number of growth management initiatives, Metro directs growth to nodes and transit corridors within the UGB, encourages the creation of mixed use centres, and the use of multiple modes of transportation with an emphasis on light rail.



Public Realm

The public realm is often overlooked from a sustainability perspective, but plays a critical role in sustainable community design. The public realm forms the seams that hold the fabric of communities together. It is the place where citizens interact and the space in which culture evolves. Social wellbeing is fostered through a well-planned and carefully designed network of public places, streets and open space. Well-planned (and well-used) open space is an important element of the public realm, with benefits ranging from increased physical activity to clean air. The public realm also includes cultural places that are accessible and meet the needs of all members of the community. Equally important are those public spaces in between, including sidewalks, street corners, and other open space. These places support informal interaction and encounters, which are essential for community building.



Elements of a sustainable public realm include:



Connected parks and trails system: Parks have an almost infinite variety of forms and a similarly wide range of functions. They are spaces where trees and other vegetation absorb carbon dioxide, produce oxygen and generally filter the air. More importantly, however, they are the social ‘breathing space’ for inhabitants of a city– a place to escape the turmoil of everyday life. Trails extend the benefits and amenity of the park through the city. Insofar as they too are green and vegetated, they provide valuable corridors for the city’s non-human residents, so vital to a city’s ecological health.



Public gathering places: Parks, plazas, streets and other components of the public realm must remain public assets, and are important elements of the city regardless of their size. They should always be places of unfettered access for the masses, which provide the physical context for the basic civil rights of freedom of speech and assembly. Public gathering places must be engaging and open and to all regardless of ethnicity, culture, gender, sexuality, class or level of physical ability. This rule has important implications for the design of public gathering places, from wheelchair accessibility, to appropriate signage.



Public art and monuments: Public art can contribute to the improvement of the public realm. Public art can make streetscapes more diverse, showcase local artists' work and contribute to an element of surprise in the experience of urban landscapes. Monuments, meanwhile, can make the city's history come alive. Properly placed on natural sightlines, they provide focal points of interest, and destinations for casual passersby. Public art is also a tool of placemaking, distinguishing one city from the next and diversifying the urban landscape. Similarly public cart installations can help with urban navigation by providing recognizable landmarks in key public locations.



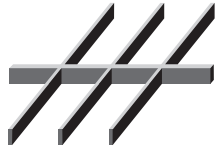
The walking world: One of the most critical aspects of sustainable community design is a re-visioning of the purpose and function of streets. Sustainable community design demands that we place the needs of the pedestrian (and cyclist) over those of the car. Sidewalks should be designed as wide as possible, to facilitate interaction as well as movement, as such interactions are an inevitable and desirable outcome of creating streets for people. The pedestrian environment should be human-scaled, with a continuous building-wall fronting directly onto sidewalks to help create an "outdoor room" feel. Narrow lot widths result in a more diverse, exciting streetscape, increasing the frequency of establishments encountered on any given journey.



Downtown Melbourne, Australia

In 1993, Danish architect and urban quality authority Jan Gehl undertook an extensive study of the use of Melbourne's public realm. Discovering some rather uninspiring physical realities and use trends, Gehl made a sweeping series of recommendations. These were taken up by Rob Adams, Melbourne's Director of Design and Urban Environment who, recognizing the vital importance of a vibrant and engaging public realm, initiated an intensive program of public investment. One of the earliest and most important symbolic gestures in this regard was dropping the term Central Business District to describe the city's downtown core, and re-imagining it as the Central Activities District. This went hand in hand with a re-conceptualization of downtown as a

24 hour district with a wide diversity of functions, from office and commercial space, to restaurants, bars, clubs and theatres. Streets were recognized as the main element of the public realm, the most vital part of the built environment for design consideration and investment. Sidewalks were, and continue to be, widened and paved in bluestone. Streetlighting was improved to illuminate the new 24 hour city. New residential space was added, bringing the critical mass for functioning businesses. Massive investments were made in street trees, street furniture and public art programs. New parks and public squares were created, the most infamous of which, requiring just under \$400 million US in public funding, was Federation Square, which now functions as Melbourne's living room, cultural centre and nighttime destination. The net results of these efforts have been astonishing; between 1992 and 2004, downtown Melbourne has seen an 830% increase in residents, a 275% increase in cafes and restaurants, 71% more public space on streets and in squares, pedestrian traffic has nearly doubled in the Bourke Street Mall, while nighttime pedestrian traffic has increased 98%. While all of these developments are exceedingly positive, the gains in pedestrian traffic especially demonstrate the importance of the public realm in sustainable community design.



