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Towards a Greener Greenbelt for Sustainable Communities: Case study of Vitoria Gasteiz - Spain and Ontario - Canada

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Abstract

Countries around the world have responded to growing concern about the problems associated with sprawling development by creating a wide range of policy instruments. Greenbelt policy is one of the most effective measures against the current environmental problems. It provides a 'green lung' around towns. The creation of sustainable greenbelts is an integral part of sustainable urban design in a community. The goal of this sustainable greenbelt is reducing the use of non–renewable resources, minimizes the negative environmental impacts and providing many more opportunities for recreation. From this point of view, This paper focuses on study and analysis of the sustainable greenbelt that not only provides additional open space but does so in a more sustainable manner through analyzing the sustainable greenbelt in Vitoria Gasteiz - Spain and Ontario (Canada) to find out extent of Sustainable current greenbelt design, in order to get greener greenbelt in the future follow the highest standards of sustainable development.

Key words: Greenbelts, benefits of greenbelts, sustainable development, greener greenbelts.

1. Introduction

The land around our towns and cities is continually facing a range of challenges and conflicting land use. Green Belt policy has provided a framework for making some of these decisions around those towns and cities. The creation of sustainable greenbelt is an integral part of sustainable urban design in a community and the city it provides many more opportunities for recreation, alternative and safer transportation and wildlife habitat.

2. Research goal

The goal of the research is providing a practical application to a greener future greenbelt. It is a hybrid design which integrates the goals of greenbelt and blending the sustainable features

as well as including new design ideas based on the research can help to make a difference to both the community and City.

3. Methodology

Methods used in this project include researching relevant printed work on the subject of greenbelts and sustainability, throughout the research we have compared greenbelt land in Vitoria – Gasteiz in the north of Spain with Ontario's greenbelt in Canada and they face many of the same challenges and opportunities as greenbelt land due to their proximity to major urban areas.

4. Greenbelts

Greenbelts serve a number of purposes, they tend to share two features suggested in the term "greenbelt": an open landscape (green) and a linear shape (belt).

4.1 Definition of a greenbelt

Green Belt is an area of land protected from development, Green Belt land surrounds cities and towns to inhibit 'urban sprawl', prevent neighboring towns merging into one another, preserve the countryside and the setting and character of historic towns, and assist in urban regeneration by promoting 'brownfield' development (Jin and Park, 2000). Greenbelt is also defined as a linear park which with a system pathways for pedestrians and bicycle traffic that links neighborhoods with the large community. Green belt areas helped save the rural communities from being absorbed by large urban centers as well as helped preserve unique landscape which offers many benefits to the urban population as well. Greenbelts also help to make a place more livable, providing opportunities for recreation and alternative means of transportation also providing a scenic and natural setting in an urban area.

4.2. Objectives of greenbelts

Greenbelts have been established in many cities, serving in each case one or more purposes, it includes:

- Checks the unrestricted sprawl or large built-up area
- Prevent neighboring town from merging into one another.
- Assist in safeguarding the countryside from encroachment.
- Prevent the setting and special character of historic towns.
- Provide opportunities for access to the open countryside for the urban population.
- Provide opportunities for outdoor sport and outdoor recreation near urban areas.
- Retain attractive landscapes, and enhance landscapes near to where people live to improve damaged and derelict land around towns.
- Secure nature conservation interest and to retain land in agricultural, forestry and related users.

4.3 Benefits of greenbelts for people

Greenbelts offer in fact a broad variety of benefits; The Greenbelt rather addresses people's basic needs and helps avoiding future problems by protecting clean air and water, supporting regional food production and providing jobs, it includes (Choi, 1994):

- Walking, camping, and biking areas lose to cities and towns.
- Contiguous habitat network for wild plants animals, and wild life.
- Cleaner air and water.
- Better lands use of areas within the bordering cities.

4.4 Advantages of greenbelts

Fig.2. the greenbelt in Netherlands and Paris

4.4.1 Bring nature into the political equation

Greenbelts save money and enhance the health and wellbeing of nearby residents by naturally filtering water, controlling flooding and cleaning the air. These essential ecosystem services would be performed by costly, built infrastructure.

4.4.2 Reconnect with nature in our neighborhoods

Urban and suburban dwellers, especially children, are becoming increasingly disconnected from nature in their everyday environments. Greenbelts provide excellent opportunities to get our local nature fix by exploring nearby fields, forests and wetlands, and by creating relationships with the precious agricultural lands that feed our cities (Martin, 1993).

