



Natural Resources
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LetsTalkCleanResources.ca

Online Engagement: Final Report



December 2016

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EXECUTIVE SUMMARY

About This Engagement

The Government of Canada is helping Canadians, communities and industry take advantage of new opportunities in clean technology in the natural resources sectors, now and in the future. Budget 2016 invested over \$1 billion over four years, starting in 2017–2018, to support clean technology, including in the energy, mining, forestry, fisheries, and agriculture sectors. In July 2016, the Government of Canada invited Canadians to engage in a dialogue and share their ideas on clean technology in Canada’s natural resource sectors on “LetsTalkCleanResources.ca.” Engagement objectives were to communicate the wide range of applications and benefits of clean technology in Canada’s natural resource sectors and to engage in a conversation with Canadians about their ideas to develop clean technology and meet Canada’s Mission Innovation commitments. This online engagement complements conversations with key partners and stakeholders.

Participation

While thousands of participants visited the website (over 35,000 unique page views), 315 registered participants provided input from across Canada. While Ontario had the most participants, comprising 43% of those who provided input, the western provinces (British Columbia – 15%; Alberta – 11%) contributed significantly as well. Approximately two-thirds of participants identified as individuals, while the remaining third identified as organizations, with clean technology companies participating the most (32%). LetsTalkCleanResources.ca provided several ways for Canadians to participate in the conversation, ranging from a top of mind response to a quick poll, to participating in discussion forums, to submitting extensive position papers and policy briefs.

Outcomes

The following key themes were identified as potential actionable outcomes for the Government of Canada’s consideration:

- The federal government could support clean technology and natural resource firms in adopting and developing clean technologies by providing facilities and services to test and “de-risk” clean technologies. Oftentimes, firms lack the capital and many are risk-averse to adopting new innovations in regular operations.
- A carbon policy is required to quantify and put a price on carbon emissions, as well as measure the capacity of various clean technologies in reducing emissions.
- Clean technology has a role to play in combatting greenhouse gas emissions and federal policies and programs should reflect this, including Canada’s climate action plan.
- The federal government should develop improved funding and support mechanisms for clean technology research and adoption by small and medium-sized enterprises.
- Federal funding programs need to be less confusing, be harmonized across departments jurisdictions and permit innovative and new technologies to be developed that are “outside of the box.”
- The federal government has a key role to play in facilitating partnerships, research collaborations and commercialization of clean technologies among governments, academia, industry, innovators, entrepreneurs and international partners.

- The federal government should develop a variety of tax incentives to lure venture capital and encourage access to capital and markets.
- The federal government should encourage the adoption of clean technologies in rural/remote/Indigenous communities by developing micro grids among industries and communities and encouraging further subsidies for clean technologies to compete with the price of off-grid diesel generation.

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ABOUT THIS ENGAGEMENT

Our Commitment to Engage Canadians

The Government of Canada is committed to helping Canadians, communities and industry take advantage of new opportunities in clean technology in the natural resource sectors, now and for the future. Engaging in meaningful and constructive dialogue with Canadians is an important part of delivering on these commitments in a way that is responsive to the needs of the public.

To make the best decisions about how to deliver on these commitments, it is important to hear from those impacted by, and interested in, the future of clean technology. As part of this conversation, in July 2016, the Government of Canada invited Canadians to engage in a dialogue and share their ideas on clean technology in Canada's natural resource sectors on LetsTalkCleanResources.ca.

LetsTalkCleanResources.ca provided a space for Canadians to participate in an open and transparent conversation with one other and with federal officials. Responses to questions were posted on an ongoing basis to respond to ideas suggested by Canadians. Officials followed the engagement in real time and exchanged ideas about clean technology in an interactive way. The intent of this engagement was not simply to ask for submissions, but to engage in a meaningful discussion with Canadians about ideas to transition Canada to a low-carbon economy.

ENGAGEMENT OBJECTIVES

1. To communicate the many opportunities for clean technology in Canada's natural resource sectors.
2. To engage in an ongoing two-way conversation with Canadians about their ideas to support clean technology and meet Canada's Mission Innovation commitments.



This online engagement complements ongoing conversations with key partners and stakeholders. Since December 2015, Natural Resources Canada (NRCan) has met with over 300 natural resource and clean technology stakeholders, through 10 multi-sectoral ministerial roundtables across Canada. Senior government officials have also held over 30 meetings with international and intergovernmental partners, industry associations, companies, think tanks and funders. Ongoing engagement continues by NRCan and other natural resource partners, including Agriculture and Agri-Food Canada (AAFC) and Fisheries and Oceans Canada (DFO).

Background

Innovation in clean technology in Canada's natural resource sectors is a significant parts of Canada's transition to a low-carbon economy.

CANADA'S NATURAL RESOURCE SECTORS

Accounted for almost **one-fifth** of nominal GDP in 2014



ENERGY

EMPLOYED
950,000 Canadians

Representing **5.2%**
of all jobs in Canada



FORESTRY

EMPLOYED
195,000 Canadians

Directly accounts for over
20% income
of **171 municipalities**



MINERALS SECTOR

EMPLOYED
378,000 Canadians

Our total value of mineral
production was nearly
\$45 billion



AGRICULTURE

2.2 million Canadians
work in agriculture or agri-food

1 IN 8 JOBS



FISHERIES & AQUACULTURE

CANADA EXPORTED
\$6 billion
in fish and seafood in 2015

Aquaculture contributes about
2 billion \$ per year
in economic activities



The vast majority of **Canada's**
greenhouse gas emissions
come from **NATURAL RESOURCE**
DEVELOPMENT AND USE

Prime Minister Trudeau has [committed](#) a number of his ministers to support innovation and the use of clean technologies in our natural resource sectors, including in the energy, mining, forestry, fisheries, and agriculture sectors. The government is also investing in clean technology producers, so that they can tackle Canada's most pressing environmental challenges and create more opportunities for Canadian workers. This is complimented by enhancing tax measures to make Canada an attractive jurisdiction for investments in research, development, and manufacturing of clean technology.

On November 30, 2015, Prime Minister Trudeau announced Canada's participation in [Mission Innovation](#), a global initiative of countries [working together](#) to accelerate clean energy innovation. As part of this initiative, countries agreed to double their national investments in clean energy research and development over five years, while encouraging greater levels of private-sector investment in transformative clean energy technologies.

Budget 2016 invested over \$1 billion over four years, starting in 2017–2018, to support clean technology, including in the energy, mining, forestry, fisheries, and agriculture sectors.

