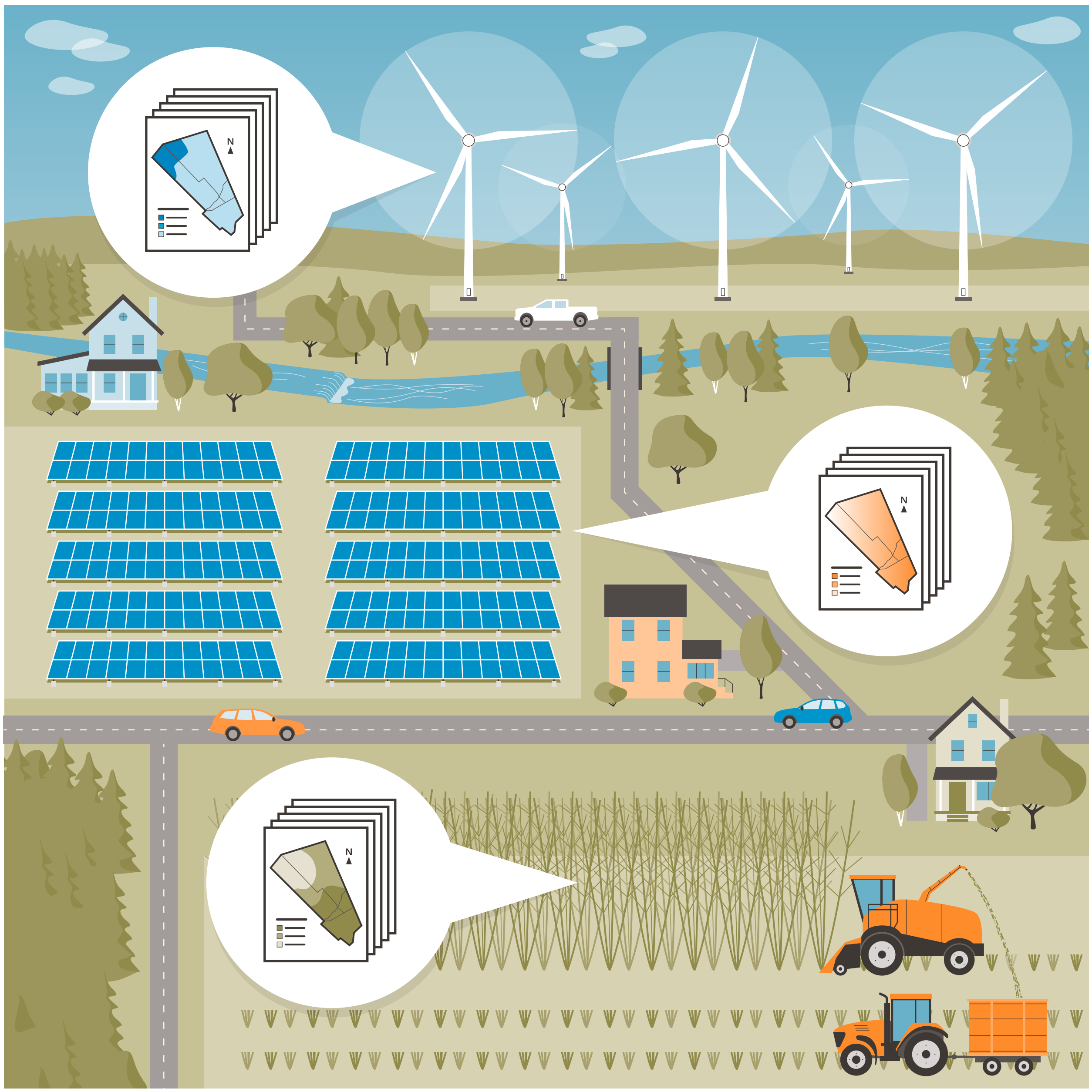
Mapping opportunities for land-based renewable energy generation in Ontario: a primer



CEKAP
Community Energy Knowledge - Action Partnership

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Context

The transition to distributed renewable energy (RE) production is well underway, especially in the electricity sector. Technological innovation, public policy and consumer demand have all helped to restructure electricity markets and create conditions in which RE systems are becoming cost-competitive against electricity generation from coal, nuclear, and natural gas. At the same time, the transport and heating sectors are beginning to take advantage of a greener, cheaper grid through electrification. Social movements and political leaders are emboldened by these developments, evidenced by the growing number of communities, corporations and governments setting goals to be "100% renewable" over the coming decades.

The purpose of this guidebook is to help local communities and local governments to identify and manage the opportunities and impacts of this transition. Our focus is on land-based RE, namely wind farms, ground-mounted photovoltaics (solar), and cellulosic biomass[1]. We offer a set of concepts, techniques, and tools through which planners and communities can produce a map that indicates where land-based RE systems are likely to be implemented in their region. Perhaps more importantly, we show how these maps can be used to generate public dialogue and public policy in order to capture the opportunities and minimize the impacts of the transition to land-based RE. The full guidebook is available here. This document is meant as a primer. We explain the rationale behind our emphasis on land-based RE, and offer a high-level overview of our mapping approach including a case study of the Regional Municipality of Peel, Ontario.

1 Cellulosic biomass includes corn stover, straw, and woody materials. These are biological materials that are not considered food for direct human consumption, although some of these materials have uses as animal feed, animal bedding, pulp and paper, lumber, and other non-energy uses.

Why ‘land-based’ renewable energy? What about rooftop solar?

The transition to RE is a landscape transformation. For decades, our primary energy supply has mostly come from fossil fuels (coal, oil, natural gas), which exist below ground and are transported long distances before they are converted into heat or electricity. Increasingly, we are deriving our energy from renewables which, for the most part, can only be recovered above ground (wind, solar, biomass), and must be converted into heat or electricity on-site (or, in the case of biomass, a relatively short distance away). As a result of the localized nature of RE, opportunities for our local communities are tremendous. Home-owners, property owners, and community cooperatives can participate in energy generation through direct ownership or manageable investments, which means the financial benefits can be more evenly distributed across society. As RE systems become the primary source of energy for electric vehicles, local air quality and therefore health outcomes are vastly improved. Local efforts to maximize RE generation will also help to address the global climate crisis.

With these opportunities come challenges. Renewable energy systems introduce landscape impacts and land-use tradeoffs that need to be identified and managed – think about solar panels covering what was once an active pasture; wind turbines altering a natural view and introducing a new risk to local wildlife; or agricultural fields growing crops for energy rather than food. RE infrastructure is also highly visible and covers wide areas; energy generation is no longer ‘out of sight, out of mind’ like coal or nuclear. These landscape changes can often be in conflict with existing land-based economies and ecosystem services, and their high visibility raises concerns about landscape aesthetics among local citizens.

Figure 1: Images (taken by authors) of the kinds of RE technologies this guidebook is focused on: utility scale wind (top); ground-mount photovoltaics (middle); and cellulosic biomass (bottom, showing short-rotation willow production for energy end-use).

How much land will be needed to power a sustainable energy future? Can we allocate significant tracts of land to RE production and still ensure that our local landscapes provide food, habitat, spaces for recreation, and other land-based economies and ecosystem services? How are these land-use tradeoffs perceived by the general public? How will changing technologies mitigate or exacerbate these issues? And how should our existing land-use planning systems evolve to help manage these trade-offs?

These are just some of the questions that our guidebook will help answer. Using the tools described in our guidebook, local communities and governments will have some of the critical information they need to prepare for this integrated energy-land transition.

"What about rooftop solar which does not require any new land?"

Indeed, some of our RE supply can be recovered with rooftop solar energy systems, and therefore without significant landscape transformation. Rooftop solar energy is necessary, but by itself insufficient as a means to achieve a sustainable energy future. Detailed energy assessments at the city-scale have shown that rooftop solar energy potential is about half of total current electricity use across most cities in North America; by 'current use', this does not account for the electrification of transport and heating.[2] In other words, renewable energy generation will need to sprawl beyond our rooftops and existing infrastructure if we hope to achieve ambitious goals around RE generation while decarbonizing heating and transport systems.

"But total land requirements for RE generation are small".

