

GREEN
INNOVATIONSMAKING CANADA
A GREEN WORLD
LEADER

Through a green lens: creating Canada's next steps
in the bio-economic landscape

**A greener
business**
Increasing your
triple bottom line



JOHN GORMAN

**Canada's
resources**
A bio-based
industry on the rise



GREEN IN YOUR HANDS

Driving Change
Making a move to
mobilize change

↓ THE 12 PRINCIPLES OF GREEN CHEMISTRY

1 Prevention
It is better to prevent waste than to treat or clean up waste after it has been created.

2 Atom Economy
Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product.

3 Less Hazardous Chemical Syntheses
Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.

4 Designing Safer Chemicals
Chemical products should be designed to effect their desired function while minimizing their toxicity.

5 Safer Solvents and Auxiliaries
The use of auxiliary substances (eg. solvents, separation agents, etc.) should be made unnecessary whenever possible and innocuous when used.

6 Design for Energy Efficiency
Energy requirements of chemical processes should be recog-

nized for their environmental and economical impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure.

7 Use of Renewable Feedstocks
A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable.

8 Reduce Derivatives
Unnecessary derivatization (use of blocking groups, protection/deprotection, temporary modification of physical/chemical processes) should be minimized or

avoided if possible, because such steps require additional reagents and can generate waste.

9 Catalysis
Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.

10 Design for Degradation
Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.

11 Real-time Analysis for Pollution Prevention
Analytical methodologies need to be further developed to allow for the real-time, in-process monitoring and control prior to the formation of hazardous substances.

12 Inherently Safer Chemistry for Accident Prevention
Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires.

SOURCE: ANASTAS, P. T. AND WARNER, J. C. GREEN CHEMISTRY: THEORY AND PRACTICE. OXFORD UNIVERSITY PRESS: NEW YORK, 1998, P. 30

CHALLENGES



By exploring the scope of sustainable business practices and building a bio-based economy, **Canada is stepping up our green game.**

Industrial biotechnology and Canada's role for the future

The world is starting to seriously embrace industrial biotechnology and the movement to green and more sustainable products, with the growing recognition of the positive impact on the reduction of CO2 emissions. In Europe, the policy is around "white biotechnology," which is industrial biotechnology. The European Union has a number of programs to encourage development of this sector. Europe has a long term focus on moving to more sustainable technologies, which will use the tools of white (industrial) biotechnology as a key to getting there.

More than green fuel

The World Wildlife Fund produced a global study and report, "Industrial Biotechnology - more than green fuel in a dirty economy?" (<http://www.energyboom.com/category/tags/world-wildlife-fund>). This report identifies our fundamental dimensions of the continuation of industrial biotechnology: improved efficiency, the substitution of fossil fuels, the substitution of oil based materials, and the creation of a closed-loop system with the potential to eliminate waste.

Collaboration is key

The United States recently released "The National Bioeconomy Blueprint," which outlines their five key objectives, one of which is fostering

partnerships, on which President Obama stated:

"We're all familiar with clusters like Silicon Valley. When you get a group of people together, and industries together, and institutions like universities together around particular industries, then the synergies that develop from all those different facets coming together can make the whole greater than the sum of its parts."

Europe, the United States, the World Wildlife Fund and several countries have embraced industrial biotechnology. Canada is one of those countries that have stepped up and are putting appropriate policies in place to capture the benefits and opportunities of the bio-based economy.

Call to action

A report by BIOTECCanada, "The Canadian Blueprint — Beyond Moose and Mountain — How we can Build the World Leading Bio-based Economy," provided some good recommendations for Canada to consider (<http://www.biotech.ca/en/policy-matters/beyond-moose-and-mountains/bio-techstories.aspx>). This industry-led blueprint is a call to action for Canada. Canada needs to and is embracing biotechnology and the bio-based economy as catalysts for our next phase of innovation and prosperity. Having a more sustainable and green economy is no longer mutually exclusive. The tools of industrial biotechnology are key to having both capacities in Canada as we possess one of the world's



Dr. Murray McLaughlin
President and CEO of Sustainable Chemistry Alliance and Executive Director of Bioindustrial Innovation Centre

largest and most impressive biomass supplies.

Canada's role

Canada is just beginning to move in that direction of increased sustainability, but still needs to work on regulations and policies that will help to expedite movement to a bio-based economy, and position Canada in a world leadership position. We are seeing several regional organizations taking up the challenge of establishing Canada in the leadership role.

Organizations like CRIBEQ (in Quebec); BioAtlantech (New Brunswick); BioAlliance (PEI); BioEnterprise and OAFI (Ontario); Ag-West Bio (Saskatchewan); CRIBE (Ontario Forestry); and others, are all pushing to make Canada a world leader in bio-

technology and sustainability. At the Sustainable Chemistry Alliance (SCA) located in Sarnia, Ontario, supported with federal funding from Bioindustrial Innovation Centre, a Centre of Excellence for Commercialization and Research (CECR), the focus is on the commercialization of bio-hybrid chemistry and sustainable technologies. To date SCA has made 11 investments of 5.2 million in the pilot to demonstration stages of technologies, creating over 1800 direct and indirect jobs and having over 130 million dollars of investment in Canada. SCA is one small piece of a much needed focus on the industrial biotech and sustainable technologies.