4.4.3 Treat our green spaces properly

Communities should manage their network of parks, community gardens and ravines as a series of functioning ecosystems, rather than isolated ornaments (Kuhn, 2003). **T**hese green spaces deliver essential health benefits and provide a home for birds, plants and animals .We need to redouble our efforts to enhance and restore these ecosystems and maximize their benefits.

4.4.4 Help to limit urban sprawl

Greenbelts are also important in efforts to limit sprawl, which is the tendency for cities to spread out and encroach on rural lands and wildlife habitat. Three U.S. states—Oregon, Washington and Tennessee—require their largest cities to establish so-called "urban growth boundaries" to limit sprawl through the establishment of planned greenbelts (Faisal, 2013).

5. Sustainable Development

Sustainability means many things to different people, but for this research it is defined as: an attempt to provide the best outcomes for the human and natural environments both now and into the indefinite future (Hellmund, 2006). It relates to the continuity of economic, social, and environmental aspects of human society, as well as the non-human environment. It is intended to be a means of configuring civilization and human activity so that society, its members and its economies are able to meet their needs and express their greatest potential in the present, while presenting biodiversity and natural ecosystems, planning and acting for the ability to maintain these ideals in a very long time. Sustainable development of resources includes natural, human, and economical the purpose of the sustainable development is positive change or human progress, not necessarily growth in numbers or size. People of the current generation and future generations, are the beneficiary from such development. For all Thus, sustainability is about sustaining a desirable quality of life for people as shown in figure 2.

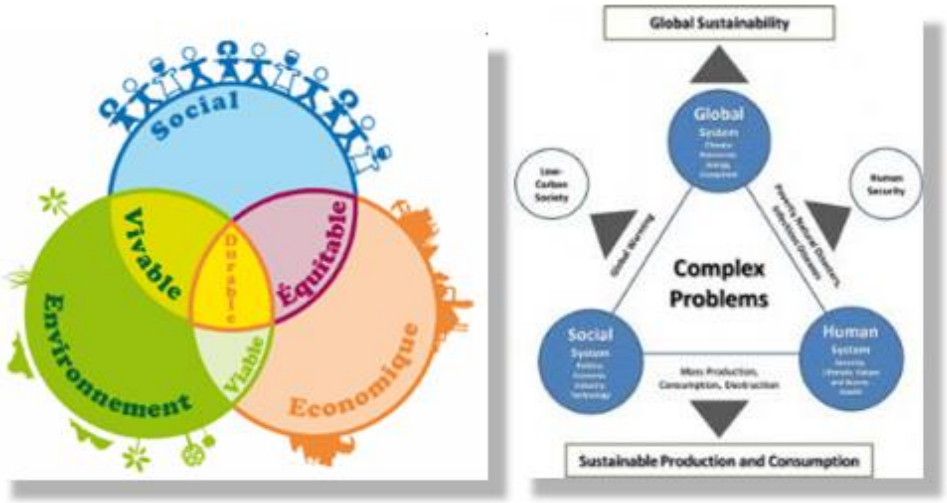

Fig 2: Sustainability Digram

The creation of sustainable greenbelts is an integral part of sustainable urban design in a community and regional context. By creating more sustainable greenbelts it lessens some of the negative environmental impacts from the construction of the surrounding community and Provides many more opportunities for recreation, alternative and safer transportation routes, and wild life habitat. Greenbelts afford flexibility in a large scale greenbelt system design by mixing the styles and intended uses it allows for better planning for sustainability.

Greenbelt Case Studies

The research looked at two case studies that provide illustrative examples of tools and strategies That could be applicable to the greener Greenbelt. They include: A summary of the lessons learned from the case studies is below.

6. Vitoria-Gasteiz greenbelt

Vitoria-Gasteiz is the capital of the Autonomous Community of the Basque Country in the north of Spain. It is a large municipality (covering just under 300 km in which the atlantic and mediterranean. it has some 240,000 people currently inhabiting this gem in northern Spain. Vitoria-Gasteiz is comprised of concentric circles, with the city itself at the center. The "Green Belt", a semi-natural green area partially reclaimed from degraded areas, surrounds the center and brings nature into the city (Berula erecta, 2012). The third circle is dominated by forestry and mountains.