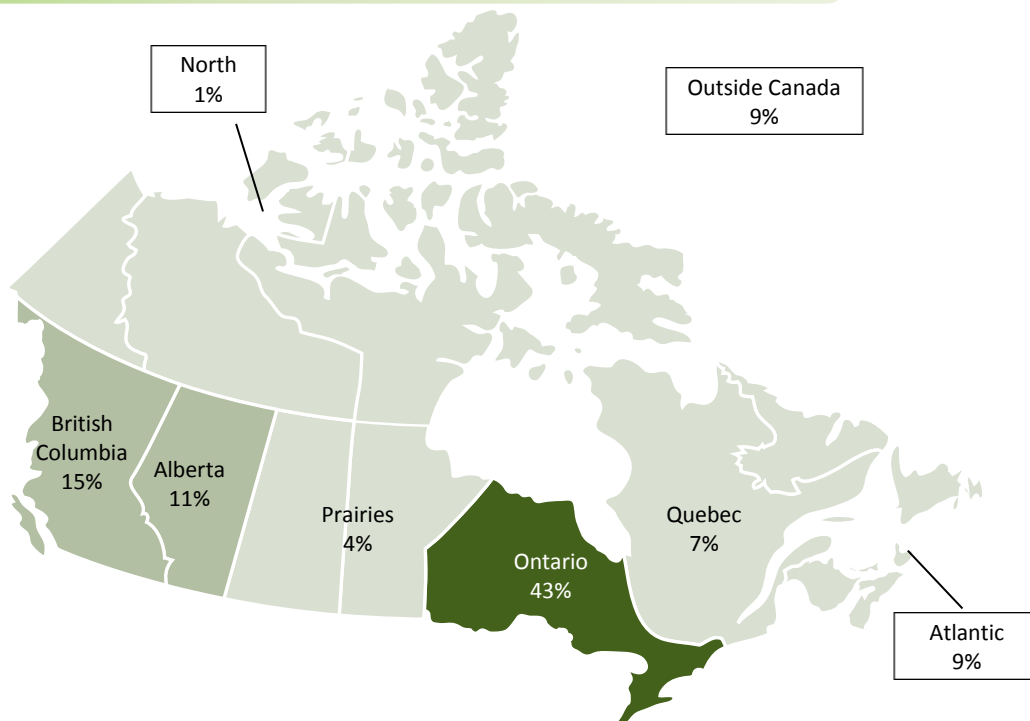
PROFILE OF PARTICIPANTS

**WHILE THOUSANDS VISITED THE SITE (OVER 35,000 UNIQUE PAGE VIEWS),
315 REGISTERED PARTICIPANTS PROVIDED INPUT.**



Canadians from across the country participated in this engagement, with most participation from Ontario (43%) and Western Canada (British Columbia – 15% and Alberta 11%). Approximately 9% of participants commented from outside Canada.

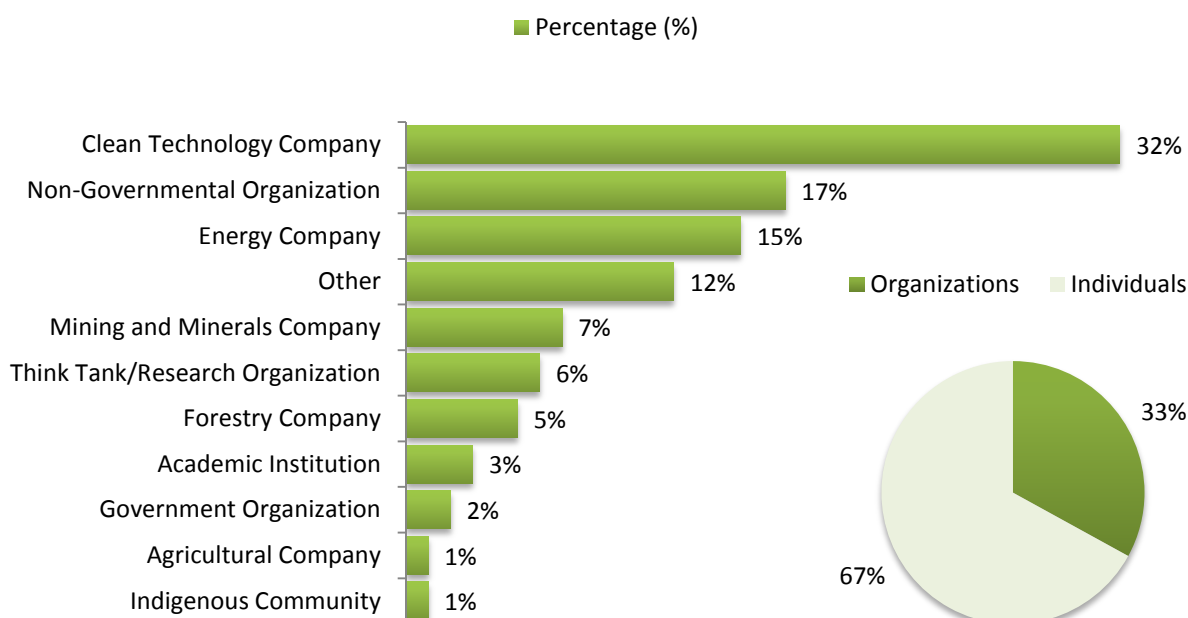
Note: Percentages may not add to 100% due to rounding.



Participation by Stakeholder Type

Most participants in this report identified as individuals (67%), while approximately one-third of participants (33%) identified as organizations.

Of those participants who identified as being part of an organization, clean technology companies were most frequent (32%), followed by non-governmental organizations (17%) and energy companies (15%).



HOW CANADIANS PARTICIPATED¹

LetsTalkCleanResources.ca provided several ways for Canadians to participate in the conversation, ranging from a top-of-mind response to a quick poll, to participating in discussion forums, to submitting extensive position papers and policy briefs.



¹ Methodological note: While online engagement provides an opportunity for Canadians to share their perspectives and ideas regarding clean technology, findings presented in this report are based on self-selected participation and should in no way be construed as a regional or demographic representative sample of Canadian public opinion. Therefore, findings should not be interpreted as statistically significant in any way.

LETSTALKCLEANRESOURCES.CA –WHAT WE HEARD

Participants in this engagement shared a variety of views on issues important to them, ranging from successes in their industries and communities to visions for the future of clean energy in Canada. There was broad agreement that the federal government had an important role to play in driving innovation in the clean technology sector in Canada and supporting its use in the natural resource sectors. The following section describes themes that we heard from Canadians through the online engagement.

Perspectives were varied on the extent of the role the federal government should take, including:

- a foundational role in creating a market for clean technology where it does not exist organically as a result of various economic factors;
- supporting international partnerships through trade offices and agreements;
- regulatory harmonization;
- research collaboration;
- learning from international expertise; and
- supporting Canadian innovation in accessing global markets.

In contrast, others suggested that the federal government should “stay out” and not intervene in the energy market.

Participants on the site were also invited to submit policy papers, reports, background information and other documents to NRCan using a “Submit Your Documents” tool. In total, 21 documents were received from a wide variety of stakeholders, including industry associations, universities and colleges, think tanks, research organizations, natural resource companies, clean technology companies, and other government departments.

The documents received contained a variety of detailed content. For instance, some participants submitted documents providing a detailed response to our discussion paper. Others provided recommendations for a Government of Canada clean technology strategy for the natural resource sectors. We also received documents describing a new clean technology that would benefit from Government of Canada funding or examples of technologies that could be used in the natural resource sectors. Last, some natural resource sector companies submitted documents that provided recommendations for how clean technology could be used in their sector.

Balancing the Environment and Economy

Climate Change

Numerous participants remarked that clean technology in the natural resource sectors had a key role to play in achieving Canada’s goals to reduce the impacts of climate change, including some who recommended that clean technology should be a major pillar of the federal government’s climate change action plan. However, many participants supported a shift away from non-renewable energy sources as a longer-term goal, but noted that this would be a complex transition for natural resources and other high-carbon industries.

Carbon Tax

One of the most frequently raised opportunities for the Government of Canada to support industry, academics and non-profits was to develop a revenue-neutral carbon tax and use its proceeds to fund the development of clean technologies and help traditionally high-carbon sectors such as oil and gas transition to a low carbon economy through means such as implementing new means of oil sands extraction that would not be so carbon-intensive. It would also encourage a lower cost to use clean technology and renewable energy sources. Funds from a carbon tax could also be used to fund research and innovation in the clean technology sector.

Participants also mentioned the interrelationship between environmental and economic factors. For example, in measuring the impact of an innovation, several participants recommended that environmental costs be taken into consideration when considering the overall economic cost and benefit of a project. One of the ways to consider the impact of an innovative project would be to determine scalable metrics, such as the amount of carbon dioxide used to mine a unit of ore over a period of years. This could be implemented across sectors to determine the net measure of innovation outputs, rather than just using the amount of research and development as a measure on its own.

