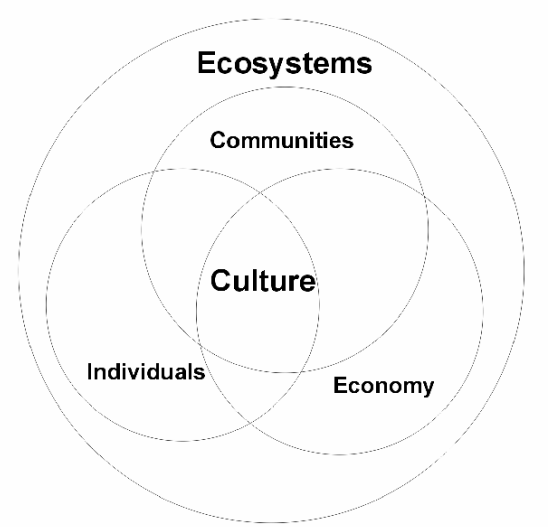
BACKGROUND DISCUSSION DOCUMENT FOR ECOLOGICAL FOOTPRINT CONSIDERATIONS

What do we mean by "sustainability" ?

"Sustainability" is defined so as to recognize two inherent things:

- the human element (culture) which considers the individual, the social interactions that occur in communities, and the interactions for goods and services in the economy; and
- that all activities are contained and constrained by ecosystems.



Based on this definition, development parameters for the demonstration projects should consider physical, social, and economic aspects.

Aspects of Sustainability

Physical:	**Social:**	**Economic:**
Air quality	People	Responsible return on investment
Water (hydrology)	Place	Sustainable livelihoods
Land/sustainable site	Process	
Energy		
Building materials		

Adherence to the Four Systems Conditions for sustainability as defined within The Natural Step are also important considerations to the project.

In order for a society to be sustainable, nature's functions and diversity are not systematically:

1. subject to increasing concentrations of substances extracted from the Earth's crust;
2. subject to increasing concentrations of substances produced by society; and
3. impoverished by over-harvesting or other forms of ecosystem manipulation.

And in a sustainable society,

4. resources are used fairly and efficiently in order to meet basic human needs globally.

Sample Aspects of Physical Sustainability from the Business Plan for an Ecovillage at River Landing planned by the Prairie Ecovillage Development Corporation

Physical Consideration	Resolutions Guiding Integrated Detailed Design
Air Quality	
a) What climatic factors will affect air quality?	Consider pollution and noise from adjacent freeway; Saskatchewan's dry climate will also be a factor
b) What can be incorporated into the construction of the project to maintain good air quality?	Remediate with vegetation and landscaping, minimize site use of fossil fuels; low volatile organic compounds (low VOC or non-toxic) building materials; identifying carbon sinks
c) How might the operation and maintenance of the site affect air quality?	Limit and restrict pesticide use and toxins; utilize trees; minimize automobile traffic at site
d) What might be important consideration related to noise?	Sound attenuation using of trees and vegetation, water features, and sound walls
Water (Hydrology)	
a) How will water be sourced?	City water (drinking); rain water capture in cisterns for irrigation purposes; some grey water reuse
b) How can water consumption be minimized?	Uniquely-designed plumbing fixtures; low-flow taps and showerheads; xeriscaping; water use policies; some grey water reuse
c) How might water be re-used or recycled?	Rain water capture and some grey water reuse
d) How will wastewater be treated?	Heat capture from grey water; some grey water reuse; City sewage treatment; potential to explore on-site primary treatment for use in irrigation
e) How will storm water and site drainage be handled?	Rain water capture in cisterns; green roof and permeable surfaces; all storm water to be managed on-site
Sustainable Site/Land	
a) What ecological assets and constraints exist?	Riverbank parks and trails; opportunities for bio-mimicry; indoor and outdoor landscaping and garden plots; dense urban development requires intensive approach to landscaping
b) What land uses might be contained on the site?	Medium-density residential; live-work; commercial space; horticulture; community space
d) How could incorporating nature into the design of the site minimize the potential negative impacts on the ecosystem?	Solar access allows for daylighting, solar heating, and solar energy generation; natural ventilation; some wind energy potential; on-site water management
Building Materials	
a) How could the project be developed so as to minimize the consumption of building materials?	Priority given to use of recycled materials, where possible; value engineering and open-concept floor-plans to minimize quantity of building materials required
b) What is the potential to re-use or recycle building materials?	Strong network of members available to source materials
c) What might be reasonable criteria for choosing building material?	Materials should have some or all of the following characteristics: reusable, non-toxic, low embodied energy, in compliance with building codes, meets all other specifications set out through design charrette
Energy	
a) What are the preferred sources for energy including heat, electricity, and the potential of passive system?	Energy and electricity systems will include solar, wind, ground-based heat-storage, and green electricity purchased from City grid
b) What features might be incorporated into the project to reduce consumption?	EnergyStar appliances; some appliance sharing (eg. laundry facilities); use of daylighting, vegetation and natural ventilation; superior insulation
c) What is the potential for re-using and recycling energy?	Ground-based heat-storage; wastewater heat recovery; air-to-air heat exchange
d) How can energy systems contribute positively to nature?	Excess energy generation expected to be available for sale