The city has a high proportion of green public areas, ensuring that the entire population lives within 300m of an open green space. The Basque capital offers over ten million square meters of parkland and green areas for walking, cycling, bird watching and observing deer or riding.

Fig.3.location of Vitoria-Gasteiz

6.1. Problems

The idea of creating the Green Belt came about in the early 1990s with the aim of dealing with all the issues associated with the degraded state of the peripheral areas of the city of Vitoria-Gasteiz. When the project began, there were areas of high ecological value around the edge of the city, such as the forests of Armentia and Zabaglione. Although affected by problems of erosion, fires, etc., they had managed to survive the urban and industrial expansion of the city in the form of gravel pits, landfills and other degraded spaces that threatened the survival of the remaining natural areas (City of Vitoria-Gasteiz, 2012). The area offered low levels of security for visits or going for walks and had become a physical and social barrier between the urban environment and the adjoining rural milieu. in order to resolve the existing problems and to restructure or take advantage of these clearly residual, undervalued periurban spaces, the Environmental Studies Centre of the Town Hall of Vitoria-Gasteiz decided to undertake a large-scale project that would embrace all the outlying districts of the city and provide a solution both for its more developed areas and for its natural spaces.

6.2. Objectives

The idea to create a network of green, periurban spaces also found support within the framework of the 1986 General Urban Development Plan, which proposed to extend the system of green urban areas to include a number of spaces located on the edge of the city as follows (European Commission, 2009):

1. Promote the conservation of natural periurban spaces and the ecological restoration of other recoverable spaces, creating a natural continuum around the city.
2. Integrate the city's periurban parks within the urban layout and connect these at the same time to the natural environment, thereby improving the physical and ecological accessibility between the main green areas and natural spaces of the municipality.
3. Develop periurban spaces in order to promote their use by the public and satisfy to some degree the growing demands of the inhabitants of the city for open-air leisure areas and to relieve, at the same time, the pressure on other, more fragile natural spaces.
4. Take advantage of the recovery and development of these new spaces to encourage environmental awareness and education with the ultimate aim of involving the inhabitants of the city in their conservation.

6.3. Outer Greenbelt concept

Green Belt is a group of periurban parks of high ecological and landscape value, strategically linked by means of eco-recreational corridors. The Green Belt is the result of an ambitious project initiated in the early 1990s, the main of which was to restore and recover the outlying areas of Vitoria-Gasteiz, both from the social and public use viewpoint; the Green Belt offers a multitude of opportunities for walking, leisure and the pure enjoyment of being in contact with nature. It is also fast becoming the ideal location for educational activities and initiatives, designed to increase the public's awareness of environmental issues.

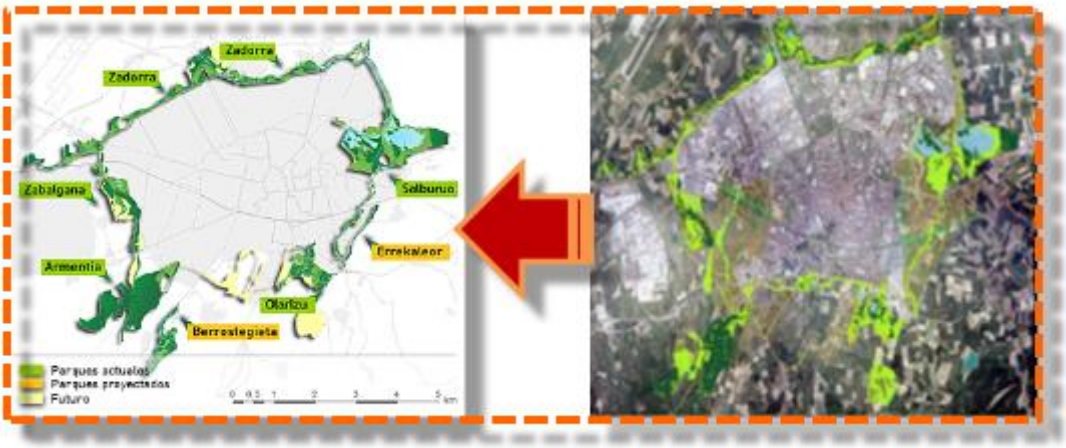

Fig.4. the outer greenbelt of Vitoria-Gasteiz

Nearly 100% of the residents of Vitoria-Gasteiz live within 300 meters of a green area, and nearly a third of the urbanized area of the city is in parks and nature. It is easy to get to even quite large natural areas as a result of the city's extensive network of trails and footpaths. Especially interesting is the City's effort to develop an "interior" green belt while connecting the green spaces around the city.