Another way to encourage advancement of clean technology, including renewable energy sources, would be to meet Canada's G7 commitment to phase out all subsidies to fossil fuels and use the funds from the subsidies to support renewable energy through research and development, rebates to individuals who install wind, solar and other renewable energy sources in their homes, and/or create an X-Prize competition to support innovation in this area.

De-risking Clean Technology: A Federal Role

Testing new technology

In terms of larger industry, there was a significant appetite for de-risking new clean technology innovations, especially when it comes to their adoption in capital-intensive industries, such as mining and minerals sectors. The federal government was seen to have a valuable role to play in supporting innovators through the provision of facilities (e.g. NRCan's research labs) for innovators to test new technologies and ensure they are functional, have environmental benefits and are a safe investment for companies in natural resource industries, in turn "de-risking" the technologies for deployment.

Several participants also noted that private industry should not be responsible for de-risking because it must expend significant capital and abide by federal and provincial regulations and ensure the health and safety of workers. It was also noted that facilities to perform these tests are unavailable or costly. Thus, they felt that the federal government would be best positioned to absorb the risks that private industry faces in researching and developing early-stage clean technologies.

Incentives

For example, participants focused on the mining industry said there were myriad types of clean technology available that could be implemented at present in the mining industry, but they would be difficult to implement without incentives such as funding for pilot or full-scale projects. The mining

industry tends to be risk-averse because projects are capital-intensive and regulations are stringent, which limits companies' interest in trying new innovations.

Partnerships and Collaboration

Participants thought the federal government should establish partnerships with provincial/territorial governments, industry, academia and non-profits. Some felt that to place a greater emphasis on market needs, the federal government should play a specific role in:

- “matchmaking” among funders, customers, partners and clean technology firms;
- leveraging the private sector to bring ideas to market, especially in terms of helping Canadian businesses export clean technologies overseas and partner with international companies; and
- engage the public in prioritizing which clean technology projects the federal government should invest in.

Other respondents suggested that any solution to support the clean technology industry should be industry-driven to ensure its needs are being met.

In terms of energy efficiency and smart-grid solutions, working with local (and rural) communities could create sustainable avenues for companies to the benefit of a local economy.

Several participants recommended federal investments and interventions to **establish an industry** for clean technology and renewables, as they felt the industry could not compete with oil and gas and utilities in its current state. Some suggested hiring an independent, qualified government-sponsored expert to assess the viability of new clean technologies and fully funding projects that appear feasible over the long term.

It was also suggested that the federal government could help promote clean technologies in industrial settings through the establishment of a **clean technology database**, which would demonstrate efficacy data, emission reduction capabilities, possible cost savings, and technical details and would support technology adoption by industry. Such a database would demonstrate available technologies to industry, as well as environmental and economic benefits.

Many participants felt that the federal government could play a significant role in financially supporting government-industry-post secondary **collaborative networks**, facilitating partnerships with Canadian business and international clean technology firms to work together on innovations. The federal government could also work to facilitate engagement with environmental groups and other stakeholders on projects, including the public, to help promote the benefits of clean technology and renewables in helping to establish an industry in Canada.

Funding and Clean Technology Financing

Access to Capital and Markets

In terms of helping attract venture capital investment, one recommendation was to support the venture capital industry by creating a national **investment tax credit program** like the one in British Columbia, which provides investors with a 30% tax credit up to \$200,000 of investment. Other participants went further in recommending that the Government of Canada make all capital gains from venture capital tax

exempt through a tax-free savings account (TFSA) type of investment instrument to lure significant venture capital investment to Canada.

There was also a recommendation to **increase federal investment** in the Venture Capital Action Plan (VCAP), which matches government investments to private sector funding. Another recommended approach was to reduce the capital gains tax rate on profits from patented inventions to encourage further research and development.

Some participants recommended that **flow-through shares**, which are currently used in the mineral exploration industry, also be applied to clean technology. The purpose of flow-through shares is to enable a company that has heavy capital costs for exploration and development, but no chance of turning a profit for several years, to sign over its tax deductions to investors for their benefit.

One participant recommended increasing Export Development Canada's (EDC) budget specifically for the export of Canadian clean technology innovations, while another suggested the inclusion of clean technology as part of Canada's foreign aid to developing countries.

Tax Incentives

Tax incentives to help project proponents included the use of **feed-in tariffs** (FIT) to support clean technology developers for 10 to 20 years and flow-through shares to enable companies that will not turn a profit for many years to transfer their tax-deductible costs to investors.

Some felt the tax system was a barrier and geared only toward supporting individual firms, rather than broader innovation networks. Participants offered several recommendations in terms of tax credits and other incentives to lure new capital to the clean technology market in Canada and support the development of clean technology in Canada.



Reform tax systems: Reducing the tax and social security burden on labour and moving taxes to the extraction of raw materials and emission of greenhouse gases are strong incentives for a transition to an economy that is resource-efficient while safeguarding job opportunities.

Research and Development Funding

Funding was a key component of many respondents' concerns. While some argued that current funding structures were not assisting smaller companies to innovate in their approaches, many respondents felt that a general lack of funding was a serious barrier to the success of Canadian companies trying to break into the clean technology market in the natural resource sectors.

Consequently, some even proposed that the government create incentives to solicit funds from the private sector to fund clean technology innovation programs as a means of reducing financial risks associated with early technological adoption.

Some participants thought federal and provincial/territorial governments should continue to fund industry-post secondary-government collaborative organizations because they continue to run research and development that leads to new innovations, regardless of the boom and bust cycle of the industry.

Several participants felt that clean technology research funding for universities should instead be transferred to the federal National Research Council (NRC), provincial equivalents and the private sector. While universities were seen as great institutions for generating new ideas, entrepreneurs in the private sector were seen to have the expertise necessary to commercialize innovations in the real world.

Others felt that biomass (e.g. wheat, straw, hemp) could be more effectively utilized if funding programs were not so confusing and divided among departments and if the federal government could operate in time with business needs and enable projects to work outside of the box, which means allowing some to fail.

Funding Options

There was a sense that not enough commercialization and clustering were happening and that the federal government should intervene. Compounding this was the concern that education and higher-level skill development were often not sufficiently focused on the innovation needs of the clean technology industry. Some also felt that research and development ideas were not always “use inspired,” meaning they would not have a real-world application.

Many participants noted a need for better inter-jurisdictional collaboration, citing a disconnection between federal and provincial funding bodies. This situation often required more preparatory work on the part of the applicant to secure funding and was a barrier to entry, particularly for small businesses.

One participant proposed that research and development should be looked at differently. When it came to research, a better funding mechanism for clean technology researchers would prevent lost time competing for numerous funds while better collaboration between funding bodies (whether federal, provincial or otherwise) would ease the access to capital. As for development, many respondents were in favour of aligning funding with the potential for commercialization of products – a revision of funding policies to facilitate and channel market access would be preferred.

Another respondent proposed that funding not be strictly channeled towards universities and research institutions, but rather flow to companies that conduct research based on practical necessities. Such prioritizing of capital for corporations would allow for better allocation of much needed funding.



I am of the belief that there is sufficient money provided by the government for clean technology research, but is channeled via "inside the box" conventional methods and yet expected to yield "outside the box" solutions.

Participants were particularly concerned with the way that the federal government invests funding in a similar manner across provincial jurisdictions. They advocated that the federal government instead provide targeted and customized support because the drivers differ by province.