Vital partnerships

In Sarnia, a true cluster is building in the area of green and sustainable technologies, based on the concept of "fostering partnerships" and seeing the synergies develop from having all the right individuals come together within industry, college, universities, and local governments, to support the cluster.

As stated in the BIOTECCanada report:

"The challenge is to engage all Canadians in building a bio-based economy that becomes the foundation for a safer, cleaner, healthier and more sustainable future." Let's meet the challenge.

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Leaving behind a green footprint

Attaining greener habits is an easier transition than one may think. Canadian businesses are taking bigger strides in tackling green innovations. It has now become a noteworthy characteristic that leaves a positive reputation.

A green business can only take on the title entirely if it follows the right criteria - incorporating principles of sustainability into each of its business decisions, supplying environmentally friendly products and services that replaces the demand for non-green products, services, and making an enduring commitment to environmental principles in its business operations.

Positive alternatives

Canadian companies need to take into consideration the benefits of our renewable resources. Canada's large landmass and unique geography make it a top location for renewable energy.

There are many different meth-

ods of renewable energy sources. For instance, biomass is the method of removing usable energy from biological material in solid, liquid or gaseous form, and wind power can be transformed into mechanical energy, or electricity.

Currently, the most popular source is solar energy, which utilizes energy from the sun.

Business meets environmental happiness

The Ontario Environment Industry Association (ONEIA) is a business association that helps support the environmental industry in Ontario.

"While our industry is diverse, ONEIA provides a place where a variety of companies, entrepreneurs and other organizations, as a team, can be more efficient in creating a society that understands and values how the market can contribute to environmental problems." An association like ONEIA encourages businesses to think about the environment when making decisions.

Besides renewable sources, another

great alternative is incorporating green chemistry - the use of chemistry for pollution prevention - into the manufacturing process. It is a process that is applied to the design, manufacturing, and use of the chemical product. This substitute results in less waste, and safer products.

Green companies

There's an annual list of 100 Canadian companies that are cited to be "Canada's Greenest Employers," crafted by the editors of Canada's Top 100 Employers Project.

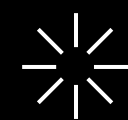
Companies are being recognized for various reasons, such as incorpo-

ating the creation of green teams at office locations to involve workshops on energy conservation as well as waste reduction initiatives.

Green accomplishments also include encouraging consumers to bring in old electronics for proper recycling, as well as making movements to integrate more renewable sources. Year after year, these top environmentally friendly companies model how society and businesses alike should make greener decisions.

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WE RECOMMEND



Debbie Baxter
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PAGE 07

"Stand-alone environmental building features are evolving into fully operational programs and sustainability is being integrated into core business strategies."

Eco-friendly chemicals p. 05
Game-changing green solvents

Intelligent sustainability p. 06
Strategic and holistic operational views



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GREEN JOBS: THE PLACE TO GO

Canada is facing enormous environmental challenges. Our resource industries are imposing demands on our natural environment, we need greener ways of producing and using energy, and our cities can still become more sustainable. More than ever, our national environmental agenda demands committed individuals that are ready to lend a hand.

Rise in green jobs

According to ECO Canada, jobs in the green economy are continuing to expand quickly. Private and public sector employers are seeking employees that understand the technical aspects of environmental challenges: everything from managing and reducing waste to restoring natural environments. Potential green employees must also have "softer" skills, such as being able to organize their work, communicate effectively on paper and in person, and work well with others.

Green graduate

Graduates of university environmental science and studies programs have these skills and knowledge. These programs are now available in every province. Some of the best have been accredited by ECO Canada. In 2010, Trent University's Environmental and Resource Science B.Sc. Program became the first Canadian environmental program to be accredited.