This is also correct. Previous research from our group suggests that Ontario would need approximately 3 per cent of its farmland if it were to power itself entirely on photovoltaics.[3] But the proportion is misleading. Absolute land requirements, in terms of total actual hectares or acres needed, are large. And virtually every hectare we would consider for RE generation is already supporting an economy, a livelihood, an ecosystem, and a lifestyle. So we need to be thoughtful in how we allocate land to RE production. The same is true for off-shore wind or tidal energy, although our work-to-date does not focus on those options.

Why is this guidebook speaking to Municipal and local audiences?

Increasingly, the responsibility to deliver on the Province's climate change mitigation ambitions is falling to local and regional governments. The emergence of community energy plans and local climate plans express that responsibility. And as markets open up for RE development, especially

2 Gagnon, P. et al. 2016. Rooftop solar photovoltaic technical potential in the United States: a detailed assessment. Technical Report NREL/TP-6A20-65298, National Renewable Energy Laboratory (USA). See https://www.nrel.gov/docs/fy16osti/65298.pdf. For some guidance on how to map rooftop solar energy resources, see https://www.aimspress.com/article/10.3934/energy.2015.3.401

3 Calvert, K. 2018. Measuring and modeling the land-use intensity and land requirements of utility-scale photovoltaic systems in the Canadian province of Ontario. The Canadian Geographer 62: 188-199.

rural communities are at the front lines as developers approach land-owners to host new systems. Recently, Municipalities (re)gained some control over RE development and now have the authority to shape the market through the design of land-use plans and by-laws that regulate RE development. In other words, Municipal Councils and local planners need to facilitate RE development while managing the land-use tradeoffs described above. These responsibilities are unfamiliar to Municipalities in Ontario, and there are very few resources available to help Councilors and planners make decisions in this new role. Our guidebook is meant to provide capacity to fill that role. Since the guidebook considers the Ontario energy market and land-use policy framework, users of the guidebook outside of Ontario should be careful not to directly extrapolate the methods and findings. Still, the general approach will be useful.

How to Use the Guidebook

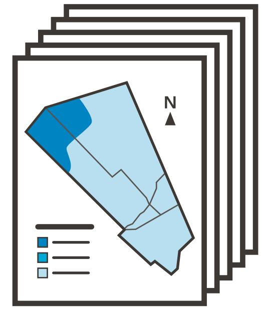
The guidebook is broken down into two sections. Section 1 provides details on the data and techniques used to produce maps that communicate possible opportunities for PV, wind, and biomass energy development. Section 2 provides detailed guidance on how to leverage those maps for community and stakeholder engagement.

These workflows can be used for stand-alone projects, depending on research needs and priorities. For example, if a few possible sites have already been identified for renewable energy development, skip to Section 2 for ideas on how to engage the public around those opportunities. If the goal is only to identify possible sites based on technical criteria, work only from Section 1 (but you've been warned: the social dimension of RE development is a hugely important factor in determining the success of a project, and so we really think you should incorporate public engagement as part of the assessment).

The guidebook has been written for a reader with some technical background in renewable energy siting, land-use planning, and/or geographic information systems (GIS). We have tried, to the best of our ability, to be clear in our description of the workflow, without providing extraneous detail. We decided to leave out very detailed step-by-step instructions, given the rapid pace of change in the software and data that are used for this type of work. We didn't want the toolkit to be obsolete upon publication! Instead, we describe our approach at a conceptual level, but with enough detail such that the processing and analytical steps will be intuitive for someone with a GIS background, and that the logic underlying map outputs will be comprehensible to someone with expertise in renewable energy and/or land-use planning. In all cases we demonstrate the intermediate and final results of our workflow using examples from our recent work in the Regional Municipality of Peel, funded by the IESO. These examples represent the kinds of outputs that can be produced from the workflow.

You will find our guidebook here, in a separate document, which provides a detailed workflow and identifies data needs to map land-based RE resources in Ontario. In what follows, we provide a high-level overview of the process and its outputs, to give readers a sense of the capabilities and relevance of the mapping process and its outputs.

Overview of the RE Mapping Process



Our mapping approach unfolds in two phases. First, a technical analysis identifies where land-based RE systems are likely to be implemented in a region based on the suitability and accessibility of land resources for a specific RE technology. Second, the results of this technical assessment are used as the focal point for community engagement and cross-sector dialogue about the concerns/conflicts or preferences/opportunities around the development of these particular sites. Although we discuss this as two phases, it is really part of an integrated, standardized framework to RE resource assessments.

Our inspiration to develop a standardized framework comes from the most successful energy industry of all: the fossil fuel industry. In the fossil fuel industry, the distinction between 'resources' from 'reserves' is crucial to investment planning and policy making: Resources refer to the total quantity of a particular fuel (oil, coal, natural gas, uranium) that has been estimated to exist; 'reserves' are a sub-set of resources that are assumed to be accessible based on favorable geological, technical and economic conditions.[4] The distinction is based primarily on the level of certainty associated with estimates of recoverable volumes (X axis on Figure 2), along with their potential for reaching commercial production based on market conditions (Y axis on Figure 2). Methods for estimating and calculating reserves relative to resources might vary across organizations and jurisdictions, but the language used to communicate those estimates and calculations is universal. In this way, industry is able to communicate opportunities that exist now, and is also able to communicate how opportunities might grow under particular market and policy conditions. In order for RE to compete at the agenda-setting stage of an energy strategy or investment decision by a community, government, or corporation, information about an area's RE resource base must be presented with the same level of clarity.

4 Miller, R.G. and Sorrell, S.R. 2014. The future of oil supply. Philosophical Transactions of the Royal Society 372. https://royalsocietypublishing.org/doi/10.1098/rsta.2013.0179. See also https://www.spe.org/industry/reserves.php and https://mrmr.cim.org/en/standards/canadian-mineral-resource-and-mineral-reserve-definitions/

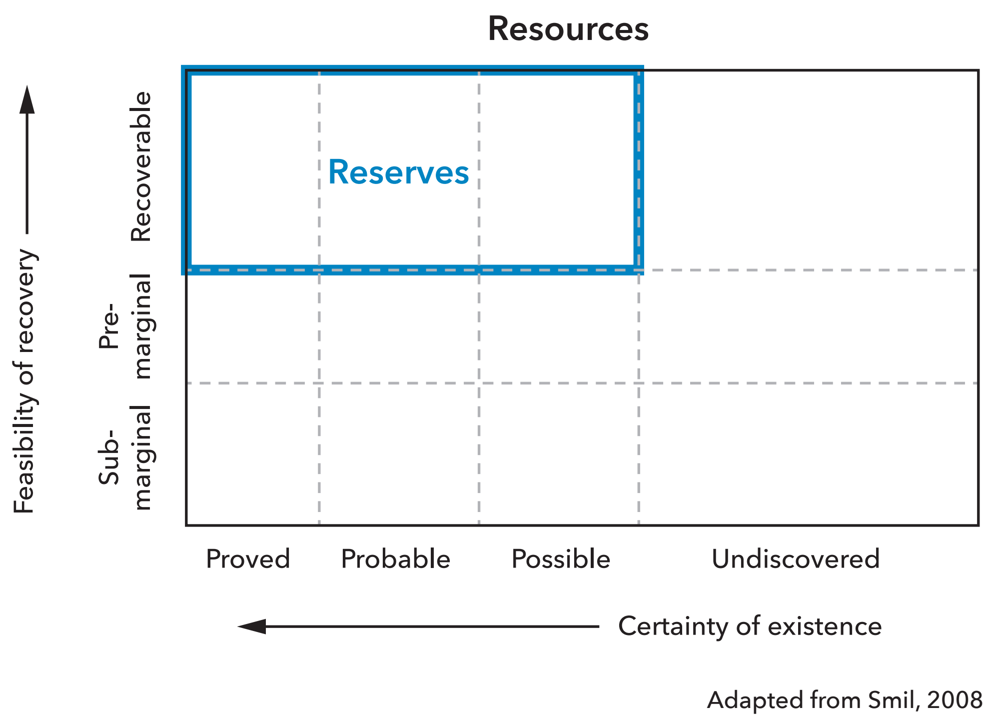


Figure 2: A mental model of the resource-reserve classification system used to organize and communicate fossil fuel resource assessments.

The huge problem with this, of course, is that information about fossil fuel resources-reserves is not always in the public domain. Prospecting for fossil fuels very rarely involves the communities in which those resources might be developed. Moreover, the framework in Figure 2 was developed for 'below ground' resources. For renewables, the primary resource of interest is land/space, not the resource itself. And so the model has limited applicability for renewables.