While some participants recommended that there should be fewer strings attached to funding, others commented that mechanisms for discovering unheard of small inventions were more important. Their suggestion was to promote the existence of funding opportunities to high school students to help ensure the students' commitment to innovative ideas in the future.

Respondents recommended supporting individual innovators by providing government investments, financing and support from the start of a project. Support would also include management and commercialization advice, strategic planning capacity and help establishing strong networks with other innovators, venture capital financiers, etc. Some people suggested that any government support must include a focus on the commercialization of clean technology. They also recommended that federal investment programming support clean technology clusters/networks and not just individual firms.

Greening Public Infrastructure

When considering applications for clean technology, participants often described a role for government in greening public infrastructure to reduce our environmental impact and energy consumption. Ideas included:

- increasing infrastructure for electric vehicles (e.g. more public charging stations);
- building more cycling and transit infrastructure; and
- investing in the electrification of transportation.

Similarly, participants felt that governments should establish ultra-efficient building codes (e.g. net zero homes) and/or provide incentives to incorporate new technologies (e.g. tax reduction for electric vehicle charging stations in newly constructed office buildings).

Others said the federal government should borrow and invest in greening its own infrastructure, such as office buildings and outdoor spaces, renewable energy and public transportation infrastructure (including electrification capacity) because interest rates are low. More specifically, to reduce costs, the federal government should fund projects directly through public-private partnerships (P3s) rather than forcing proponents to borrow through banks.

Participants frequently noted the large impact of the transportation sector on emissions and the opportunities for clean technology innovation in this sphere. Participants wanted the federal government to convert most public, domestic and commercial transportation to green-sourced electricity/renewable fuel vehicles. Some focused specifically on public-owned vehicles and specified that diesel trucks, buses, trains and cars should all be replaced with electric or clean renewable fuel vehicles. Others wanted automobile manufacturers to be forced to sell electric and other low-emission vehicles at a similar price to traditional gasoline and diesel automobiles. They also wanted the federal government to build electric vehicle charging stations along major highway routes to make electric vehicles more convenient for Canadians to use.

Various participants recommended supporting green infrastructure, including creating and convening public-private partnerships to encourage clean technology development, including using P3s to pair technology producers with natural resource sector companies that would adopt clean technologies.

Challenges, Barriers and Gaps

Small and Medium-sized Enterprises

Participants frequently noted the challenges specific to small and medium-sized enterprises (SME), which are responsible for a significant proportion of job creation in Canada and are the major players in the clean technology sector. Many cited challenges in accessing capital to fund research and

development (e.g. 25% required to receive 75% from federal programs), especially in the clean technology sector, which often has significant start-up costs. One participant suggested that funding was already sufficient for research and development, but that promising projects should be vetted up front and then have funding provided without strings attached to enable “outside the box” deployment.

Some also raised concerns that federal subsidies appeared to be diverted toward major corporate players rather than SMEs. They agreed that there is a role for the federal government in the provision of financial support for SMEs in clean tech, with some venturing that the federal government should provide 100% funding support until the industry is better established throughout Canada.

Participants raised concerns that private corporations receive too many subsidies from the federal government while creating too few jobs. They recommended diverting corporate subsidies to small and medium-sized enterprises, which create most new jobs in the Canadian economy.

“ *If sustainable development and socio-economic health within small and remote communities is made the top priority as a commonly recurring practice during natural resource development, the public support for large sustainably managed products will be much easier for governments and corporations to obtain.* ”

Rural and Remote Communities

One of the most significant barriers cited by participants to adopting clean technology in rural and remote areas was **utility policy**. The utility services in most remote communities are subsidiaries of the provincial utility and often do not provide stable electricity, nor do they allow for any third-party generators on the grid. In turn, there is no incentive to shift away from diesel generation in these off-grid regions. In addition, non-diesel alternatives are not subsidized by provincial utilities, which removes any economic incentive to change the status quo.

A proposed solution to this problem would be to establish partnerships among industrial sources of power (mines/mills) and adjacent Indigenous and northern communities with the creation and operation of **micro-grids**. Introducing an industrial source of both generation and demand could support the development of renewable energy projects, and the operation of micro grids would bring the required stability necessary in the local system. However, this would be dependent on the locale of the industrial power source and the remote communities to be connected.

Participants also stated that displacing diesel generation must be done with job creation and economic development in mind, as well as environmental concerns. For example, alternative energy, like bio power, could provide more jobs for local communities than current diesel systems.

Participants highlighted several technical challenges in deploying clean technologies in micro grids ("off-grid" areas) in Canada's remote communities. This included grid balancing, seasonality (e.g. run-of-the-river and solar tend to only work during certain seasons, especially in the far north) and expensive on-site engineering requirements.

Some participants also felt that focusing on local projects in small or remote communities would bring about the best possible sustainable considerations and practices because the people in the community would be more concerned about their own communities.

Externalities and Spinoff Effects

Participants stated that **existing regulations were a barrier** to clean technology innovation. Some felt that policy could be an obstacle in circumstances where work was too siloed (e.g. choosing energy generation over clean water) or not industry-driven.

A few participants were also concerned that not enough thought was being placed in the "circular economy," where materials from old products are broken down and re-used in processes to manufacture new products through means such as 3D printing. They claim that the circular economy could lead to significant reductions in energy use, and therefore greenhouse gas emissions as manufacturing processes become more advanced.

Some participants felt that any new approach to clean technology should consider all the potential outcomes and impacts of its implementation. For example, some were concerned that sustainable forestry practices currently being implemented (i.e. approach of selling low amounts of fibre for a high price) would be superseded by using forest products to continue running biomass fuel generators that had run out of other materials to keep them running. This is one example of life-cycle thinking that some felt should be considered for sustainability.



The recycling of materials achieves greater energy savings than the amount of energy that can be obtained in any form of “waste-to-energy” and can have a dramatic impact in reducing greenhouse gas levels.

Sector-specific Challenges

Participants identified several challenges in the **mining** industry, including the cyclical nature of the minerals industry; the capital-intensive nature of the industry that requires proof that new technologies will work; and the lack of certainty in policy frameworks, which impedes major capital investment.

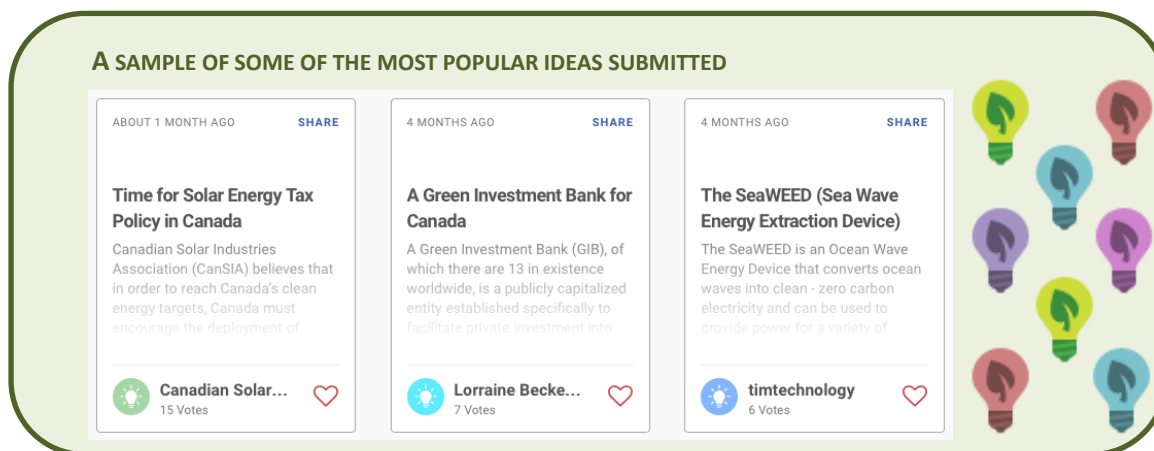
Participants concerned with the **fisheries** sector recommended that the federal government support the industry's adoption of clean technology by branding and promoting catches by vessels employing these technologies as “clean caught” Canadian seafood on the world market. Industry efforts could receive broader recognition within target markets. Some respondents clarified that the focus of the fisheries sector should include emissions management, both from a vessel operations (e.g. clean technology propulsion) and processing (e.g. less dumping of effluent) standpoint.