Sample Specific Energy Considerations (excerpt from Business Plan for Ecovillage at River Landing)

A System Options Report has been drafted for the Ecovillage at River Landing project by Integrated Design and the Saskatchewan Research Council (Appendix H). This report identifies and evaluates energy conservation and efficiency technologies and measures, utilization (and/or generation) of renewable and alternative energy, and other sustainable features available in the marketplace today. These measures were grouped into four packages and are summarized in Table 1.2 of the report. Each package contains measures that result in a performance efficiency that ranges from 50% over standard practice to a Net Zero (or 100% efficient) project. The technologies recommended in the report are considered to create the smallest ecological footprint while at the same time remaining economically viable for the Ecovillage at River Landing.

According to the report:

> *Energy conservation has always been the most cost effective method for meeting comfort conditions in buildings, and forms the primary recommendation of this report. Before any of the renewable/alternative technologies described in Section 4 are implemented, the energy conservation and efficiency measures in Section 3 should be maximized. High R-value walls, high R-value roof, high quality windows, heat recovery, compact fluorescent lights, programmable thermostats and energy star appliances are the first step. Meters in each suite, showing the consumption of natural gas, electricity and water, will have the greatest impact in maintaining efficiencies over the long term.*
>
> *Solar thermal technology, coupled with a long term storage means and possibly a water source heat pump system, is a technology that lends itself well to an urban setting such as the River Landing location.*
>
> *Solar electric technology, which has a high capital cost, should be used in places such as the pumping system for the solar thermal system where the photovoltaic power output matches well with the load. If an agreement can be negotiated with the electric utility regarding the inter-tie of a photovoltaic generation system with the grid, the implementation of this system may be more cost effective.*
>
> *Wind and biofuels do not work well in an urban setting, and are not recommended technologies for this project.*
>
> *Run-of-river hydro may be a technology worth pursuing in order to increase the profile of the project with investors. Significant additional engineering would be required to determine the viability of a system like this in Saskatoon.*
>
> *If the Ecovillage were able to make all of the pieces fall together to capture waste heat from the Queen Elizabeth power station, there would be a significant benefit to the rest of the community. There may also be other waste heat sources available, which should be investigated.*
>
> *Maintaining grid connections to natural gas and electricity is recommended. The cost of these connections is fairly small in an urban in-fill location. A grid connection for natural gas provides a backup source to be utilized only as necessary. If the technology improves or the Ecovillage implements further renewable sources in the future such that natural gas is no longer required, the connection can be severed at that time. The connection to the electric grid allows the grid to be used as an energy storage medium if there is excess electrical energy generated by on-site means.*

Aspects of Social Sustainability

People

Creating homes (rather than housing) that focuses on people and community.

Good examples of creating social sustainability can be found in research on inclusive housing (see attached slides).

Some typical common spaces that facilitate social sustainability include:

Large kitchen	Laundry	Dining room	Guest room
Lounge	Studio	Recreation room	Craft room
Office	Workshop	Pedestrian paths	Gardens

Some typical programming includes:

Potluck dinners	Movie nights	Morning coffee	Book club
Birthday and holiday celebrations			

To accomplish social sustainability, often designs will incorporate a variety of housing unit types to allow for resident diversity in terms of income, age, and other demographic characteristics. Affordability of the homes is an important consideration and the goal is to ensure no individual investor pays more than 30% of their personal income to cover housing costs.

Place

Selecting a location that is supportive of the people who live there is also of paramount importance – especially for those who may have limited means of transportation, require childcare in close proximity, are involved in training activities, etc.