Infrastructure

Compact, mixed use development goes hand in hand with engineering standards that put more emphasis on the quality of the city and less on simply moving people, water or waste. This means reduced parking ratios, wider sidewalks, narrower paved areas, and a range of alternative approaches to traditional municipal services. At the community design scale, a well-integrated sustainable infrastructure program allows for benefits from economies of scale, providing increased financial incentives and significant environmental benefits. Consideration of these elements in early planning phases – and tailoring the plan to local context – greatly increases the sustainability potential in community design.



A solar heated community in Alberta



Sustainable infrastructure includes:

Green energy: Solar and Wind energy are only the two most prevalent forms of green energy infrastructure, and by no means exhaust of the possibilities for green energy technologies. The development of a green energy system can be supported by municipalities through provisions in Official Plans supporting distributed energy generation, and through progressive zoning codes that allow small scale, green energy generation within all zones. Municipalities can set aside city-owned lands for the purpose of green energy generation and can mandate that development of city-owned lands incorporate green energy.



> **Solar energy** can be captured in two ways. Passive solar systems are oriented to take advantage of the sun's heating abilities directly. A building that is super-insulated, with large, south facing windows and thermal mass positioned to absorb the sun's rays can capture that energy and re-radiate the stored heat after the sun goes down. Active solar energy technologies use pumps or fans to distribute the heat energy created by solar radiation. They are primarily used for space and water heating. Photovoltaic energy, or the creation of electricity from the sun's rays, can be either passive or active, and is probably the most appropriate form of electricity generation in dense urban environments; it is silent, produces no emissions, and can be designed to be visually unobtrusive.



> **Wind energy** systems can be implemented at both small and large scales. Small scale projects using single turbines (which convert wind energy into either electricity or usable mechanical energy) and by virtue of their size can be integrated into urban settings. In this way, multiple small wind turbines are a means of distributed electricity generation, that can be used to power anything from a water pump to an entire neighbourhood. . Distributed generation means that, rather than being generated at a few huge stations, the grid is powered at thousands of diffused points. The benefits of such a system are increased security, and decreased inefficiencies associated with long distance transmission. Large scale wind power projects with multiple large turbines are referred to as wind farms. Municipalities can support this form of clean energy by purchasing electricity from a wind electric company.



District energy: District energy is an innovative solution to two age-old problems; how to safely and efficiently heat urban interior space and what to do with waste heat from industrial processes or electricity generation. District energy solves these problems by using the waste heat generated by industrial processes or electricity generation for interior heating. District energy facilities are centrally located in high density urban areas to maximize efficiencies in distribution.



Vacuum waste: Vacuum waste disposal systems are another early design consideration which can result in considerable efficiencies in waste disposal. Neighborhoods are designed with pneumatic tubes connected to each building that “suck” streams of waste to a central plant. Not only do such systems not require wasteful bags, their relatively simple technology requires very little energy or maintenance, as compared with traditional waste disposal processes: entire fleets of specialized garbage delivery trucks can be eliminated through the installation of such a system. The systems are most effective in new high density areas where the waste pipes can be installed at the same time as other below grade infrastructure.



Water conservation: In addition to managing water conservation at the point of consumption through municipal campaigns to distribute water conserving fixtures to existing households, mandating low-flow fixtures in all new municipal buildings, and encouraging the private sector to do the same, replacing leaky water mains and distributional infrastructure is a low tech, extremely efficient, if unglamorous, means of conserving water, and contributing to sustainability. Massive water savings can also be realized through the replacement of old municipally owned irrigation infrastructure with efficient drip irrigation systems. This is especially true where such efforts are combined with the practice of xeriscaping to replace water intensive landscaped vegetation with drought tolerant species.