Some participants wanted federal investments in new designs for **nuclear fission** power stations, from small scale to larger plants, which could then be used to innovate in other areas, such as fuel for transportation in the future.

Looking to 2050: A Vision for Canada's Energy Future

In addition to participating in conversations about clean technologies, participants also shared their ideas on what a transition to clean energy in Canada would look like by 2050. Ideas included moving

away from a resource extraction model of creating wealth to a value-added model. However, participants stated that moving away from such profitable natural resources is unrealistic and needs more careful consideration.



Many respondents indicated that key aspects of transitioning to a low-carbon economy were partnering with major industries to drive innovations in clean technologies, carbon reduction and mitigation strategies (along with better gathering of measurements) and improved funding mechanisms for clean technology research.

Participants shared innovative ideas such as a Green Investment Bank targeting organizations seeking funding and facilitating private investment, to ensuring Net-Zero homes become standard across Canada. Many participants mentioned investing in alternative energies such as tidal and wave energy as well as wind farms. For example, a participant suggest installing tidal turbines in coastal provinces and another proposed that converting sea waves into energy through non-tidal means, such as during a storm, would be capable of producing electricity and reduce the harm of the storm at the same time.

Opportunities in the transportation sector was a continued theme in a transition to clean energy. As we move to improving efficiencies in the production and use of electricity, one commenter suggested that focusing on better transportation, building codes and industry practices would help transition the Canadian energy mix to include more renewable energy sources. In line with electrification, a large number of respondents were vocal about the importance of electric cars in the future. With a higher need for charge stations across the country and more efficient and longer drivable cars, a smarter electric grid would benefit all Canadians.

Some participants wanted federal investments in new designs for nuclear fission power stations, from small scale to larger plants, which could then be used to innovate in other areas, such as fuel for transportation in the future.

In addition to investments in clean energy, incentives in the form of tax credits can promote the use of greener technologies. One such example, as suggested by a participant, was an investment tax credit (like in the United States) when a company spends money on solar panels or a wind turbine to generate the electricity it needs.

While support for private sector initiatives is important, so are community-based investments. Ensuring that support for communities operating renewable energy resources exists is paramount to having the

public embrace clean energy. Participants named a number of examples of solar, wind and biomass projects in their communities.

WHAT'S NEXT IN CLEAN TECHNOLOGY?

Throughout the engagement process, officials followed along and engaged in conversations with participants, answered questions and shared additional information. A variety of ideas described ways to enhance both the competitiveness and sustainability of our natural resource sectors as we transition to a low-carbon economy and also described the challenges that various industries, sectors, and communities face in this transition.

Findings were reported back to the public on a regular basis and shared with policy and research teams in real time. The feedback and ideas gathered through this engagement provided important input to the creation of policy and program options for the Government of Canada to deliver on its commitments to support clean technology in the natural resource sectors.

Public input helped the Government of Canada better understand the challenges and opportunities facing the clean technology and natural resource sectors and make decisions that reflect the aspirations of Canadians. It also provided insight into Canadians' vision for a low-carbon economy and the steps that are required to get us there. While findings from the public online engagement are not representative of every possible viewpoint or of public opinion in general, they do provide ideas and recommendations and help to explain how meaningful changes can occur to the clean technology industry.

For more information about actions that the Government of Canada is taking on clean technology in the natural resource sectors and other issues important to Canadians, follow [@NRCan](#) on Twitter and visit nrcan.gc.ca.



ANNEX A – DISCUSSION QUESTIONS

What does clean technology in the natural resource sectors look like to you? Join the conversation!

Clean Natural Resources Development Today

How could the federal government and industry work together to support the adoption and/or commercialization of clean technologies in the natural resource sectors? (8 responses)

Encouraging the adoption of clean technologies represents a significant challenge for natural resource sectors. For example, the mining sector currently faces challenges in the adoption of clean technologies which could benefit the sector as well as Canada. For instance, regulations in particular jurisdictions do not permit the replacement of diesel engines in underground mines and confined locations with cleaner alternatives.

Although Canada remains a global leader in mining innovation in certain areas (such as electrification, which was noted by Carl Weatherell of the Canada Mining Innovation Council in the recent Spotlight on Clean Technology), when compared to other resource sectors, the mining sector must seek new ways to improve the rate of uptake and integration of advanced technologies into its operations.

Do you agree that a lack of capital is a barrier to clean technology research and development? What could be done to solve this? (18 responses)

A common challenge to clean technology innovation in the natural resource sectors raised in [discussions on this site](#) was lack of stable and consistent capital or financial support to make investments in research and development.

Do you agree with these comments? Do you see a role for the federal government in addressing this barrier?

We've heard through discussions on this site that collaborations and partnerships have been key to supporting sustainable and effective clean technology innovations. What are some examples that you could share of successful collaborations or partnerships? (3 responses)

For example, Natural Resources Canada works with other government departments and agencies through the [Program of Energy Research and Development \(PERD\)](#). This program provides funding to 13 federal departments and agencies for research and development designed to advance sustainable energy future for Canada. Participating departments also collaborate with other groups including: the private sector, academia, and/or international organizations.

Natural Resources Canada also works with international partners to address common challenges and opportunities. For example, Canada has partnered with 20 members under [Mission Innovation](#) to double government investments in clean energy innovation over five years, while encouraging greater levels of private-sector investment in transformative clean energy technologies.

What are your thoughts on our proposed Strategy for advancing clean technology in the natural resource sectors? What roles do you see for the federal government and other partners? (28 responses)

The proposed Strategy provides a platform to advance whole-of-government coordination to support technology development, commercialization and deployment. It is presented in Table 3 on Page 14 in the [discussion paper](#).

What challenges and obstacles do clean technology producers, natural resource industries and communities face in developing and adopting clean technologies? (46 responses)

Innovative uses of technology can help reduce the environmental impacts of extraction, harvesting and use of our natural resources. Canada can both protect the environment and grow the economy. These goals are not incompatible—they go hand in hand.

The [discussion paper](#) explores some challenges in adopting and developing clean technologies, from start-up costs and regulations to lack of infrastructure. We also recognize that some of the solutions to these challenges might come from outside of the natural resources area. You might have experiences or successes in your own communities, regions, or industries to share.

Mission Innovation: Clean Energy Solutions for Tomorrow

What do you think are the benefits and/or challenges to using waste and/or agricultural and forestry resources to create new renewable products from a biorefinery? (4 responses)

Biorefineries have the potential to make a vast number of bioproducts from agriculture and forest biomass that are currently made from fossil fuels – from heat and electricity, to transportation fuel, to paints, coatings, chemicals, plastics and building materials for homes, cars, and beyond. Like the US and many European countries, Canada has invested in advancing the development of biorefineries and is now a recognized leader in this field.

Click here for more information about biorefining in the forest sector: <http://www.nrcan.gc.ca/energy/efficiency/industry/processes/systems-optimization/research-development/5603>

How can Canada increase its ability to bring clean energy technologies to remote or off-grid areas? (7 responses)

While much of Canada benefits from the use of clean energy technologies, this is not true for some of the more remote parts of our country.