The framework we use in this work builds on lessons learned in the fossil fuel industry, dozens of academic publications, a handful of policy reports, years of in-house experience and hours of conversations with RE professionals. The framework is represented graphically in Figure 3 and described in detail in Table 1 below. The framework has six key features which, in combination, make this approach innovative and effective:

1. Uses a standardized nomenclature through which to identify, organize and analyze the factors that distinguish theoretical RE potential from what is actually realizable in a given area (Figure 3 and Table 1)

2. Rooted in a geographic information system (GIS) to rigorously analyze the spatial limitations on RE resource access, allowing us to improve estimates of realizable potential in an area while at the same time identify, more precisely, where the resource might be accessed.

3. Accounts for local regulations, in addition to federal and provincial regulations, when accounting for regulatory constraints on site access as well as competing uses of land

4. Enables policy-scenario analysis, for example by showing how access to land and in turn RE would change under different regulatory settings (e.g., wider set back distances from dwellings for a wind turbine).

5. Brings together expert-drive technical analysis with participatory mapping, in order to account for the competing values held over the landscape from various community members and stakeholder groups.

6. Employs 'positive reasoning' to indicate areas that are preferential for development, all else being equal. Normally, RE mapping frameworks only employ 'negative reasoning', by removing constraints or identifying concerns. Positive reasoning means we can look for ways to maximize opportunities, not only to minimize the impacts.

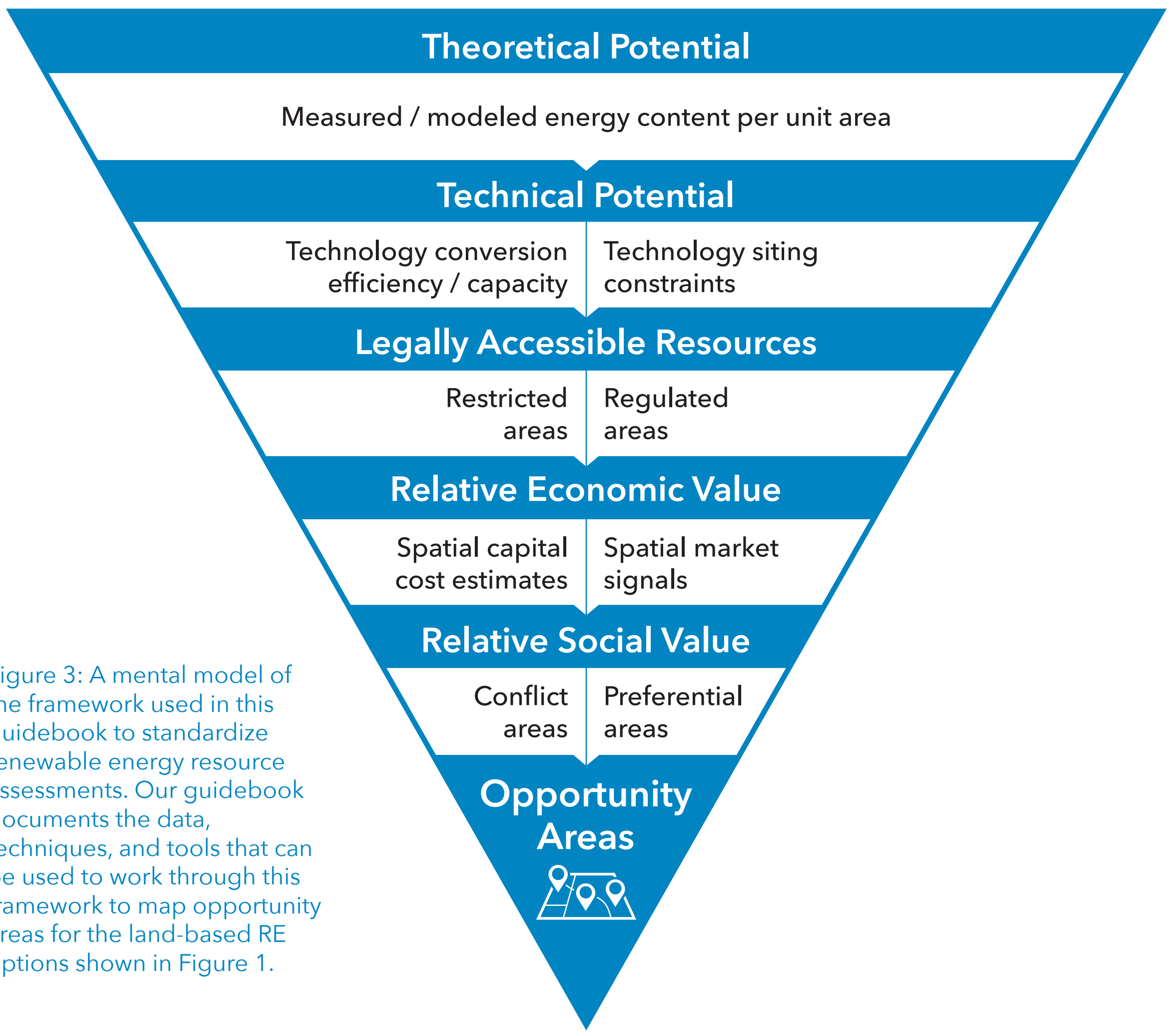


Figure 3: A mental model of the framework used in this guidebook to standardize renewable energy resource assessments. Our guidebook documents the data, techniques, and tools that can be used to work through this framework to map opportunity areas for the land-based RE options shown in Figure 1.

Table 1: RE Mapping Process

Category	Definition		Example Distinguishing Factors
Theoretical Potential	Measured or modeled energy potential across a geographic area. These maps depict physical expressions of energy flows across Earth's surface. Also referred to as physical limit or gross potential.		Irradiance; wind speed; heat value of biomass;
Technically Recoverable Resources	Theoretical resources are mapped as 'technically recoverable' or 'not technically recoverable'. These maps depict theoretical resources that can be converted into useful energy by prevailing technologies (technology conversion efficiency limit), at sites that can be accessed using reasonable engineering solutions (technology siting constraints). Both are dependent on interactions between the technology and site characteristics.	Technology conversion efficiency / capacity factor limit (a.k.a. 'production ceiling'): estimated net energy recovered based on system efficiencies and system capacity factors, typically assuming conversion technologies at or beyond the research and development stage of innovation chain. This limit will increase through technical innovation.	Technology resource requirements (e.g., wind power profiles; biomass type); technology capacity factor and conversion efficiency
		Technology siting constraints (a.k.a. 'carrying capacity'): includes site-specific barriers to infrastructural development and to system engineering and operation. In the case of biomass, residue coefficients are applied to account for the organic content that needs to be returned to the landscape to maintain a soil health.	Land cover; slope; altitude and other site specific physical attributes that are incompatible with technology implementation
Legally Accessible Resources	Technically recoverable resources that are accessible without violating existing regulations related to land-use and infrastructure siting. Prohibited areas are removed from consideration. Regulated areas are mapped along a gradient of 'regulatory risk' from high to low based on the discretionary powers held by government to approve or decline a project.	Prohibited areas: includes those areas and features that are protected from development by inhibitive regulations. Often, these areas are protected from all infrastructure development. In some cases, they are protected from specific kinds of renewable energy development (e.g., solar farms not permitted on "prime agricultural land")	Protections on cultural and natural heritage; zoning by-laws; infrastructure set-back requirements
		Regulated areas: represents permissive regulations. The level of permissiveness relative to a specific technology is interpreted so that we can distinguish the likelihood of project approval	