6.4. Inner greenbelt

The superimposing of different spaces and elements identified as forming part of the future urban green infrastructure of Vitoria-Gasteiz forms a grid or network that becomes more concentrated towards the center of the city, defining an interior greenbelt. Peril-urban Green Belt, Agricultural Belt and the Upland Ring- linked by means of radial axes that would act as Ecological corridors. (10)The work on the main spaces and on the connecting axes, through naturalization actions and environmental enhancement of different kinds both in the urban space and in the region, will contribute to the consolidation of a stable ecological system that will improve the environmental quality of the city and improve the health and welfare of citizens

Fig.5. **the inner greenbelt of Vitoria-Gasteiz**

6.5 The layers of a greenbelt in Vitoria-Gasteiz

A holistic approach based not only in construction but in integrated and sustainable urbanism, it includes:

6.5.1. Renovation and refurbishment of buildings Refurbishment of the Europa Congress Centre, with thermal isolation, PV installations and green roof and façades. Also a new street lighting system with efficient lamps with "starlight" criteria, reducing pollution.

6.5.2. Water management the rise of the Batan River and the installation of natural drainage systems will collect rain water and take it to Zadora river instear of the Water Treatment Plant, reducing energy consumption.

6.5.3. Biodiversity Ecological corridor connecting inner city with the outer Green Belt, Zadora River and Vitoria Mountains. Re- surface of the Batan River creating a river ecosystem.

6.5.4. Renovation of the public space Improvement of the public space and quality of life for citizens, with the inclusion of community gardens, game areas for children, etc.

6.5.5. Mobility Improvement of sustainable mobility, with bike lines, widening of sidewalk sections, reduction of car lanes and access priorities to public tram and buses