Some suggested location criteria to consider include:

environmental quality	solar access
distance from city centre	proximity to amenities/services
access to public transport	aesthetics
compatibility with surrounding neighbourhood	noise
child-friendly	site configuration
ownership	purchase/lease opportunity
land costs	timeline to develop
zoning considerations	other opportunities/challenges

Planning Process

Allowing for inclusive decision-making processes also contributes to social sustainability. The following is a sample (again from the PEDCO Business Plan for an Ecovillage at River Landing).

Project Phase	Project Identification and Qualification	Incorporation and Management	Identification of Technical Assistance Supports and Expertise	Project Planning and Feasibility Assessment	Business Plan Development	Sourcing Financing	Construction	Post Project Evaluation
Milestones	Establish development objectives *(Nov05-Apr06)* Site Selection (*Nov-May06)*	Incorporate a membership entity *(Feb-Mar 06)* Establish reporting mechanisms and timelines *(Sept 06)* Develop prospectus to attract investors *(Fall 06 - Spring 07)*	Secure project development funding to support planning and pre-development work *(Feb-Sept06)*	Identify technological & social features based on development objectives *(Jan–Jun 07)* Develop initial financial model including estimate of construction costs/financing options *(Oct-Dec06)* Host design charrette *(Mar-Jun 07)*	Consolidate and confirm concept plans and financial information into a business plan *(Jun-Sept07)*	Conduct pre-sales *(Apr-Dec07)* Secure construction funding and financing using completed business plan *(May-Jun07)*	Begin construction *(Fall 07 or earliest availability of site)*	End construction *(Fall 08 or one-year from construction commencement)*

Aspects of Economic Sustainability

Responsible Return on Investment

Economic sustainability means more than economically-viability. It also means generating a responsible return on investment based on the economic reality that all housing projects must not only cover costs, but generate enough return so as to mitigate all risks associated internally or external to the project.

Some examples to help illustrate these include:

- internal risks: management experience; cost of financing; cost-overruns; incorporation of new technologies and approaches; design complexity; and shifting sales demand.

- external risks: availability challenges and increasing costs for labour and materials; and competition for consumers.

Sustainable Livelihoods

The concept of sustainable livelihoods is based on a community economic development framework that identifies human, natural, financial, physical, and social capital as important components to development that is supportive of people. A sustainable livelihood is defined as one that increases the capital base (stock of assets). Conversely, in an unsustainable situation, assets are spent as if they were income thereby leaving less for the future (or future generations).

The following has been excerpted from the Business Plan for an Ecovillage at River Landing to illustrate the components of Sustainable Livelihoods.

Stock of Assets/The Capital Basis for a Sustainable Livelihood	**Resolutions Guiding Integrated Detailed Design**
Human Capital *Creating opportunities for increased well-being through skill development, creative outlets, personal growth, and health promotion.*	Opportunities for clean-air and active transportation are integrated into the concept plan for the Ecovillage. Amenity spaces include studios and courtyards to enhance the opportunity for personal growth. The demonstration aspect of the project also provides an opportunity for increased skill development and knowledge.
Natural Capital *A safe and healthy environment that uses less of the natural resource base and avoids future conflicts over dwindling resources.*	The "green" technologies built into the design of the Ecovillage ensure at least a 60% improvement in energy performance for the project along with other resource efficiencies.
Financial Capital *Opportunity for asset-building by ensuring expenditures remain below income and providing opportunities for income-generation.*	A conserving approach to design ensures capital costs remain reasonable for investors to avoid large ongoing mortgage costs. Energy and other resource efficiencies also reduce long-term costs faced by investors and allows them to take a *green mortgage** approach to financing their purchase to keep it affordable.
Physical Capital *Secured basic needs (eg. shelter, energy, food, services, information, etc) at affordable rates.*	Housing affordability, on-site food production and other income-generating opportunities, proximity to services, and location within the heart of the city all contribute positively to the physical capital of the Ecovillage.
Social Capital *Opportunity for membership within a connected group where relationships of trust and reciprocity exists.*	Common facilities, courtyards, and community programming all contribute to the social capital of the Ecovillage.

* ***Green mortgage*** - The Ecovillage at River Landing project will achieve substantial utility-cost savings that could potentially allow an investor to use the same monthly housing expenditure to purchase a larger mortgage. The following example illustrates the potential of a green mortgage.