Table 1: RE Mapping Process - contunied

Category	Definition		Example Distinguishing Factors
Relative Economic Value	Legally accessible resources are mapped according to relative economic potential, based on relatively low spatial capital costs and relatively high market readiness. Map outputs created for this category become an input into community / stakeholder engagement exercises. Note: this does not map site-level economic viability. Outputs at this level provide spatial information necessary to determine viability based on site-level techno-economic analysis.	Spatial capital costs: mapped on a gradient from relatively lower to relatively higher capital costs of development. These costs are a function of site access, site preparation, and connection to distribution systems. These costs vary as a function of total system costs depending on the resource in question.	Distance to transmission / distribution infrastructure; distance to access roads; land value; land-cover; topography
		Market readiness: where relevant, indicators of market readiness are mapped to indicate sites at which RE resources may be more 'market ready', all else being equal.	Local market price (e.g., locational marginal price of electricity); larger parcel sizes (scale economies)
Relative Social Value	Sites that are likely to be developed with least social conflict and / or are perceived as preferential areas by multiple decision-makers. Mapped primarily through participatory mapping with the general public, stakeholder groups, and organizations that have capacity to implement projects	Least social conflict: mapped on a gradient from more to less acceptable. Participants indicate areas that they might find 'acceptable', 'not acceptable', or 'conditional' for the development of a particular resource. Those are compiled into a single map layer.	Proximity to home, work, and / or places of recreation; land-cover type and land-use trade-offs; risk of wildlife impacts
		Regulated areas: represents permissive regulations. The level of permissiveness relative to a specific technology is interpreted so that we can distinguish the likelihood of project approval	Land-owner willingness; utility needs;

Mapping resources that are legally accessible is, frankly, a complicated process. Regulations are often applied only under certain circumstances, and very rarely is the regulation applied in binary fashion (a yes/no decision). Regulations can change frequently. In order to account for this, we have developed a methodology that maps sites based on degree of regulatory control, as summarized in the table below. This analytical nuance allows us to indicate sites that would require more and less legal considerations in order to develop a new RE project, depending on the quantity and nature of the regulations that would apply to a particular site or ecological feature.

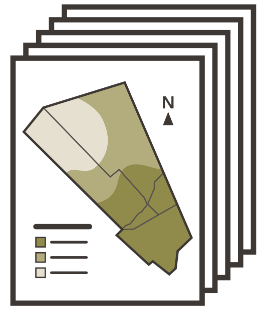
Table 2: The classification system used to interpret and map restricted and regulated areas.

Regulatory Screening Level	Description	Example	Legend Label (see map)
1	Regulations inhibit RE development of all types or a specific type	The Province of Ontario has prohibited the development of PV farms on 'prime agricultural land'.	Restrictive
2	Regulations inhibit most forms of RE development with some exceptions.	The Province of Ontario has regulations that inhibit significant site alterations within 30 metres of a body of water, however, if an EIA demonstrated that the facility's environmental impact is minimal, then the facility may move forward with construction. As such, the 30m setback for bodies of water is a level 2	Somewhat restrictive
3	Regulations inhibit some forms of RE development, with more exceptions.	The Federal Government has a set of recommendations for the construction of wind farms in proximity to aerodromes. It is suggested that wind farms of more than 6 turbines should not be within 10km of a VOR facility, however, required consultations with the airport may result in the passing of a proposed wind farm within the recommended buffer. This makes the 10km setback a level 3.	Not very restrictive
4	There are no pre-determined regulations applying to RE, but an EIA will still be required	Open areas such as active or abandoned farmland that do not fall within any specific regulatory control relative to RE development.	No pre-determined restrictions

The integration of technical and participatory mapping is especially significant. Using maps as a focal point for community and stakeholder engagement activities is an effective way to connect the conversation to the spaces and landscapes that matter to people, while providing them with detailed information about what is possible and what trade-offs need to be discussed in their specific community. Indeed, research has shown that local and participatory renewable energy planning processes reduce public tensions around renewable energy development by leading to more thoughtful and inclusive development decisions.[5] Indeed, opposition to new RE projects is strongest when community members are not incorporated into the planning process.

5 Walker, C. and Baxter, J. 2017. Procedural justice in Canadian wind energy development: a comparison of community-based and technocratic siting processes. Energy Research and Social Science 29: 160-169. https://www.sciencedirect.com/science/article/pii/S221462961730124X. See also https://theconversation.com/lets-create-climate-policy-that-will-survive-elections-104886.

Case Example: Mapping Energy Futures in the Regional Municipality of Peel, Ontario



In this section, we want to give a preview of what outputs from the workflow might look like and how they can be leveraged for decision-support in renewable energy and spatial planning, using results for the Regional Municipality of Peel (see Figure 4)

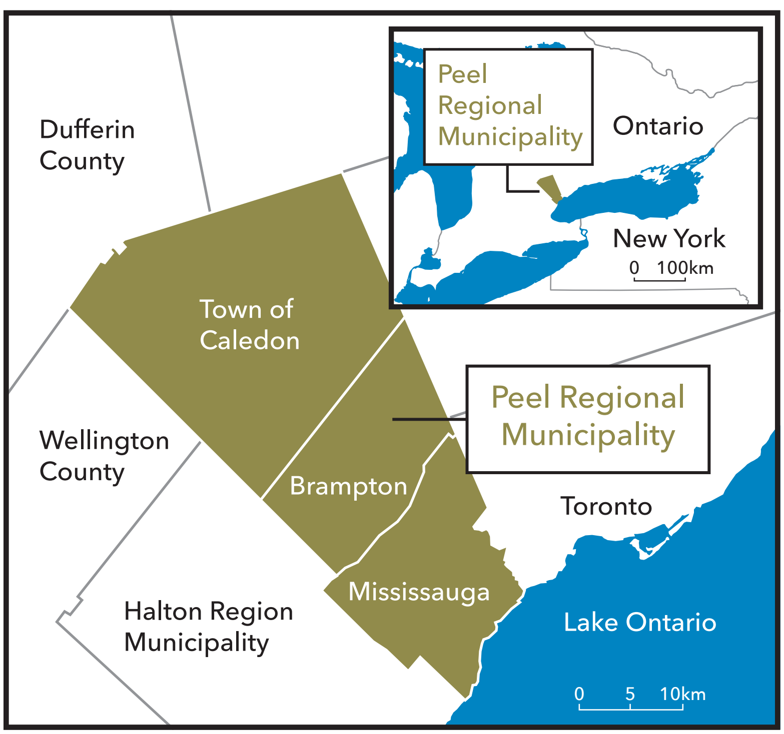


Figure 4: Study area.

Phase 1 Outputs: Mapping Opportunities to Develop RE

Opportunities for Wind Energy Development

Due to a relatively weak wind resource across the region, large scale wind farms are limited to the northwest portion of the region. Smaller scale turbines may be possible elsewhere. The primary constraint on development is the 'set-back' requirement: i.e., the minimum distance that a wind turbine must be from the nearest home, school, hospital, and other 'noise receptor'. Here, we are showing land availability under a 550m set-back distance, and under a larger 1500m set back distance, to show the implications of this decision on opportunities for development. Under these scenarios, it would be possible to install 4,764 MW and 7.5 MW, respectively. Clearly, setback distances play a major role in determining total area available for wind energy generation.

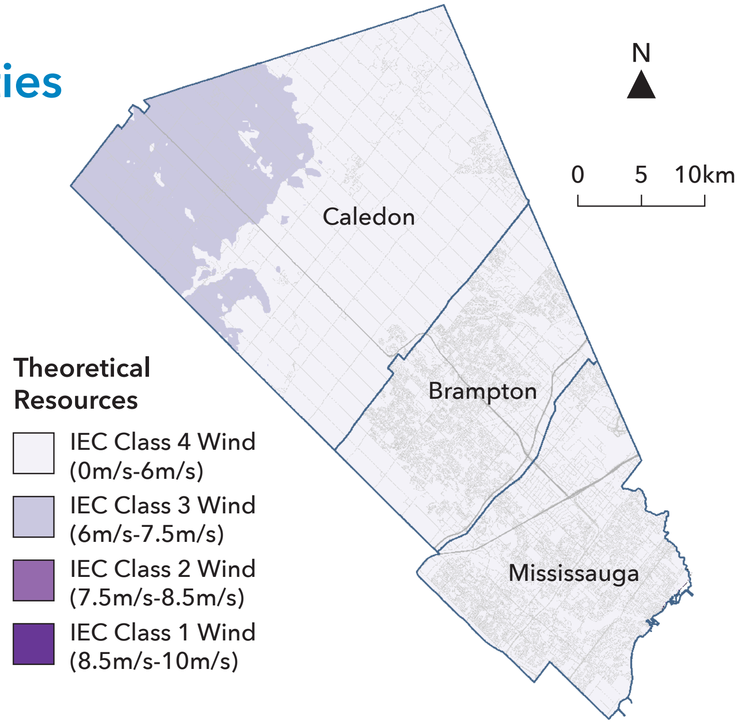


Figure 5a

Theoretical Resources Map

The International Electrotechnical Comission (IEC) 61400 standard is used to communicate which turbine technologies are suitable for use in an area based on annual average wind speed, and is not indicative of the overall generating potential that wind energy has in the region.