6.7. North axis

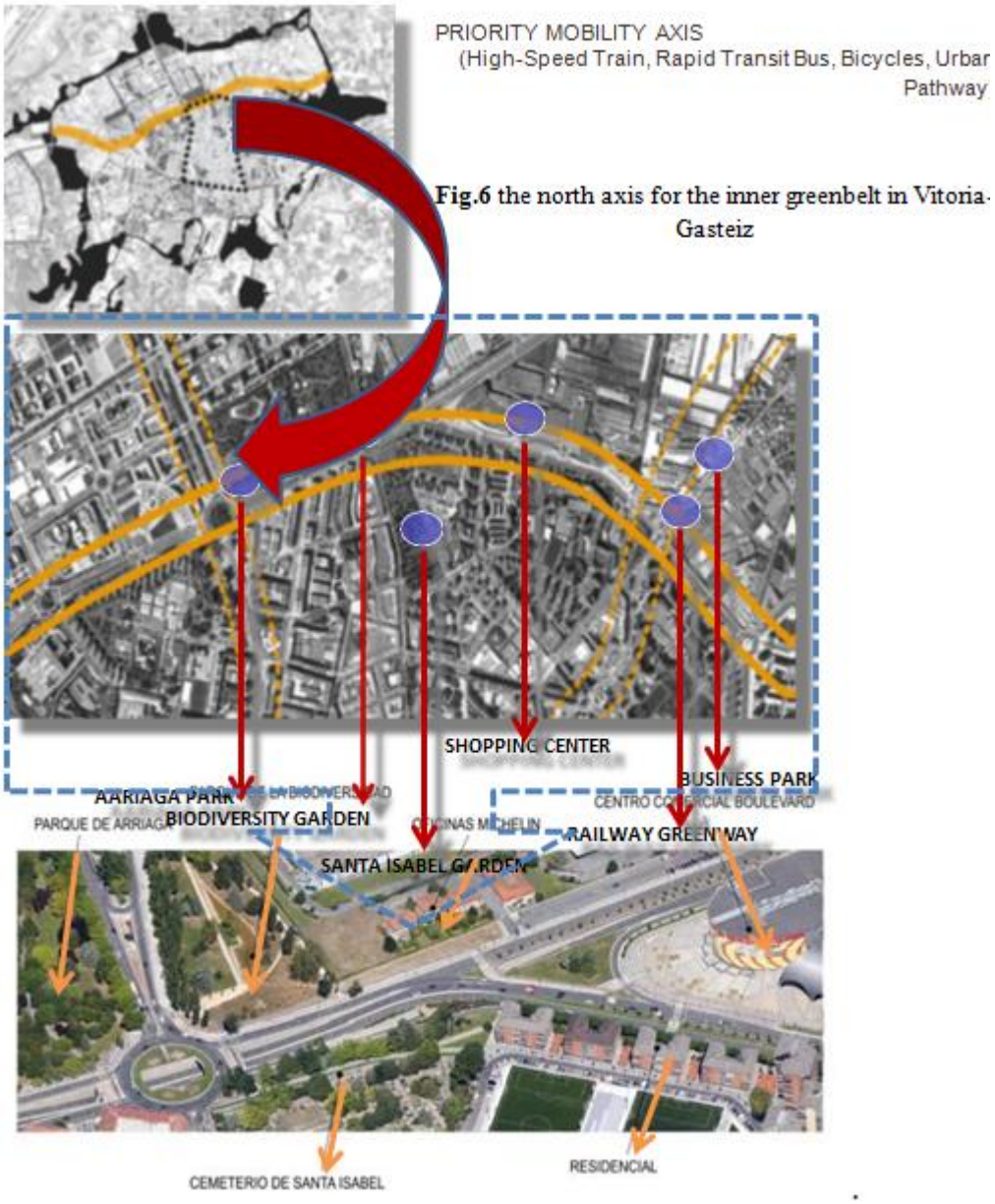

Fig.6 the north axis for the inner greenbelt in Vitoria-Gasteiz

The proposal for the north axis of the inner green belt in Vitoria-Gasteiz looks to create a new urban forest and meadow landscape that will act as green infrastructure for the city (UN-Habitat, 2010). Urban meadows would reduce maintenance costs from mowing, help mitigate storm water runoff, and provide urban wildlife habitat. An urban forest would reduce air pollution, reduce urban temperatures and provide wildlife habitat among other benefits. Both would improve the quality of life and personal health of residents by adding color, texture, and natural character to the city, which has been shown to provide psychological benefits for citizens.