Low Impact Development: Mitigating runoff is an important strategy to improve the quality of the local watershed. As it drains over roofs, roads and parking lots stormwater runoff collects oil, gas, road salt, garbage and other toxins and concentrates them in local water bodies. Sustainable practices such as LID aim to more closely replicate the natural hydrologic cycle whereby rainwater percolates through the ground to recharge the water table or is used by vegetation. Early in the design process LID dictates that the design be established to work with the site’s terrain to reduce the amount of clearing and grading. Once under development LID can be accomplished by increasing the amount of pervious surface across the city or site through green roofs, permeable paving materials and the enhancement of traditional curbs and gutters with bioswales (a shallow depression that slows, transports and treats runoff). All these strategies aim to address runoff at its source with less reliance on hard infrastructure. See more at www.lowimpactdevelopment.org.



Waterfront Toronto – District Energy

As part of the Sustainability Action Plan in its Sustainability Framework document, Waterfront Toronto has committed to the installation of a district energy facility in the new West Donlands neighbourhood to provide heat and cooling to all buildings on site. Along with energy related goals such as ensuring that all new buildings on site are at least 40% more efficient than Canada's Model National Energy Code for Buildings standards, the installation of a district energy facility will significantly reduce the overall energy footprint of the development.



Calgary - Ride the Wind

In 1981, Calgary's Light Rail Transit (LRT) Line, the CTrain, opened its doors to the public and now has the highest LRT ridership in the North America. In 2001 the decision was made to switch the power source of the electricity for the train from coal and gas fired electrical plants to wind generation. This innovative idea, a partnership between ENMAX energy, Vision Quest Windelectric Inc. (now TransAlta.) and Calgary Transit, uses the power purchased from 12 large scale turbines to run the CTrain. Although the CTrain LRT is already an incredibly efficient mode of transportation, with each person trip generating less than 1/10 the pollution of a similar trip by personal automobile, the Ride the Wind program reduces emissions to virtually zero. This is an excellent example of the synergies possible when sustainably designed infrastructure systems are combined.



Suburban Transformations: Inspiration for Vaughan

In order for a city like Vaughan to be sustainable, it must act up on a number of the tools for sustainable city building described above. As the quotation from naturalist John Muir on page 1 suggests, in nature, everything is connected and so sustainability requires action on many fronts. What follows are brief case studies where sustainable practices have been more widely implemented. The case studies sample activities at a variety of scales including the whole city and specific development sites.

Sustainable Okotoks



A suburban municipality in the Calgary Region, located in the watershed of the Sheep River, the Town of Okotoks has found itself facing substantial population and development pressures over the past two decades. A growth rate of 10% in the late 1990s led the planning department to begin researching the possibility of creating a sustainable community. The end result was an approach to sustainability based on four foundations: fiscal (e.g. affordable infrastructure); environmental stewardship (e.g. the preservation of a pristine river valley); social conscience (e.g. a range of housing stock, local opportunities for education); and economic opportunity (e.g. a mix of high quality jobs and a diversified economic base).

- The Mayor and Town Council led a public education process on sustainability through the publishing of Mayor's letters in local papers. The public were then engaged through a Town wide survey, results of which formed the basis for the Sustainable Okotoks vision. This vision recognized the local ecological carrying capacity as an absolute limit to the growth of the town. The Town's residents overwhelmingly support capping population growth at 25,000 – 30,000, - the population that the Sheep River can reasonably support without impacting its ecological health or water quality.

- The recognition of global, as well as local limits to growth has led Okotoks to reduce its ecological impact through the application of a variety of sustainable technology and infrastructure: a mix of land uses minimizes the energy and resources associated with commuting; road width and intersection dimension standards have been reduced in order to facilitate the development of a more compact urban form.
- Alternative energy options are being explored in all municipal buildings. Solar hot water heaters, for example, are being employed at various locations to heat buildings, heat pool water, and refinish arena ice. The Drake Landing Solar Community, a multi-partner neighbourhood development facilitated by the Town of Okotoks, intends to meet 90% of its space and water heating needs through solar technologies.
- Concern for the Sheep River watershed means water conservation is a priority and as such the Town has initiated a comprehensive demand management and infrastructure renewal program, and a municipal xeriscaping, or drought tolerant vegetation landscaping program.
- The public realm is to be protected and enhanced through natural restoration programs on lands in need of rehabilitation. Public open spaces are to be linked through a pathway system to “major amenity nodes” and the Sheep River. All new paths are to be paved and outfitted with a coordinated street furniture program to enhance the variety of path uses. Connectivity will be increased through an intensive urban forestry program which extends the green space of the path system to the Town’s road network.