Sample Mortgage Worksheet - Illustration of Green Mortgage Potential

	PEDCO Unit		Market Unit
Purchase Price	$ 200,000		$ 200,000
Downpayment (minimum 5%)	$ 10,000	5%	$ 10,000
Mortgage Required (Principle)	$ 190,000		$ 190,000
CMHC Insurance Premium (3.75% or waived for green project)	waived		$ 7,125
Total Mortgage Debt	$ 190,000		$ 197,125
Total Monthly Payment (P+I+T)			
Mortgage Principle + Interest (assuming 6.75%; 25 year amort)	$ 1,313		$ 1,362
Property Taxes	$ 357		$ 357
Total	$ 1,670		$ 1,719
Minimum Gross Household Income Required @ 30% GDS	**$ 66,799**		**$ 68,768**
Other Monthly Costs to Consider			
Heating	$ 40		$ 100
Power and Water	$ 45		$ 75
Insurance	$ 35		$ 35
Maintenance	$ 18		$ 35
Total Monthly Costs (incl Mortgage)	$ 1,807		$ 1,964
Approximate Gross Income Required @ 35% Total Shelter Costs	**$ 61,971**		**$ 67,344**

Based on ratio of income to mortgage cost. Note that qualification also includes other debts, which must not exceed 42% of gross income.

OPTIONAL USE OF RESIDUAL MONTHLY UTILITY SAVINGS

Monthly amount available from utility savings	$ 157
Additional mortgage-able capital	$ 23,928
Total new mortgage (at $64,425 annual household income)	**$ 213,928**
Total new monthly costs (incl Mortgage)	$ 1,964

What is LEED?

- The Leadership in Energy and Environmental Design Green Building Rating SystemT (LEED) is a voluntary, market-based rating system for defining what elements make a building 'green' and to quantify how 'green' a building is in comparison to another building.

- LEED is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts. It encourages a whole building approach over a building's life cycle that guides a collaborative and integrated design and construction process.

- LEED, Canada NCv1.0 (adapted from US Version 2.1) applies to new construction and major renovation of commercial, institutional and high-rise residential buildings. In the future, additional LEED tools will be available for: core and shell, multiple buildings, residential projects, commercial interiors and existing buildings.

- Project teams (owners, developers, architects, and contractors) use the LEED rating system as a tool to help them determine green project goals, identify green design strategies, measure and monitor progress and document success.

- The development of the LEED Green Building Rating System was instigated by the members of the U.S. Green Building Council. The Council is a national non-profit organization whose membership is comprised of: contractors, architects, building owners, developers, financial institutions, product manufacturers, environmental groups, universities, utilities, research institutions and federal, state and local governments.

- The System has now been adapted for use in Canada under the Canada Green Building Council. In BC there is a Vancouver Branch of the Cascadia Chapter of US Green Building Council.

- Council members developed LEED to define "green building" by establishing a common standard of measurement; promote integrated, whole-building design practices, raise awareness of green building benefits and transform the building market.

How does LEED work?

- LEED provides a menu of green building measures in five environmental categories:
    - Sustainable Sites
    - Water Efficiency
    - Energy and Atmosphere
    - Materials and Resources
    - Indoor Environmental Quality

      Innovation and Design Process is an additional category where points can be earned for exceptional building design and

performance above the LEED requirements or innovative performance in green building categories not specifically addressed by LEED. Points are earned in each category. The points are performance based rather than prescriptive to encourage innovation and an integrated approach to design.

-
- After a building has been completed and the project team has submitted the project documentation along with the appropriate fee, the Council will certify the project as LEED Certified, Silver, Gold or Platinum based on the total number of points earned on a menu of green building measures.

(This excellent summary courtesy the BC Construction Association)

What about LEED for Homes?

LEED for Homes is a voluntary rating system that promotes the design and construction of high performance "green" homes. A green home uses less energy, water, and natural resources; creates less waste; and is healthier and more comfortable for the occupants. Benefits of a LEED home include lower energy and water bills; reduced greenhouse gas emissions; and less exposure to mold, mildew and other indoor toxins. The net cost of owning a LEED home is comparable to that of owning a conventional home.
The LEED Rating System is the nationally recognized standard for green building. LEED certification recognizes and rewards builders for meeting the highest performance standards, and gives homeowners confidence that their home is durable, healthy, and environmentally friendly

What are ENERGY STAR Qualified New Homes?