6.8 East axis; the proposal for the east axis of the inner greenbelt involves

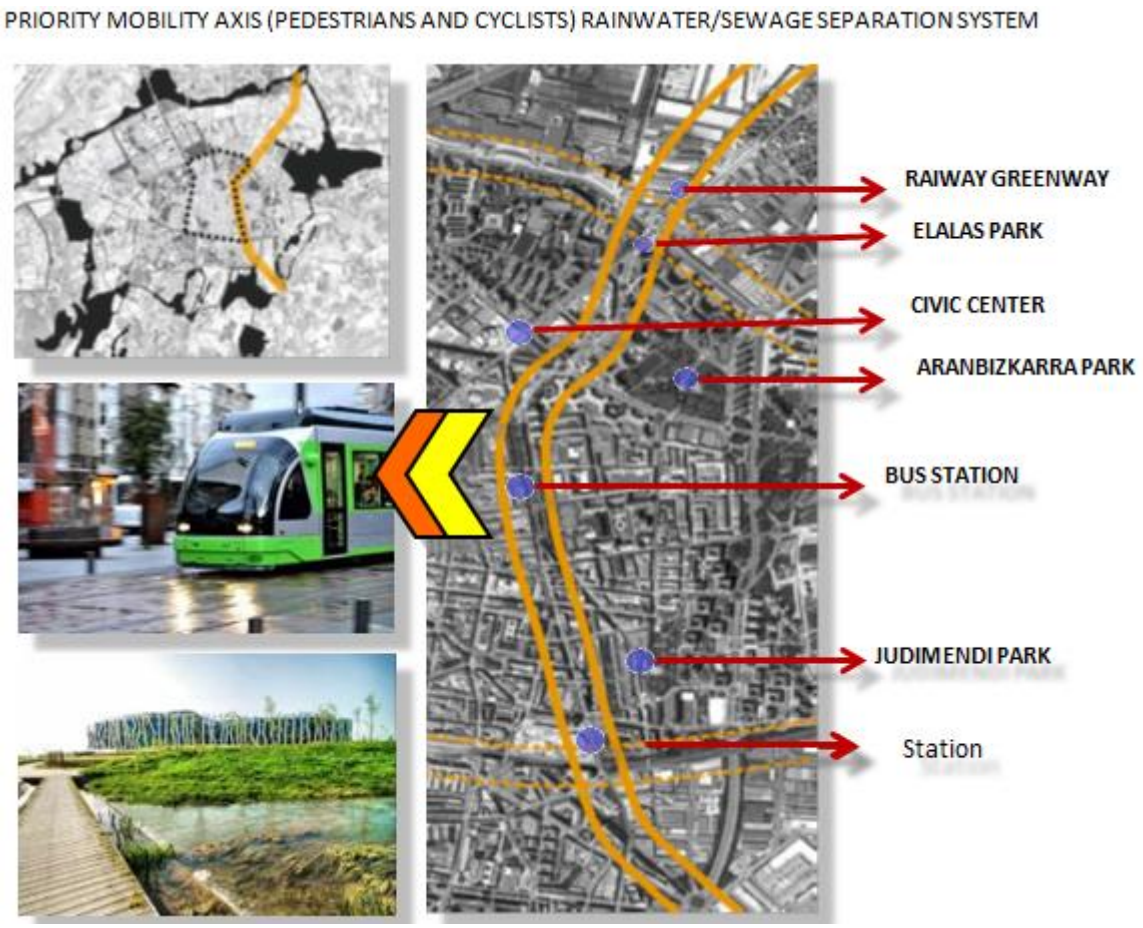

Fig.6.the east axis for the inner greenbelt in Vitoria-Gasteiz

- Widening the axis to provide parallel corridors, one for vehicles and one for pedestrians
- Expanding on the typical park landscape to include urban farms to support biodiversity.
- Developing a diverse set of strategies for storm water, from canals to bios wales that also reference the regional-scale topographical and hydrological.Table (1) the "Layers" of a Greenbelt in Vitoria-Gasteiz

RENOVATION AND REFURBISHMENT OF BUILDINGS

Photovoltaic systems on roofs for energy self – sufficiency.

Introduction of **green building** criteria and techniques that favor efficiency and savings in the consumption of energy, water and materials; the generation of renewable energy and an increase in bio capacity and biodiversity

WATER MANAGEMENT

Transformation of conventional rainwater treatment systems into **urban sustainable drainage systems**, reducing the Introduction of rainwater into the sewer system.

Rainwater reception systems.

Infiltration tanks that act as surface impoundment areas where the water is

stored until infiltration

URBAN GREEN DESIGN AND MANAGEMENT

integration of functional urban designs and the **generation of habitats for Insects, small birds and pollinators**.

Designs of green spaces based on floral compositions of a seasonal nature, with therapeutic purposes

RENOVATION OF THE PUBLIC SPACE

Creation of **multifunction urban**

elements as meeting spaces with efficiency criteria and the generation of power, the use of recycled materials.

public sculptures

elements in open spaces

MOBILITY IN THE CITY

Network of bicycle lanes and public transport,

Public transport connecting the city center and suburbs

Ontario's greenbelt

Fig.6.the location of Ontario- Canada

Urban sprawl is gobbling up green space in southern Ontario at an unprecedented rate. At the current rate, an additional 260,000 acres (1,070 km2) of rural land will be urbanized by 2021, almost double the size of the City of Toronto. About 92% of the land is Ontario's best farmland Sprawling patterns of growth unnecessarily destroy green space and farmland, pollute rivers, streams and other waterways and force us to be overly dependent on vehicles, which in turn fuel air pollution and global climate change (Carter-Whitney, 2010). In southern Ontario, the area around Toronto is a densely populated and industrialized urban region, known as the Golden Horseshoe. The Golden Horseshoe area of Ontario is growing by more than 115,000 people per year. In 15 years, it will be the third largest urban region in North America behind only New York and Los Angeles.

7.2 Ontario greenbelt

Created in February 2005, the Ontario Greenbelt is made up of 1.8 million acres (728,000 hectares of land in the golden horseshoe around Toronto) and includes 800,000 acres (323,000 hectares) of land that are also protected by Niagara escarpment plan and the oak ridges moraine conservation plan. The Greenbelt was established to safeguard the quality of life in the Golden Horseshoe in anticipation of continuing population growth and urbanization. The population in the area is expected to increase by approximately 4 million to a total about 11 million people by 2013.