Inspiration for Vaughan:

Vaughan’s location makes it the steward of the Don and Humber Rivers, key inputs to the region’s drinking water supply. Though the city is smaller, Okotoks is similarly positioned in a key watershed at the edge of a major urban centre. If no other environmental imperative resonates with the City and its citizens, planning for the health of the watershed as the priority is a minimum responsibility to the wider watershed region that the City must bear. It can be used to the City’s advantage and be the spring-board for other sustainable development initiatives.

Portland Metropolitan Area



Since 1978, the municipalities in the Portland Metropolitan area have followed the Portland Comprehensive Plan which sought to locate high density mixed use centres along an efficient light rail system stretching from the central city to the furthest suburbs. These goals are further entrenched in Metro's Region 2040 Growth Plan (Growth Plan). The Growth Plan delineates a firm Urban Growth Boundary (UGB) to contain sprawl, and redirects growth towards established centres and corridors. The progress towards sustainable urban form initialized by the Growth Plan has been furthered at the municipal level by the City of Portland and surrounding municipalities, such as Beaverton.

- The overall structure of the city, a microcosm of the region as a whole, is that of dense, mixed use city centre, connected to a series of Transit Oriented Development (TOD) neighbourhoods, through multi-modal transit corridors.
- In addition to light rail and automobile infrastructure, as of 2006 Portland had over 1, 125 kilometers of bike lanes and off street bike paths. Not surprisingly, bicycle and foot trips increased by 10 percent between 1990 and 2000.

- Due to the creation of a municipal Office of Sustainable Development in 1998, and its internal green building program, Portland is now home to more LEED buildings than any other city in North America. The stock of green buildings has been spurred on by the City's commitment to have all of its own buildings brought up to LEED standards.
- The City has further committed to source all of its energy from renewable sources by 2010.
- Portland's TODs are models of public space, generally incorporating a centrally located transit stop in a plaza or public square setting, below grade parking, extensive services and amenities at ground level on surrounding buildings and residential space above.

This remains true for the TODs located in the suburban municipalities surrounding Portland. Designated as Regional Centre by the Growth Plan, Beaverton is a City of approximately 86,000 people, 11 kilometers from Portland. It is well served by Portland's light rail system.

- The Round is a mixed use TOD located at the heart of downtown Beaverton, designed to be the core of the Beaverton Central area. In addition to its extensive public space, designed to facilitate public gatherings, and its peripheral medium-rise residential with grade level retail,
- The entirety of The Round development is serviced by a centralized heating and cooling plant, which aims to cut greenhouse gas emissions associated with Beaverton Central by 25 percent below 1990 levels by 2020.
- To aid in this process Beaverton is hoping to secure green building certification for 100% of its publicly owned buildings by 2012.
- Sustainable landscaping initiatives such as the implantation of natural drainage systems and reinstating of natural wetlands are also being pursued.

Inspiration for Vaughan:

Portland has long been the poster child for compact and transit friendly planning but its suburbs were not always worthy of such praise. The recent extension of the LRT to Beaverton spurred that City to ensure the infrastructure investment was appropriately leveraged in their community. The commitment and planning for higher order transit in Vaughan (extension of the subway to the Vaughan Corporate Centre and up Yonge Street along with proposals for LRT or BRT on major corridors) should be seen as a catalyst to well planned transit supportive development proposals that also serve a civic function as an activity hub. This type of development must also be recognized by Council as a necessary pre-condition to supporting the transit investment.