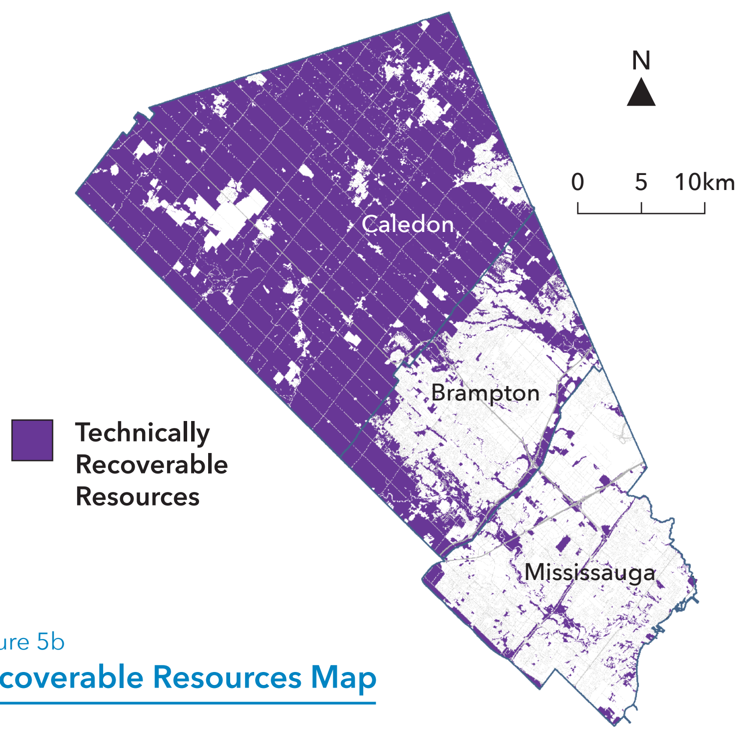


Figure 5b

Recoverable Resources Map

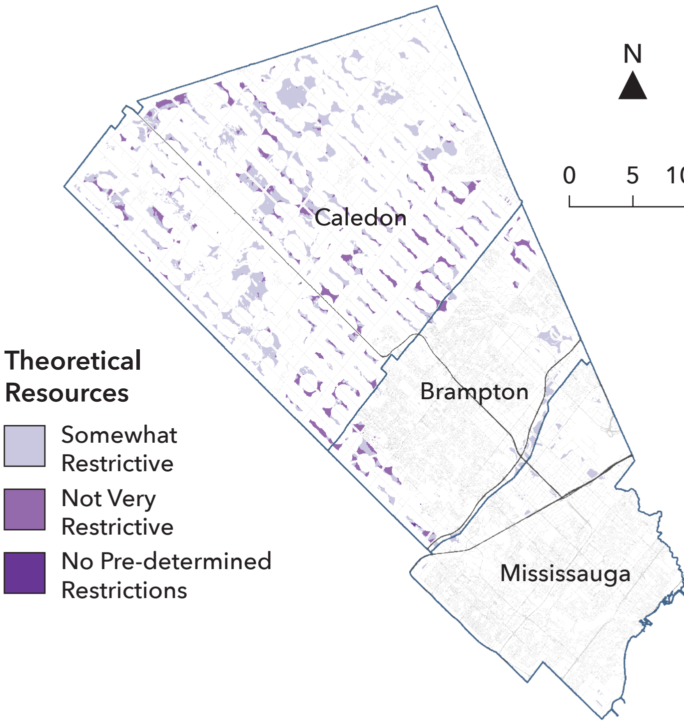
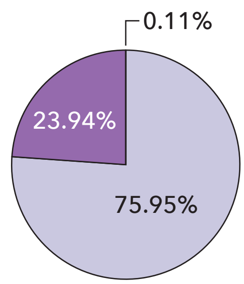


Figure 5c

Legally-accessible Resources Map

This map excludes land within 550m of noise receptors (e.g. dwellings, school etc.). The pie chart is communicating area of land under each category.



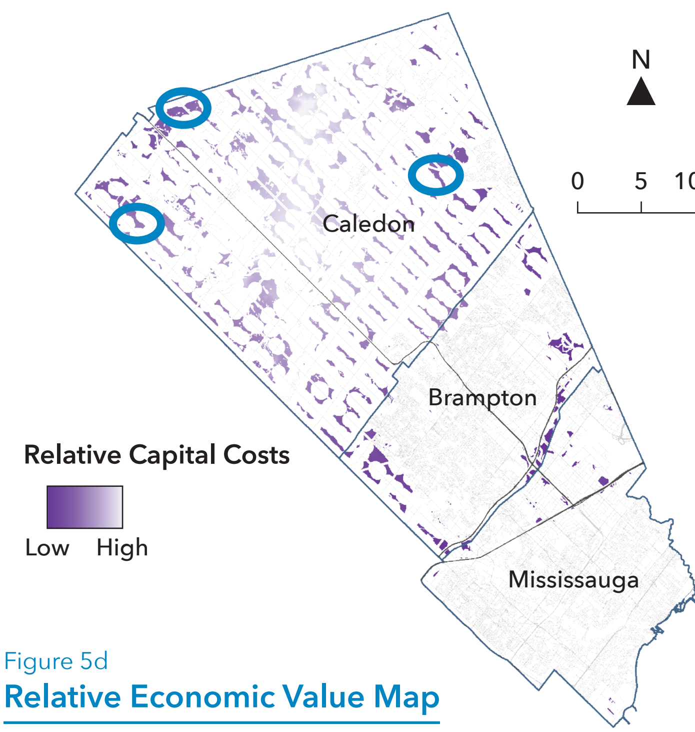


Figure 5d

Relative Economic Value Map

Opportunities for Solar Energy Development

Opportunities for photovoltaic development are more plentiful. The amount of solar energy striking Earth's surface on an annual basis is relatively similar regardless of location in the region. Solar energy is clearly not as strong as in California, but is considerably stronger than Germany where solar energy has been in operation for decades and now makes up 22.99% of their installed capacity.[1] After accounting for technical and regulatory constraints, there are more than 10,800 hectares of land which could host approximately 2,700 MW of possible installed capacity, conservatively assuming approximately 4 ha per MW installed.[2] One of the primary regulatory constraints on solar development is the protection of 'prime' agricultural land for food production – in other words, these results do not allow for PV development on prime agricultural land.