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PANEL OF EXPERTS

	Question #1 What is the future of green innovation in Canada?	Question #2 What is the value of integrating innovative sustainability strategies into business operations?	Question #3 What are the biggest misconceptions of the green industry?
 <div>Debbie Baxter VP Workplace Services and Chief Sustainability Officer, LoyaltyOne</div>	At LoyaltyOne, we believe that green innovation is transforming the way Canadian companies engage with stakeholders, locally and globally. As an example, stand-alone environmental building features are evolving into fully operational programs and sustainability is being integrated into core business strategies. Acquired learning from green innovations is inspiring a shift in individual consumer behaviours and organizational belief systems. As companies learn how to leverage their influence, focus will expand to other areas, like community building and health and wellness.	For us, it's all about driving LoyaltyOne's recruiting brand, employee engagement and retention . We have been on the Best Employers in Canada list for the past three years and recognized as one of Canada's Greenest employers, among other awards. In a recent survey, 94 percent of associates indicated that they took pride in our corporate environmental and community investment work. This kind of passion helps us retain and nurture talent.	There's a general sense in the marketplace that it's all band-aid solutions, it's not authentic and it's a branding exercise. At LoyaltyOne, we recognize that every business has a critical role, and a responsibility to create a more sustainable planet. Challenges such as climate change and evolving social policies require all of us – business and individuals – to work together to find solutions and take authentic action that create positive change .
 <div>Susan Sheehan President, Leapfrog Sustainability Inc.</div>	Canadian companies planning to be in business in five years must make green innovation core to their DNA. Why? Green innovation is not just about new products or technologies that deliver environmental benefits. The real game changer is for companies to consider how 'greening' is the key that unlocks innovation across an organization. What happens when a business looks at all of its operations – from procurement to production to recruiting – through a 'green' lens? That's when breakthrough green innovation and competitive advantage occurs .	Sustainability strategies are unique to each business and offer a direct path to competitive advantage . Short payback projects that reduce energy, materials and waste costs go directly to the bottom line, some of which can be used to fund longer-term initiatives that put lasting distance between competing firms. This is what leading global brands across all industries are doing. Their CEO's say the top benefits of sustainability strategies are differentiating their brand, retaining customers and attracting and engaging talented and dedicated employees.	Businesses and consumers continue to think that green is, by its very nature, more expensive than conventional options. But green is actually all about using resources more efficiently , or not at all. This means short and long term costs are actually minimized. Green business cases typically consider total cost of ownership – the cost of buying, shipping, maintaining and disposing – and the lowest cost option usually turns out to be the most attractive from a green perspective too.
 <div>Chad Park Executive Director, The Natural Step Canada</div>	With increasing demand on natural systems and resources, combined with an eroding capacity of natural systems to provide these resources, the opportunities for green innovation can only increase. The challenge for Canadian society will be how to create the conditions for more organizations to realize and grasp the opportunities. This will require creative approaches to collaboration; organizations that don't typically work together to do so need to find new ways to overcome barriers or identify opportunity.	When done properly, sustainability is an enabler of an organization's core business goals – e.g. profit, innovation, value creation, etc. It helps generate employee and customer loyalty, identify new risks and opportunities, and inspire creativity.	The biggest misconception is probably that there is a green industry at all – as a separate industry. The "greening" of business is going to touch every industry. There is ample evidence to suggest that sustainability is becoming the key driver of innovation in business overall. Our businesses need to and are playing a leadership role in coming up with whole new business models, technologies, and relationships that redefine how we meet human needs within the constraints of the carrying capacity of natural systems.



What “Going Green” means to Canadian businesses

■ **Question:** Why do green innovations present the most exciting business opportunity for Canada's future?

■ **Answer:** Integrating sustainability into daily operations will increase the triple bottom line.

There's a growing global demand for Canadians to take on a leadership role that redefines how we view greener technologies.

The foundation of integrating innovative sustainability strategies into business operations starts with shifting our thinking. "Canadians should be excited right now because Canada, in many ways, is the global leader in solar development. Ontario is recognized around the world as being one of the best places to participate within the market to build solar strategies, so we're gaining international recognition as a place to do business," says John Gorman, President of CanSIA.

As a result, Ontario in particular, has created thousands of jobs and hundreds of companies that are

producing panels and inverters. The market has also appealed to finance companies and developers that help pay for, and advance solar projects.

Information at your fingertips

"The 'greening' of business is going to touch every industry," states Chad Park, Executive Director of The Natural Step Canada, an organization dedicated to helping businesses articulate their vision and develop strategies towards a sustainable future.

When executed correctly, sustainability enables an organization's core business goals such as: reducing costs and risks, opening new markets and

FACTS

■ **Businesses Benefits:** Effective risk management, Improved employee satisfaction, morale or retention, cost savings and improved company or brand image

■ **A Cut Above:** Sustainability-focused companies outperform their peers and achieve above average performance in the financial markets during the financial crisis



“Canada... is gaining international recognition as a place to do business.”

John Gorman
President,
Canadian Solar Industries Association

venue streams, increasing profit, innovation, and productivity, and engaging employees.

■ **Solar Power:** Canada is a world leader in solar-power research, development and commercialization

■ **Happy Workers:** Companies that have a strong sustainability foundation have a higher retention rate and happier employees

■ **Provincial Powerhouse:** Ontario is gaining international recognition as a place to do business

Looking ahead

The vision for the future is looking bright as all industries gain more opportunities to produce and contribute environmental and social impacts.

"Brand Canada is something very special. We need to protect and strengthen our collective brand and become a model for what it means to be a sustainability leader," says Brad Zarnett, founder of Toronto Sustainability Speaker Series. Organizations are encouraged to have a shift in culture and begin to see problems in a new way.

When a company allows individuals to think with an innovative mentality, the overall vision and way of life evolves to incorporate sustainability. Ultimately, it isn't just about the environment; it's also about social connections.

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