7.2.1. Greenbelt Vision

The Greenbelt is a broad band of permanently protected land which: (Fung & Conway, 2007)

• Protects against the loss and fragmentation of the agricultural land base and supports agriculture as the predominant land use.

• Gives permanent protection to the natural heritage and water resource systems that sustain ecological and human health, and that form the environmental framework around which major urbanization in south-central Ontario will be organized.
• Provides for a diverse range of economic and social activities associated with rural communities, agriculture, tourism, recreation and resource uses

7.2.2 The "Layers" of a Greenbelt in Ontario Canada

The Greenbelt Task Force considered five "layers" for the proposed greenbelt that will provide a framework for stakeholder and public consultations. These are: (MacDermid, 2006).

- Environmental protection.
- Agricultural protection.
- Transportation and infrastructure.
- Natural resources, particularly mineral resources.
- Culture, tourism and recreation opportunities.

Environmental Protection

Protecting green space helps to ensure the maintenance or enhancement of a number of important environmental benefits that contribute to healthy communities and an enhanced quality of life, including:

- Biodiversity through protection and restoration of representative natural areas, wildlife habitat, species at risk, and connectivity.
- Clean air and clean, abundant water.
- Varied and scenic landscapes.
- Outdoor recreation opportunities, including places to enjoy and learn about nature and the outdoors.

Proposed Approaches to Environmental Protection

The task force is considering a systems approach for environmental protection in the greenbelt, this system should include: (MPIR, (2008)

- Provincially significant and/ or major natural heritage and hydrological features and functions (e. g., Oak Ridges Moraine, Niagara Escarpment, Rouge Valley).
- connections between these major features and functions, including public park/ open space lands and stream/ river valley linkages to major water bodies such as the Great Lakes and Lake Simcoe

- Agricultural Protection

Protection of the specialty crop area land base while allowing supportive infrastructure and value added uses necessary for sustainable agricultural uses and activities; Protection of prime agricultural areas by preventing further fragmentation and loss of the agricultural land base caused by lot creation and the resignation of prime agricultural areas ; Provision of the appropriate flexibility to allow for agriculture, agriculture-related and secondary uses , normal farm practices and an evolving agricultural/rural economy; and Increasing certainty for the

agricultural sector to foster long-term investment in, improvement to, and management of the land.

Proposed Approaches to Agricultural Protection

- An inventory of groundwater resources and a data management system.
- A long-term monitoring network of water levels for major aquifer systems.
- Identification and protection of sensitive aquifers and groundwater recharge areas.
- An inventory of current and past uses of groundwater and sources of groundwater contamination and an evaluation of their potential effect on health and ecosystems, including cumulative impacts.
- A strong regulatory program aimed at preventing contamination.
- An economic assessment of groundwater value, including current and replacement value
- A means of coordinating decision-making between all ministries and agencies that have jurisdiction over groundwater.

Transportation and Infrastructure

- Major infrastructure facilities that have influenced and supported past growth are located within the proposed Greenbelt Study Area. These facilities will continue to influence future growth, as well as the forms and locations of new, connecting infrastructure facilities.
- Major water and sewer systems that serve millions of residents; the Pearson and Hamilton international airports; transportation arteries such as the Queen Elizabeth Way and highways; major commuter and freight rail lines; the Parkway Belt West utility corridor; electrical generation plants and major transmission corridors; and natural gas and fiber-optic cable installations are located within the Golden Horseshoe area (Taylor and Nostrand, 2008).

Proposed Approaches to Transportation and Infrastructure

- If it is consistent with the Greenbelt Task Force vision and goals, the Province's growth management plan and the coordination of provincial, regional and municipal infrastructure planning, then infrastructure (including highways, water, sewer, power, alternative energy facilities, telecommunications/ cell towers, waste/ recycling facilities, etc.) would be permitted in the greenbelt.
- Locate infrastructure only in areas where there is a demonstrated need.
- The Province should review the way in which need for infrastructure is assessed, to ensure proposed infrastructure reinforces growth management and greenbelt objectives.

- The Province should also review the environmental assessment process to ensure that the consideration of alternatives reflects emerging technologies, innovative designs, and an appropriate balance of roads and transit.

Natural Resources

The proposed Greenbelt Study Area is abundant with a number of important natural resources, including forestry, water and wildlife. While the task force has concentrated its discussions primarily on mineral resources.