For example, Budget 2016 commits to invest \$10.7M over two years to implement renewable energy projects in off-grid Indigenous and northern communities that rely on diesel and other fossil fuels to generate heat and power. This will build on the success of the [ecoENERGY for Aboriginal and Northern Communities Program](#).

There are also innovative non-governmental initiatives which aim to support clean, advanced energy technologies in remote or off-grid areas. The [20/20 Catalysts Program](#), a collaboration between [Lumos Energy](#) and the [Aboriginal Human Resources Council](#), works to build a community of practice for Indigenous clean energy project development, partnership, and planning.

With new all-electric passenger vehicles coming soon that will have ranges over 200 km, what will it take to convince you to buy an electric vehicle for your primary or secondary vehicle and why? (42 responses)

Visitors to this site thought clean transportation was an important step toward a clean energy future (23% of responses to a quick poll). What ideas do you have? For example: more and faster charging stations, lower prices, more models to choose from, or just more time on the market to know that they will really work.

How Should Canada Invest In A Transition To A Low-Carbon Clean Energy Future? (65 responses)

In what clean energy and innovation areas should Canada invest? From transportation, to buildings, to agriculture, to emissions intensive industries - the greatest ideas could come from you!

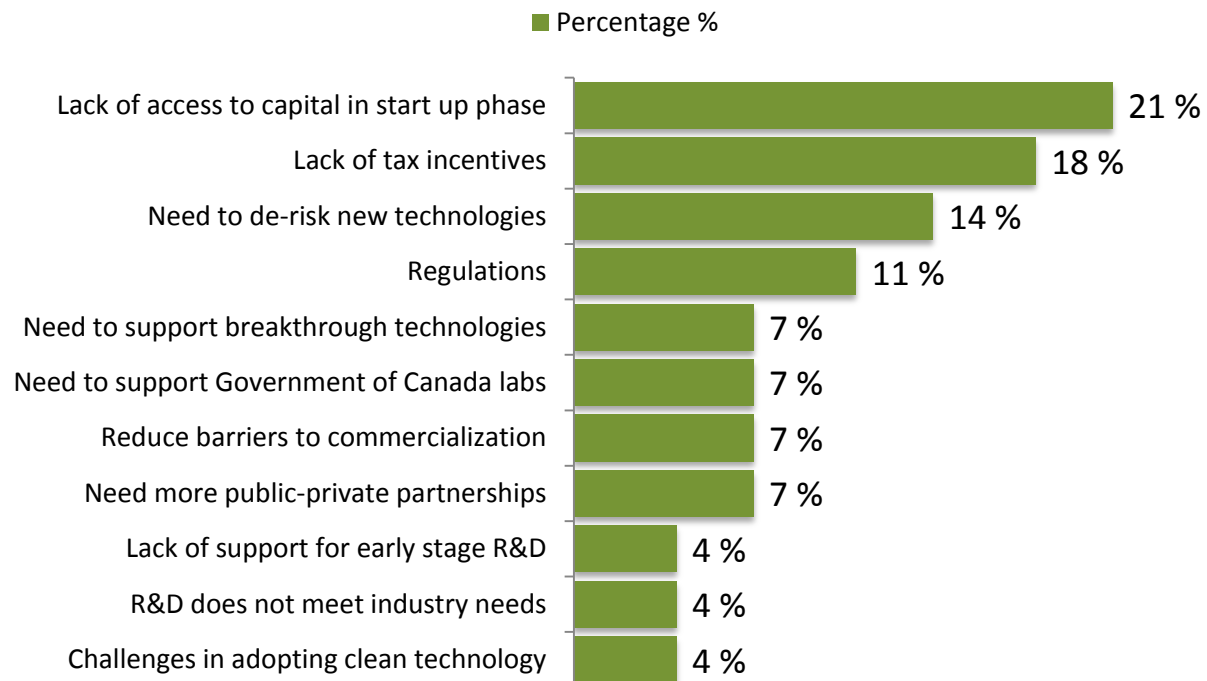
For example, in Okotoks, just south of Calgary, a [community](#) is heating its homes by collecting energy from the sun, storing it underground, and drawing on it as needed. In Okotoks, and in thousands of communities across the country, Canadians are using their ingenuity to solve problems, to better their lives, and bring us to the future.

How can Canada make investments to support new innovative energy projects?

ANNEX B – QUICK POLL RESULTS

QUICK POLL RESULTS (OCT. 21-31, 2016)

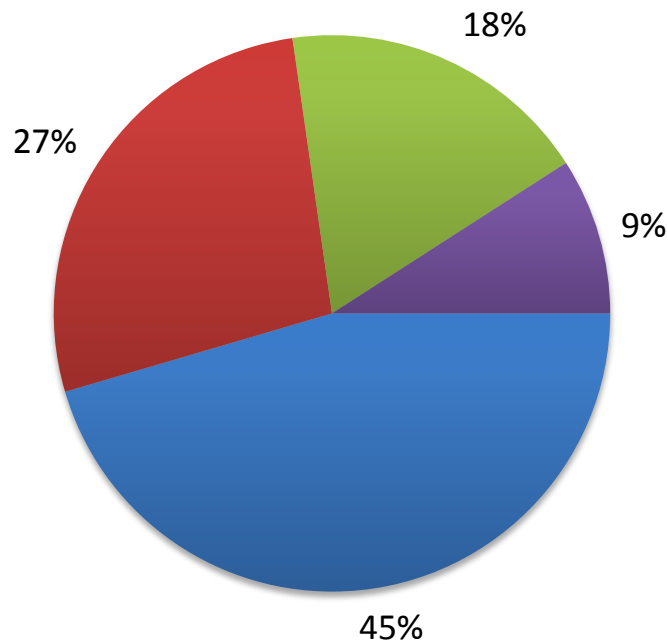
We've heard some great feedback on obstacles and challenges to natural resource industries in clean technology development and use. Which do you feel is the most important for the Government of Canada to address? (28 responses)



QUICK POLL RESULTS (OCT. 21-31, 2016)

What percentage of GHGs could be replaced by using bioenergy produced from forest biomass instead of energy from traditional fossil fuels? (11 responses)