Vancouver's Southeast False Creek



The South East False Creek (SEFC) neighbourhood in central Vancouver capitalizes on underused brownfield lands to create a model sustainable community. In 1991, Vancouver City Council adopted a resolution to develop at False Creek “a neighbourhood that is the model of sustainability, incorporating: forward-thinking infrastructure; strategic energy reduction; high-performance buildings; and high transit access.” This policy has been put into action employing extensive community consultation, an integrated design process, emphasis on pedestrians, cyclists and transit, LEED accreditation for buildings, district heating and design for passive solar energy gain, and the incorporation of urban agriculture into an extensive public realm plan.

- An advisory group of citizens, interest groups and city staff was formed during the initial planning process to monitor city compliance with official SEFC policy. This group has evolved over time into a Stewardship Group and will eventually form the basis for a SEFC neighbourhood association when the development is inhabited.

- The Integrated Design Process was initiated with a weekend workshop involving over 80 development team members, municipal staff and sustainable development experts, and resulted in the generation of design principles for the central section of the development – the 2010 Olympic Village which will be home to permanent residents following the games.
- The Official Development Plan specifies that the movement system should facilitate, in descending order of importance, the movement of pedestrians, cyclists, transit, goods, and automobiles. Southeast False Creek’s central location allows for an effective integration with existing forms of city transit, including a Sky Train station, a street car line running along the central avenue of the development, public ferry docks and bus routes along the peripheral arterials.
- The incorporation of urban agriculture into the site allows for energy savings through reducing the vehicle miles food must travel between field and table, provides an outlet for organic waste through the use of compost, and creates an active and engaging social space in the community.
- A comprehensive public realm plan includes recognition of and connection with the site’s varied industrial histories and integrated public open spaces and parks will connect the neighbourhood residents to the site’s natural and cultural history, and to each other.

Victoria's Dockside Green



Similar to Vancouver's Southeast False Creek neighbourhood, the Dockside Green neighbourhood in Victoria is being developed on a waterfront brownfield site. With a land area of six hectares, and 2,200 residents, Dockside Green will be a densely inhabited, mixed use, sustainable community. The development team, a partnership between Windmill West, Vancity and the City of Victoria, has registered to have the neighbourhood certified as a LEED Neighbourhood Development. Additionally, all buildings on the site are targeted to either LEED Platinum (for buildings on lands purchased from the city) or LEED Silver standards (for buildings purchased from private landholders).

The development incorporates a number of revolutionary sustainable infrastructure features.

- The project aims to treat all sewage produced on-site. Treated water from this process will be used for non-potable purposes, such as flushing toilets and irrigation. The remaining water will be pumped to the site's naturalized waterway.

- The project will be greenhouse gas neutral through the implementation of a central biomass gasification cogeneration facility. This form of renewable heat and energy production uses waste heat and gas generated during the production of electricity to heat water and homes.
- Green walls, green roofs, and environmentally appropriate landscaping will be used to offset the urban heat island effect, further reducing heating and energy demands.
- Public spaces at Dockside Green include intensive tree planting, public art, and interpretive signage contribute to a natural sense of place, while pedestrian walkways follow the sweeping course of the naturalized waterway, and lead to a central plaza which acts as a hub of social interaction and amenity.
- The developers have committed to the purchase of a mini-transit bus, and 10 smart cars or electric vehicles for a car share program. To reduce the desirability of automobile ownership, residential parking stalls will be sold separately from residential units.

Inspiration for Vaughan:

The SEFC and Dockside Green examples show that the development community and City council can work together to achieve high levels of sustainable development. Vaughan city council needs to set high standards and also create an atmosphere of innovation and calculated-risk to engage partnership with the development community.

A Made in Vaughan Plan

Acting sustainably impacts all aspects of our lives, public and private. In order to truly say that Vaughan is a sustainable city it will require commitment, participation, and action from the City and its citizens alike. The approach to sustainable community development that is ultimately embraced by Vaughan – the city and its people - must be meaningful locally. It will require a clear direction and set of priorities. At a minimum all new development, infrastructure and communities should be planned and designed on the basis of good planning and sustainable community and building design practices. However to be a truly sustainable City, based on the remarkable assets and current directions, the following directions are proposed.