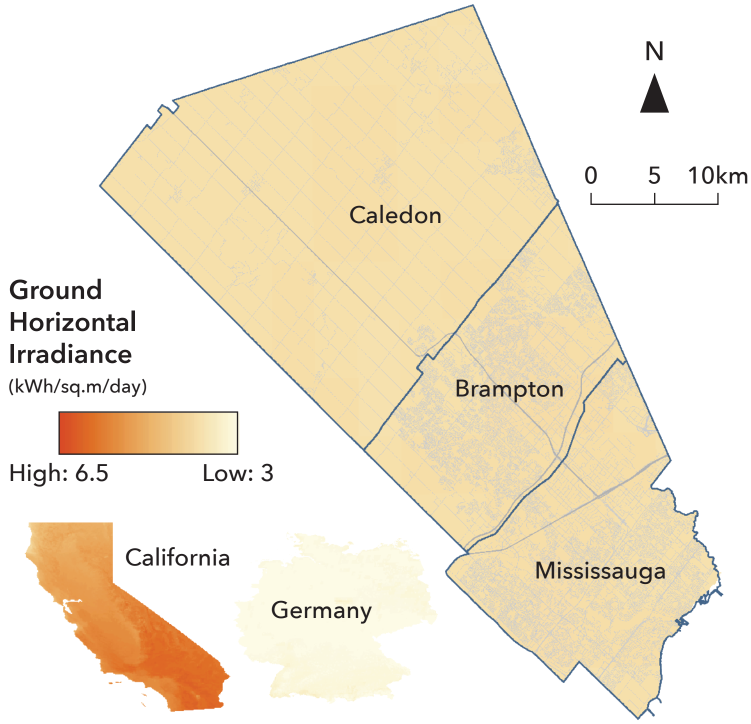


Figure 6a
Theoretical Resources Map

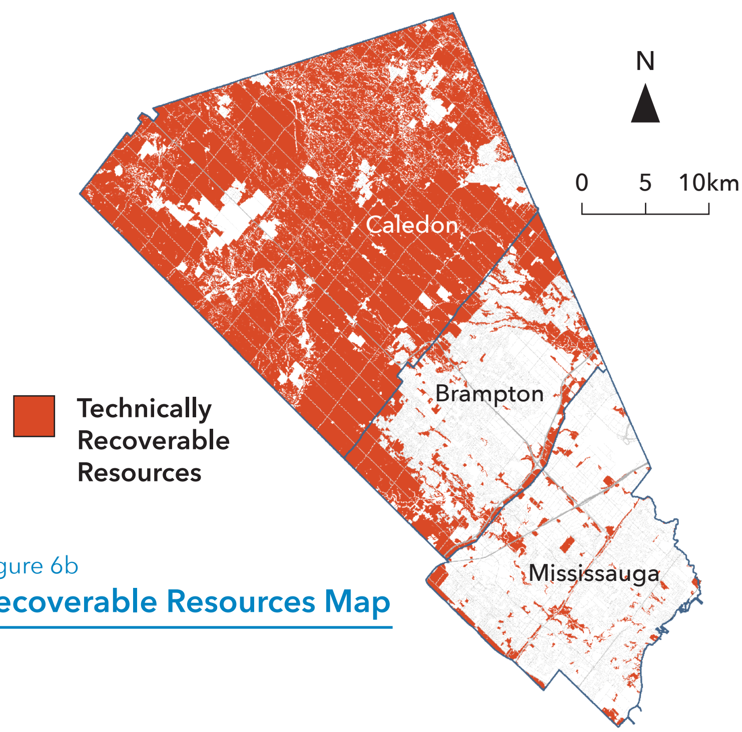
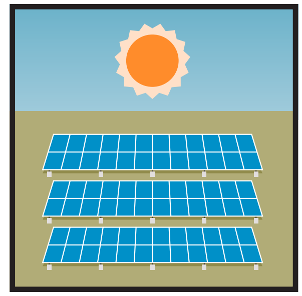
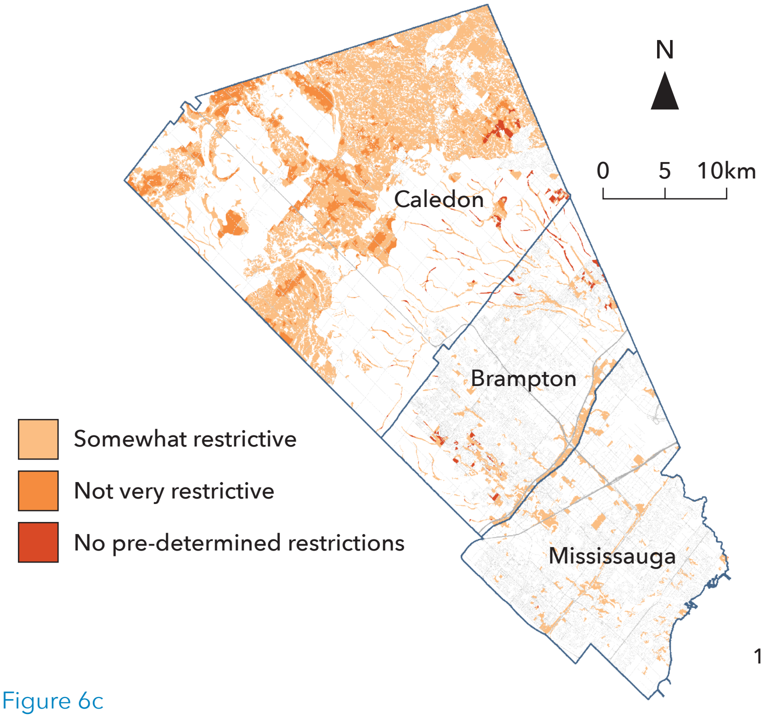


Figure 6b
Recoverable Resources Map

1 Fraunhofer ISE. 2019. Energy charts: net installed electricity generation capacity in Germany. https://www.energy-charts.de/power_inst.htm?year=all&period=annual&type=power_inst

2 Calvert, K. 2018. Measuring and modeling the land-use intensity and land requirements of utility-scale photovoltaic systems in the Canadian province of Ontario. The Canadian Geographer 62: 188-199.





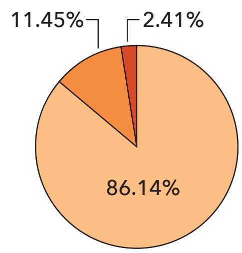


Figure 6c
Legally-accessible Resources Map

This map excludes prime agricultural land as defined by the province of Ontario, which includes land classes 1-3 of the Canada Land Inventory. The pie chart is communicating area of land under each category.

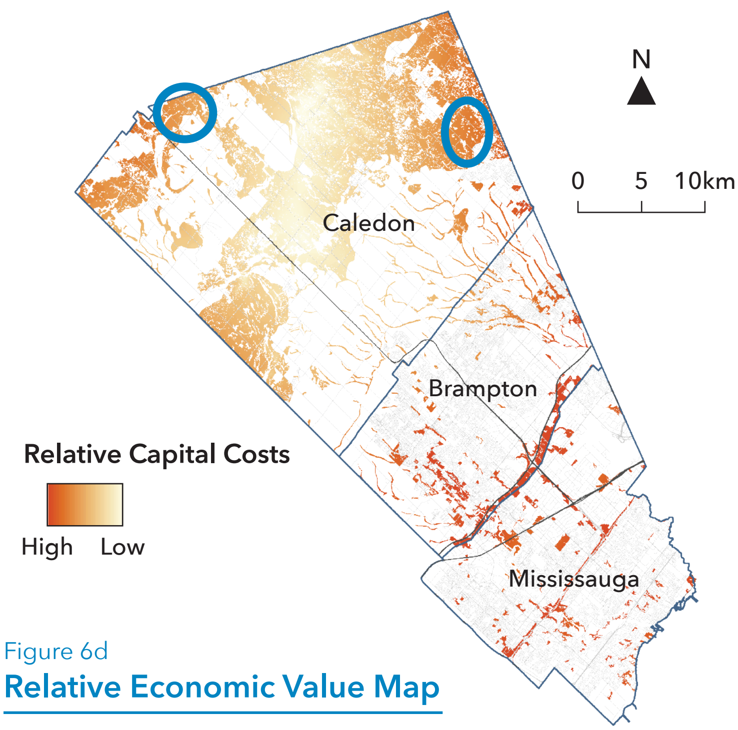


Figure 6d
Relative Economic Value Map

Opportunities for Biomass Energy Development

Biomass energy is trickier to estimate. Here, we are considering only agricultural residues including stover (residues left over after corn harvest) and straw (residues left over after harvesting wheat or barley). These can be converted into any number of biofuels, including pellets or ethanol (a liquid fuel). Here we are assuming they will be converted into ethanol. In general, it is possible to transport these residues up to 150km; if the travel distance is further, it will be too costly and / or require too much energy. Hence, we estimate total availability within a 150km radius of the region – this radius is what we call a 'fuel shed'. The resources are most dense in the southwest of the fuel shed. The bar graph is estimating the size of the ethanol conversion facility that can be established depending on the cost that a facility is willing to pay for its biomass feedstock.