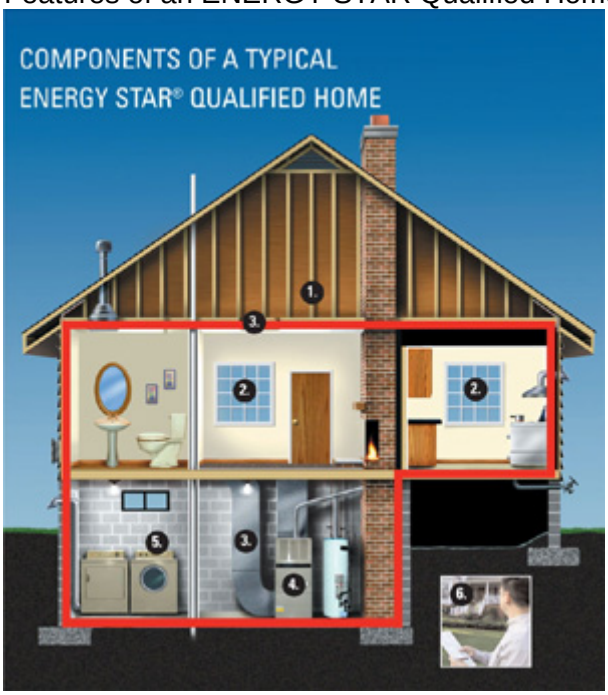
Homes that earn the ENERGY STAR must meet guidelines for energy efficiency set by the U.S. Environmental Protection Agency. ENERGY STAR qualified homes are at least 15 percent more energy efficient than homes built to the 2004 International Residential Code (IRC).

ENERGY STAR qualified homes can include a variety of energy-efficient features, such as effective insulation, high performance windows, tight construction and ducts, efficient heating and cooling equipment, and ENERGY STAR qualified lighting and appliances.

These features contribute to improved home quality and homeowner comfort, and to lower energy demand and reduced air pollution. ENERGY STAR also encourages the use of energy-efficient lighting and appliances, as well as features designed to improve indoor air quality.

Homebuyers across the country are increasingly interested in green building. When looking to build or buy a green home, energy efficiency is the place to start. That's because the energy used in homes often comes from the burning of fossil fuels at power plants, which contributes to smog, acid rain, and risks of global climate change. So, the less energy used, the less air pollution generated. And the easy way to make sure a new home is energy efficient is to look for the blue ENERGY STAR mark, the government-backed symbol for energy efficiency.

Features of an ENERGY STAR Qualified Home



ENERGY STAR qualified homes are at least 15 percent more energy efficient than homes built to the 2004 International Residential Code (IRC).

Any home three stories or less can earn the ENERGY STAR label if it has been verified to meet EPA's guidelines for energy efficiency. This includes site-constructed homes,

attached or detached homes, single or low-rise multi-family residential buildings, manufactured homes, systems-built (e.g., SIP or modular) and log homes, existing homes, or retrofitted homes.

ENERGY STAR qualified homes achieve energy savings through established, reliable building technologies. Builders work with Home Energy Raters to select from a number of features when planning and building homes. See the attached files for more information.

1. Effective Insulation

Properly installed, climate-appropriate insulation in floors, walls, and attics ensures even temperatures throughout the house, less energy consumption, and increased comfort.

2. High-Performance Windows

Energy-efficient windows employ advanced technologies, such as protective coatings and improved frame assemblies, to help keep heat in during winter and out during summer. These windows also block damaging ultraviolet sunlight that can discolor carpets and furnishings.

3. Tight Construction and Ducts

Sealing holes and cracks in the home's "envelope" and in duct systems helps reduce drafts, moisture, dust, pollen, and noise. A tightly sealed home improves comfort and indoor air quality while reducing utility bills.

4. Efficient Heating and Cooling Equipment

In addition to using less energy to operate, energy-efficient heating and cooling systems can be quieter, reduce indoor humidity, and improve the overall comfort of the home. Typically, energy-efficient equipment is also more durable and requires less maintenance than standard models.

5. Lighting and Appliances

ENERGY STAR qualified homes may also be equipped with ENERGY STAR qualified products — lighting fixtures, compact fluorescent bulbs, ventilation fans, and appliances, such as refrigerators, dish washers, and washing machines. These ENERGY STAR qualified products provide additional energy savings to the owner.

6. Third-Party Verification

With the help of independent Home Energy Raters, ENERGY STAR builder partners choose the most appropriate energy-saving features for their homes. Additionally, raters conduct onsite testing and inspections to verify that the homes qualify as ENERGY STAR.