Making a sustainable city over the next 25 years and on into the future will need visionary thinking and a willingness act upon that thinking. Thinking big can start with the Vaughan Tomorrow process and the creation of new land use policy in the new Official Plan. Can Vaughan be known as:

1. The City at the Headwaters of Lake Ontario: managing clean water as a key asset and critical resource



- A watershed planning imperative drives land-use and related policy
- There is a strong rivershed open space network that is used for passive recreation and connecting activity hubs
- Vaughan is an exemplar of innovation in storm water management, using a systems approach
- The Corporate Centre boasts post-development infiltration levels that are identical to pre-development levels - it is the showcase for sustainable development in the Headwaters area.



2. A City that Walks: A City that Works

- New communities are designed with a 2 mile radius to mixed use centres and existing areas are retrofitted to achieve the same goals.
- The kids of Vaughan walk to school.
- Streets are designed with pedestrian priority and sidewalks are mandatory in all development.
- Communities are developed with a complete range of uses at walkable distances.
- The urban form of new areas is compact and efficient for pedestrians, cyclists and transit.
- Existing and new neighbourhoods pass the “popsicle test” (kids can walk to get a popsicle and be home before it melts!) as a result of innovative land use designations and compact community design.

3. The Greengrocer for the Greater Toronto Area: a Mecca of Local Food Production



- In Vaughan, daily needs are sourced locally.
- The city is home to a healthy and vibrant agriculture sector that contributes to the local economy.
- Vaughan is known across the country for best practices in supporting local and organic food production.
- Key agricultural lands are preserved and are productive.
- Community gardens provide other opportunities for small scale local food production and urban agriculture.
- Vaughan is the heirloom tomato capital of Canada!

4. A City and A Countryside: Preserving the remarkable ecological and landscape qualities of its countryside to sustain a quality of life and competitive advantage



- Vaughan council and citizens recognize the countryside as an irreplaceable asset; new subdivisions can be created anywhere but the rivershed is irreplaceable.
- Communities and activity hubs are linked not only by roads but also greenways offering alternative routes for sustainable commuters (pedestrians and cyclists) and area fauna.
- Vaughan is a city with strong environmental health and the responsible steward for the headwaters of lake Ontario.

5. A Transit-first Community: use transit investment as a first priority not a planned priority



- All communities are designed and planned for a minimum 25% transit modal split.
- Vaughan Corporate Centre is designed and built as a vibrant multi-modal mobility hub.
- The City is a strong voice for the early investment in transit, particularly in emerging areas and supports this transit investment through appropriate development.
- Vaughan offers a range of transit options, such as jitneys, acknowledging and encouraging incremental change in habits and staggered investment.



6. A Zero Waste Community: designing to encourage full waste diversion

- Vaughan builds on early waste reduction initiatives to achieve zero waste going to landfill.
- Industries in Vaughan have taken the lead on packaging reduction; retailers in Vaughan no longer provide plastic bags.
- The municipal sector leads waste reduction efforts.
- New communities are designed around people and not garbage trucks.
- Parks, community facilities and schools incorporate compost programs
- The Corporate Centre is the first community built with a vacuum waste system, reducing the need for individual building servicing, therefore creating efficiencies and beautifying the public realm.
- Vaughn is home to numerous eco-industrial employment parks where the waste generated by one process or company is used as an input by another.



7. A Carbon Neutral Community: an energy efficient city

- All city facilities are powered, heated and cooled through zero emissions energy sources, strengthening the green-power production sector in the local economy.
- All new developments use efficient district energy systems based on geothermal heating and or waste heat and gas from other servicing processes (e.g. waste water treatment).
- New communities and the buildings within them are designed for passive solar energy gain and have built in photovoltaic panels, providing surplus energy back to the grid.
- Development patterns result in modal splits that favour sustainable modes of travel.

Next Steps

Achieving true sustainability will be a challenge for Vaughan, but it is certainly one that the city is capable of meeting. It will require changes in the way land use planning and development is carried out in the City, but it does not mean no-growth, nor does it mean sky scrapers on every street corner. In fact, if Vaughan chooses to embrace sustainable community design it will do so as a way to better manage the tremendous growth that is expected so that the city, its residents, and future residents benefit from this exciting time in Vaughan's history.

This paper is one of a series of background papers being prepared to initiate discussion around key issues in the preparation of a new official plan for the city of Vaughan. We welcome your feedback at www.vaughantomorrow.ca