Proposed Approaches to Natural Resources

- Given the importance of the availability of aggregates close to market, as identified in the Provincial Policy Statement, high potential aggregate areas should be a consideration for inclusion in the greenbelt and should be protected from incompatible land use.
- Aggregate extraction in the greenbelt should be subjected to a more rigorous approach to rehabilitation. Depleted mineral aggregate operations should more aggressively be brought into uses that would support or enhance the objectives of greenbelt protection. (Urban Strategies Inc. and Leah Birnbaum, 2010)
- The Province should clarify appropriate provincial and official plan policies surrounding new licenses for aggregate extraction.
- The Province should review the licensing process to facilitate new supply and ensure the integrity of hydrogeological and ecological systems, features and functions, taking into account the requirement to rehabilitate.

- Encourage Culture, Recreation and Tourism Opportunities

The Greenbelt Plan's goal is to provide opportunities for a wide range of open space and recreation, sustainable tourism development and the conservation and promotion of cultural heritage resources.

Proposed Approaches to Culture, Recreation and Tourism (Taylor and Nostrand, 2008)

- The greenbelt should be a publicly valued and important venue for cultural heritage and related activities, recreation and tourism in the Golden Horseshoe. This should be accomplished through promotion and marketing initiatives to support community economic development.
- Culture, recreation and tourism opportunities should respect and be compatible with other greenbelt priorities (e.g., agriculture, natural resources and ecosystem protection) Recognized and promoted cultural sites, districts and landscapes important for community identity, history and character.
- A network of protected public open spaces where people can enjoy recreational and leisurely pursuits. This network includes: provincial parks (e. g. Bronte Creek); conservation areas; navigable waterways; and municipal parks and forests.
- Private lands with recreation, tourism and conservation uses.

- a system of trails on public and private lands, supported by a provincial regulatory framework to address issues such as location and design, user conflicts, public safety and liability .

Tourism destinations that support and depend on farms, natural areas and rural communities.

Table (1) **the "Layers" of a Greenbelt** in **ontario-canada**

nvironmental protection  Photovoltaic building. **Pedestrian Amenities on a Downtown Street** Clean Air commute, Ontario, Canada. landscape in Ontario -    Canada	  **Agricultural protection** Students study modern practices  for greenhouse crops **Coastal wetland indicators have been chosen for Lake**  **Ontario, and will be used to develop a new binational monitoring program for Lake Ontario wetlands.** **Petrel Point Nature Preserve, Ontario, Canada**	**Transportation and infrastructure** Intermodal train in Ontario    **New model for infrastructure in Ontario – Canada**    Waste water treatment plant upgrade.	**Natural resources** Ontario wildlife **landscape ontario –green for life**   	**Culture, tourism and recreation**  art gallery in Ontario -Canada   Pukaskwa National Park this is in the town of white river along the northeast shore of lake superior. World water park in Ontario Canada  

A GREENER GREENBELT

The goals for the greener greenbelt is a hybrid design which integrates the greenbelt goals and blending the sustainable features as well as including new design ideas based on the research.

The Greener Greenbelt can help to make a difference to both the community and City. For the community, the greenbelt will continue the alternative means of travel and safe routes and for the City provide a greenbelt that not only provides additional open space but does so in a more sustainable manner, requiring fewer non-renewable resources and lower operational costs.

Fig.8 layers for greener greenbelt

The greener Greenbelt considered five "layers" for the proposed greenbelt that will provide a framework for stakeholder and public consultations. These are:

- Environmental protection.
- Agricultural protection.
- Transportation and infrastructure.
- Renovation of the public spaces.

Culture, tourism and recreation opportunities

Conclusion

The greener Greenbelt concept is expected to achieve the far-reaching Greenbelt vision. The Greenbelt has been recognized as contributing significantly to achieving a sustainable community. The primary purpose of the Green Belt is to prevent sprawl and the merging of communities; it is not a landscape protection policy. Greenbelts help to make a place more livable, providing opportunities for recreation and Alternative means of transportation while also providing a scenic and natural setting in an urban area. Sustainability in a greenbelt system relies

on many factors such as environmental, agriculture protection, transportation and infrastructure, renovation of the public spaces and recreation opportunities. It is not possible to label a single design as sustainable or unsustainable, but rather in how it meets its design goals and its levels of usage.

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