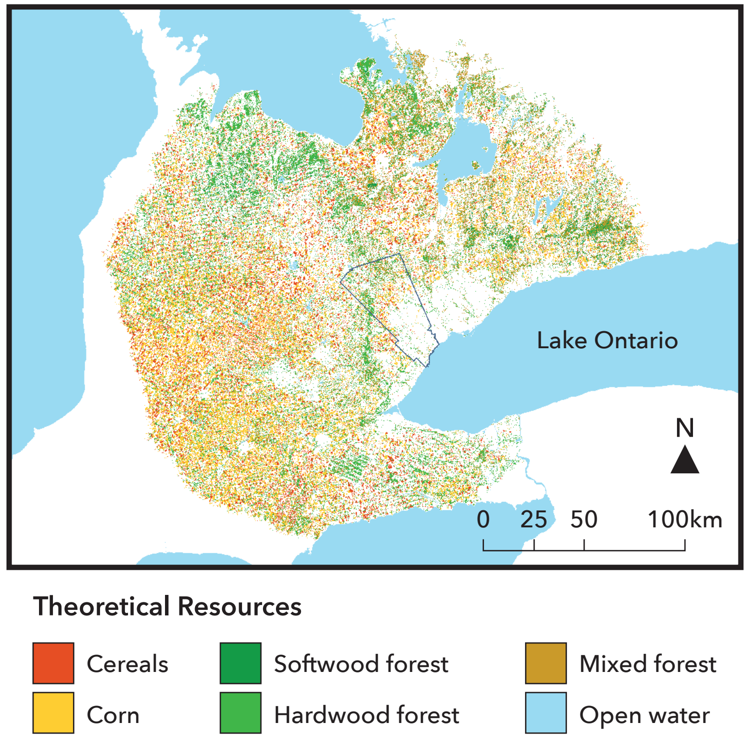


Figure 7a

Theortetical Resources Map

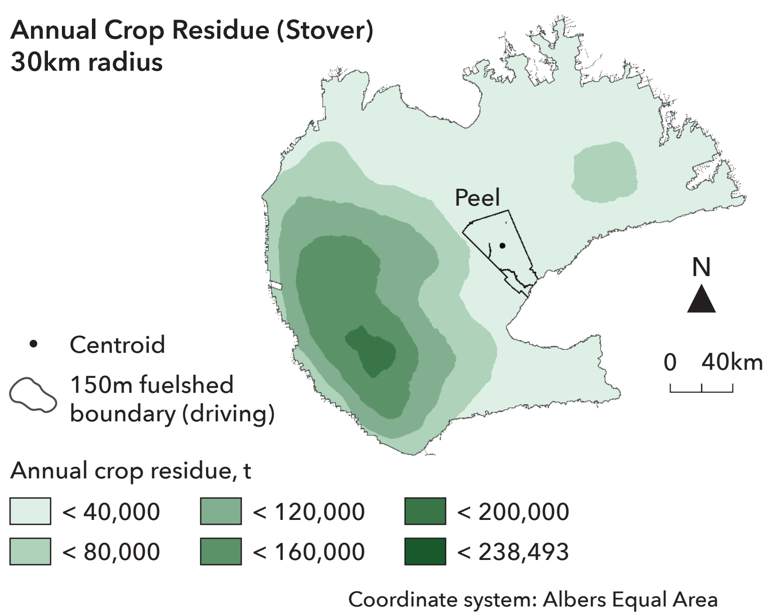
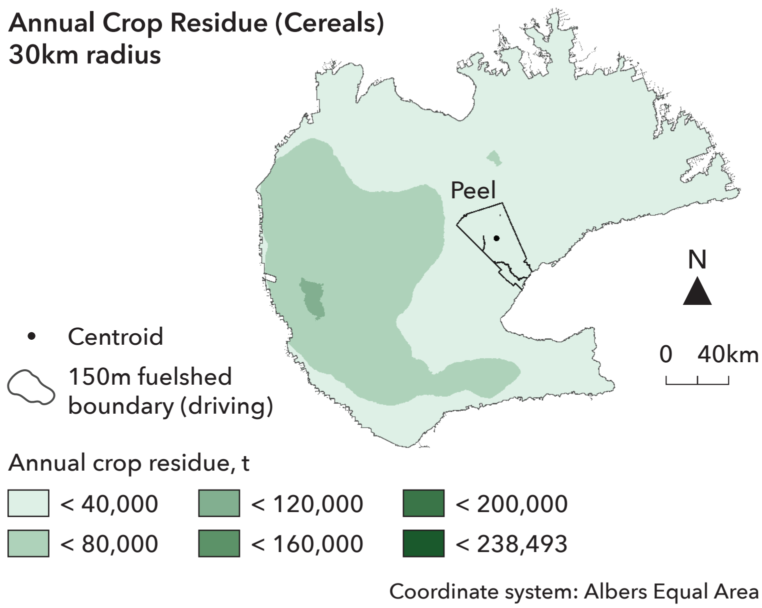


Figure 7b

Recoverable Resources Map



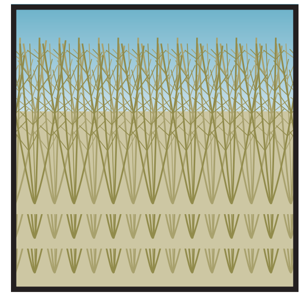


Figure 7c
Recoverable Resources Map

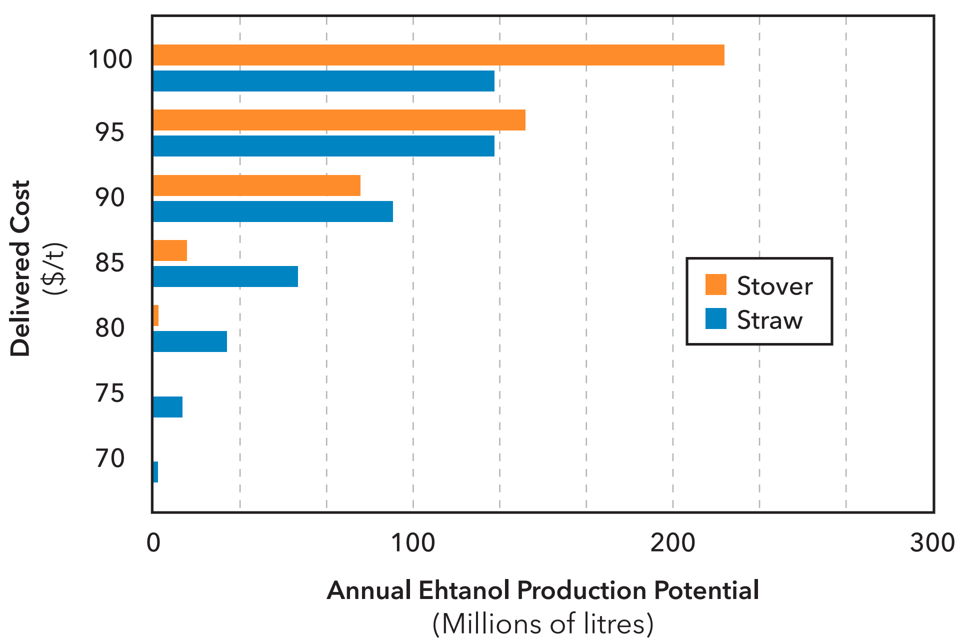


Figure 7d
Recoverable Economic Value

Phase 1 Summary

A lot more can/should be said about these outputs. Indeed, a fuller report for the region will be made available in a separate document. But hopefully this gives you a sense of the kind of outputs that our Phase 1 workflow will produce, and the kinds of questions they raise and help to answer. The result of this work is an area-based assessment and a preliminary screening of resources based on their technical-legal accessibility as well as economic potential within specific areas. This will allow land-use planners, utility companies, land-owners and the general public to better anticipate how and where RE development might occur within their region. The workflow also enables scenario analysis; we are able to strengthen or weaken regulations, for instance, and produce a map that would show how access to RE resources would change under these hypothetical conditions. That said, area of land identified as an 'opportunity area' by our workflow is just a starting point. Further site assessments, based on techno-economic evaluations relative to market and policy dynamics, would be required in order to indicate and pursue specific development opportunities.

All of the land considered 'suitable' for the various RE development options discussed above is already providing some economic and/or ecosystem function. Importantly, the map outputs shown above provide the basis for conversation with community members and key stakeholders about opportunities for RE development in their region, and possible tradeoffs that would be required in order to realize those opportunities. These maps can be scaled differently (e.g., zoomed in to a specific area), or show a different scenario (e.g., represent land availability under different types of protections) as a way of data-driven engagement. The next section provides examples of what this might look like.

Phase 2 Outputs: Participatory Mapping and Public Engagement

Through conversation with Municipal staff, we decided to conduct the participatory mapping process for solar energy resources only. Due to the geographic patterns of likely development, the process focused specifically on the Town of Caledon – a lower-tier rural Municipality within Peel that presents potential opportunities for large-scale PV development.