■ Under 21% ■ Up to 80% ■ 66% ■ Up to 100%

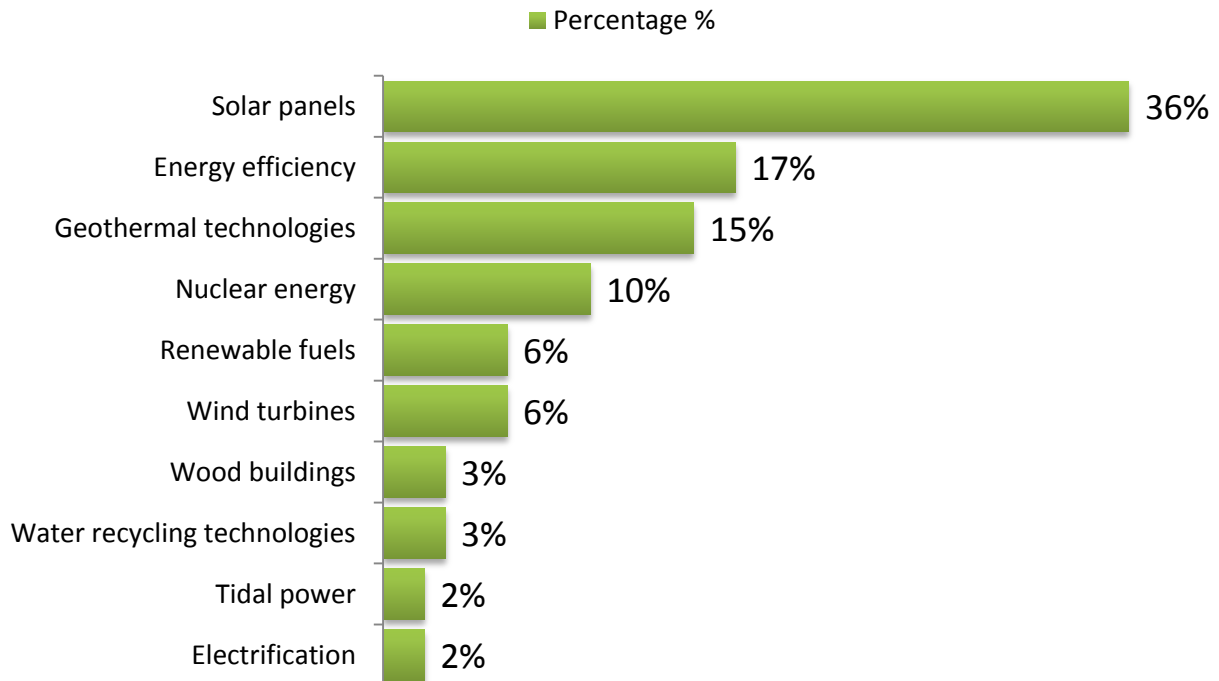


Answer: Up to 80%. Greater use of biomass to produce renewable energy in the form of electricity, heat or transportation fuel can play a useful role within a portfolio of GHG reduction strategies and support Canada's transition to "clean growth". As an alternative to fossil fuels, biomass can be used to generate renewable and sustainable energy. Forest biomass used to produce bioenergy mostly comes from residues of wood processing such as chips and sawdust produced by sawmills. However, it can also come from "waste" material from stand thinning, harvest residues, or trees killed by disturbances such as fire, disease or insects.

Check out The State of Canada's Forests Annual Report 2016 to learn more about the ways Canada's forests, sustainable forest management practices, and how the increased use of wood products and "waste" wood can contribute to mitigating climate change and reducing GHG emissions.

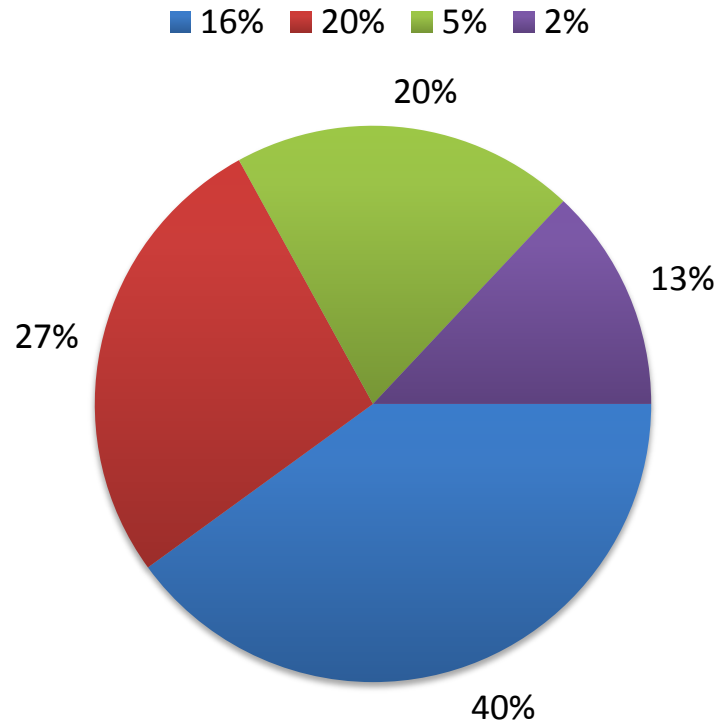
QUICK POLL RESULTS (OCT. 4-20, 2016)

What types of clean technology in Canada's natural resource sectors do you feel could help reduce the impacts of climate change? (84 responses)



QUICK POLL RESULTS (OCT. 4-20, 2016)

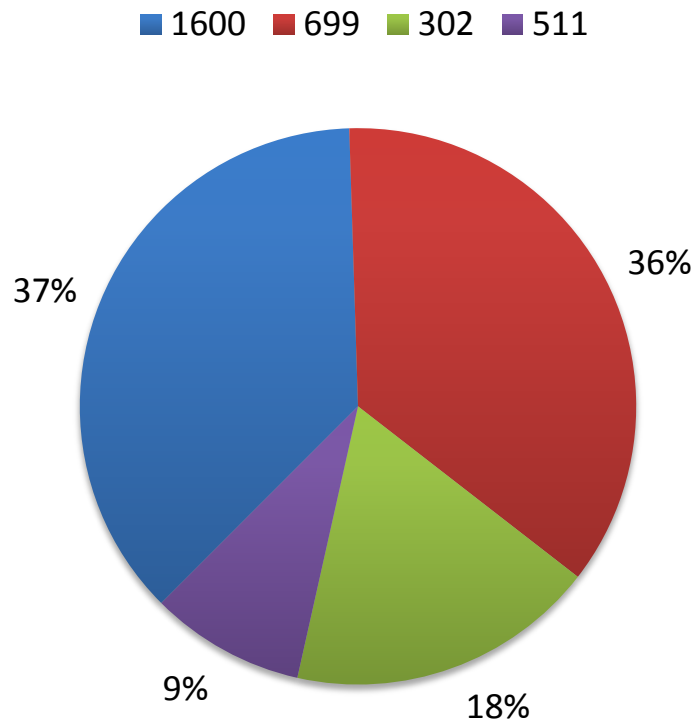
Approximately how much of Canada's electricity mix is provided by nuclear energy? (47 responses)
Correct Answer: 15.9%



Answer: 15.9% (or 16% when rounded)

QUICK POLL RESULTS (SEP. 20 – OCT. 4, 2016)

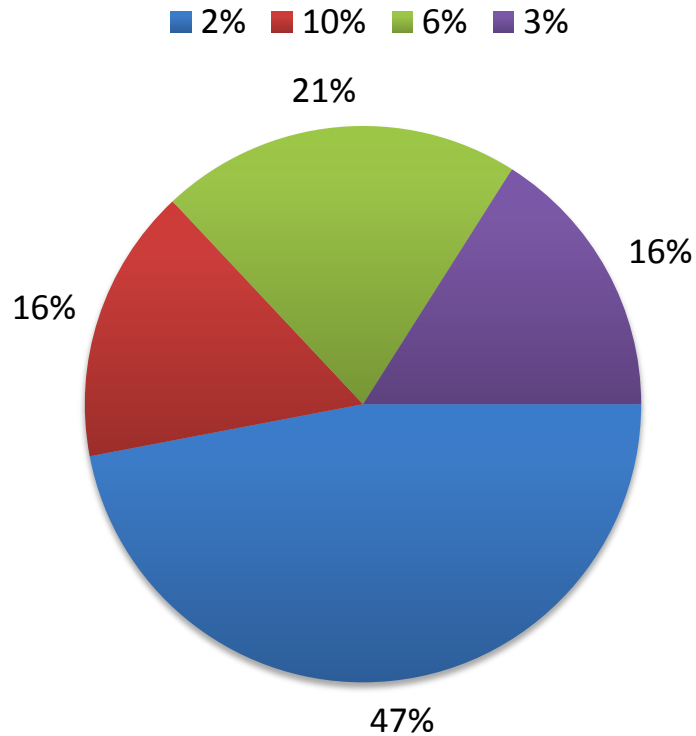
The University of British Columbia's new residence is now the world's tallest wood building. By using wood, the residence will store over 1,750 metric tonnes of CO₂-equivalent greenhouse gases. This is equivalent to removing how many cars from Canada's roads for one year? (12 responses) Correct Answer: 511



Answer: Wood is a sustainable and versatile building material that stores carbon dioxide (CO₂). The Brock Commons Residence, part of UBC's Student Housing Growth Strategy, uses cross laminated timber as its primary building material, a technology that greatly increases the technical limits for tall wood construction. This 53-metre, 18-storey building is the tallest wood frame building of its kind in the world. <http://news.gc.ca/web/article-en.do?nid=1125069>

QUICK POLL RESULTS (OCT. 4-20, 2016)

Bioenergy represents how much of Canada's total energy supply? (20 responses)

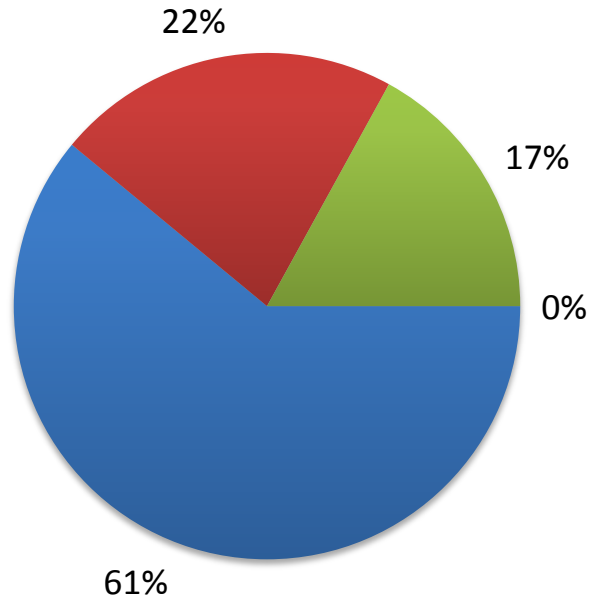


Answer: Bioenergy is a renewable energy resource derived from living organisms and/or their byproducts. It currently accounts for approximately 6% of Canada's total energy supply. Bioenergy is an extensive sustainable energy resource that can supply energy to Canada while emitting low CO₂ and reducing waste. Scientists and engineers at CanmetENERGY are at the forefront of innovative technology developments that will enhance the sustainability of bioenergy for Canada's future. <http://www.nrcan.gc.ca/energy/renewable-electricity/bioenergy-systems/7311>

QUICK POLL RESULTS (SEP. 14-20, 2016)

Do you know how much natural resource sectors contributed to the Canadian economy in 2014?
(18 responses)

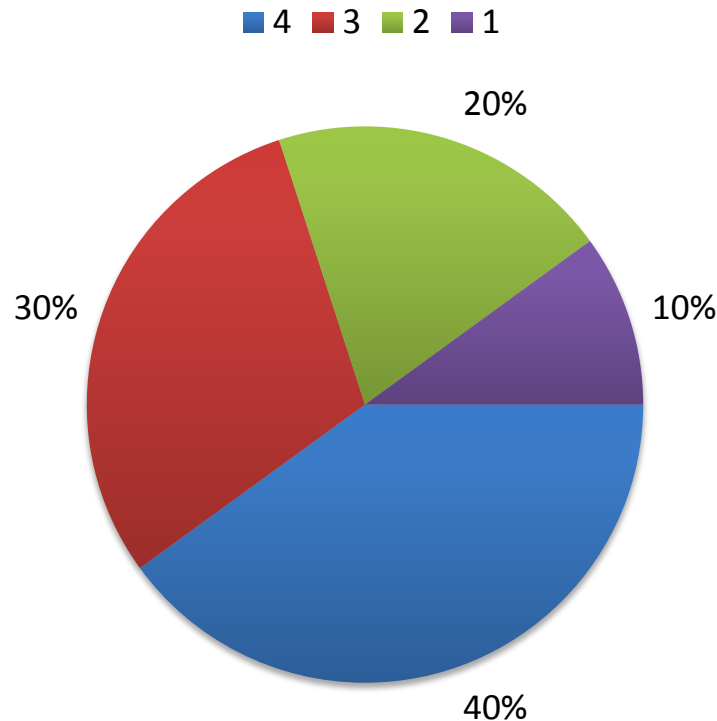
■ \$312 billion of GDP ■ \$40 billion of GDP
■ \$500 billion of GDP ■ \$1 trillion of GDP



Answer: \$312 billion of GDP

QUICK POLL RESULTS (SEP. 14-20, 2016)

Canada is home to how many of the world's 15 large-scale operational carbon capture and storage (CCS) projects? (28 responses)



Answer: Canada is home to 3 of the world's 15 large-scale operational CCS projects, with a 4th under construction:

Weyburn-Midale: The Weyburn-Midale Project is the largest ongoing CO₂-enhanced oil recovery (EOR) project with over 30 million tonnes of stored CO₂ since 2000;

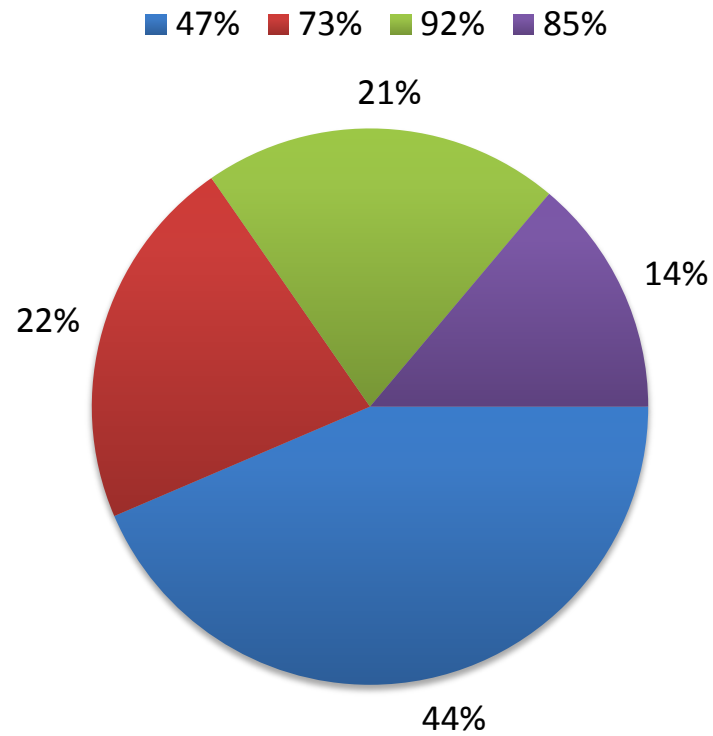
Boundary Dam: Launched in October 2014, SaskPower's Boundary Dam project is the first commercial CCS project at a coal-fired power plant and it has captured over one million tonnes of CO₂.

Quest: Launch in November 2015, the Shell Quest Project is the first industrial CCS project designed to capture and store over 1 million tonnes of CO₂ per year; and

Alberta Carbon Trunk Line: Led by Enhance Energy, the Alberta Carbon Trunk Line is expected to capture and store up to 1.8 million tonnes of CO₂ per year from a fertilizer plant and an oil sands refinery, starting in 2017. This will be the first refinery globally to have built-in CCS.

QUICK POLL RESULTS (JUL. 7 - AUG. 18, 2016)

What percentage of Canada's greenhouse gas emissions comes from the extraction, harvest and use of natural resources? (93 responses)



Answer: 92%

Quick Poll Results (Jul. 7 - Aug. 18, 2016)

In your opinion, which area has the most potential to drive a clean energy future? (17 responses)