Our principles of public engagement are simple:

- Foster a place-based conversation, to speak about places and landscapes that matter to people
- Focus on preferences rather than problems
- Elicit narratives and stories rather than diatribes
- Take the engagement to the public, and work hard to involve individuals and groups that are not always heard or able to participate in town-halls or public meetings

These principles are expressed in a participatory mapping process that unfolds in three stages, described in Table 3. Each stage involves different techniques and objectives depending on the nature of engagement. The outputs from each stage are presented below.

Table 3 - Participatory mapping process.

	Community Engagement	Stakeholder Engagement	Capacity-holder Engagement
Who?	Individuals entitled to participate in discussions about major changes to their local landscape	Individuals / organizations who stand to directly gain or lose from decisions about RE development	Individuals / organizations who possess resources and mandates that can drive RE projects
Why?	• Identify key concerns across population • Raise awareness	• Discuss specific issues and impacts, including options to mitigate	• Facilitate cross-sector dialogue to identify common opportunities
How?	• Bring information to community spaces (library, farmer's market) • Open-ended surveys	• Targeted invitations to key constituencies • Focus group centered on specific theme / issue	• Targeted invitations to key constituencies • Focus group centered on specific theme / issue

Community Perspectives

Although the mapping process focused on PV systems, we asses pervasive narratives around RE generally using a survey. The survey assesses how citizens rank different RE technologies in terms of what they believe is most appropriate for their community, and provides opportunity for respondents to submit their views on these technologies through open-ended questions. The survey is administered across the region at various public spaces, using a tablet computer, so that respondents can submit their answers with support from a researcher, but without directly communicating to the researcher. This allows for more anonymity in the survey responses and hopefully encourages respondents to be honest. At the same time, administering the survey in person helps to facilitate conversations, along with opportunities for shared learning and correcting common misperceptions about specific technologies. In the meantime, this personal approach builds good-will among the community, as someone has taken time to bring the survey to them. Future iterations of this methodology will, however, also include an online option to increase accessibility to the survey.

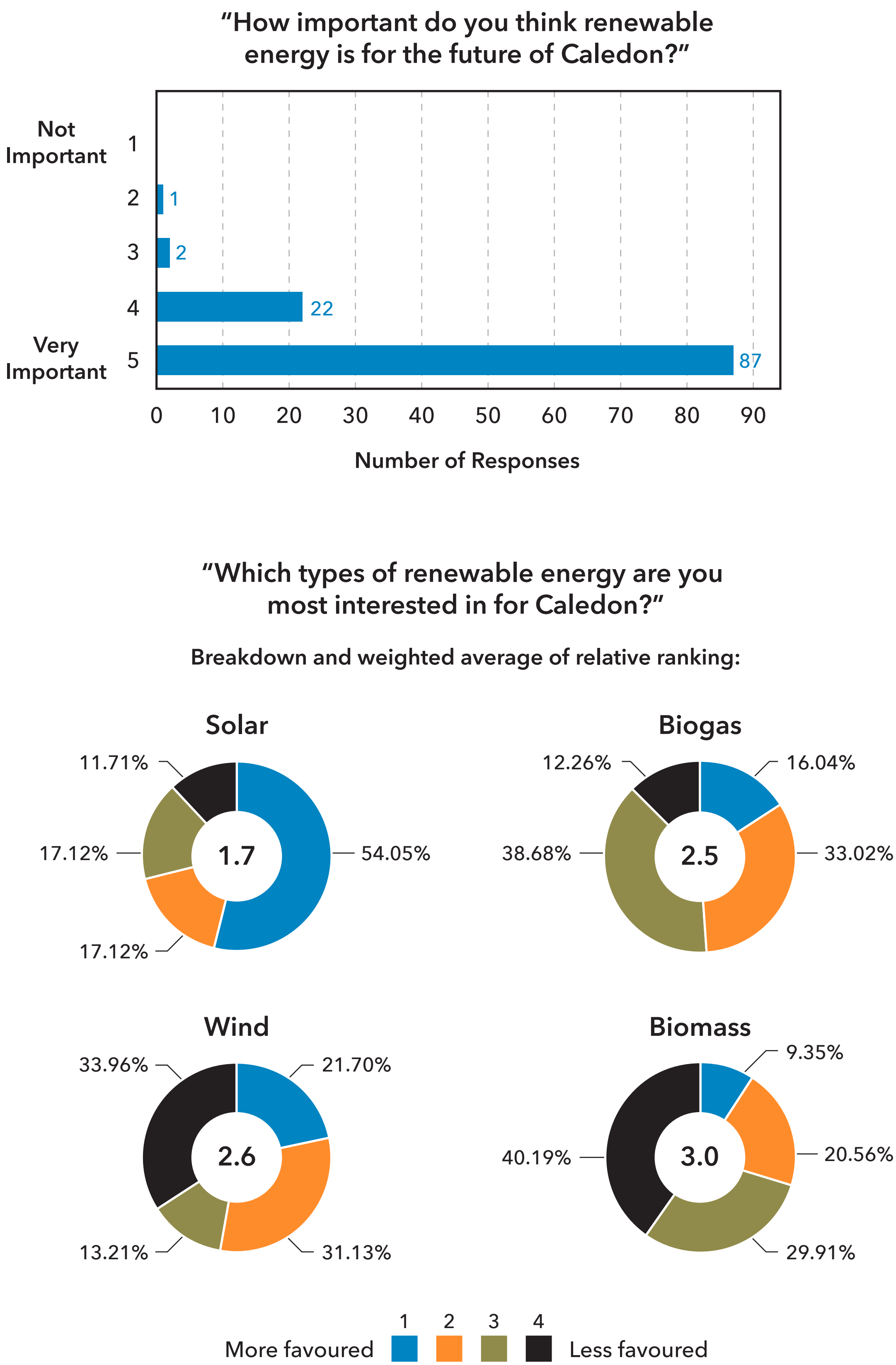


Figure 8 - Community responses.

After completing the survey, participants place a marker on a mounted paper map to indicate their concerns and preferences around possible PV development opportunities within the region. In red, they indicated where they did not want to see new PV systems developed and in green they indicated where they would like to see new PV systems developed. As you can see, a few locations had clusters of indicators which suggest more interest, either positive or negative.

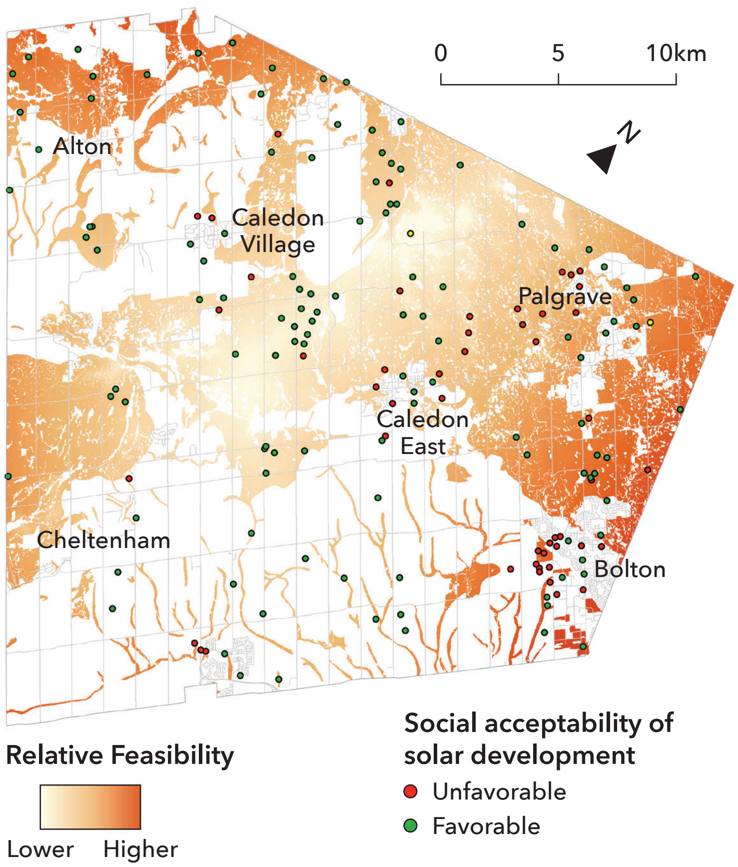


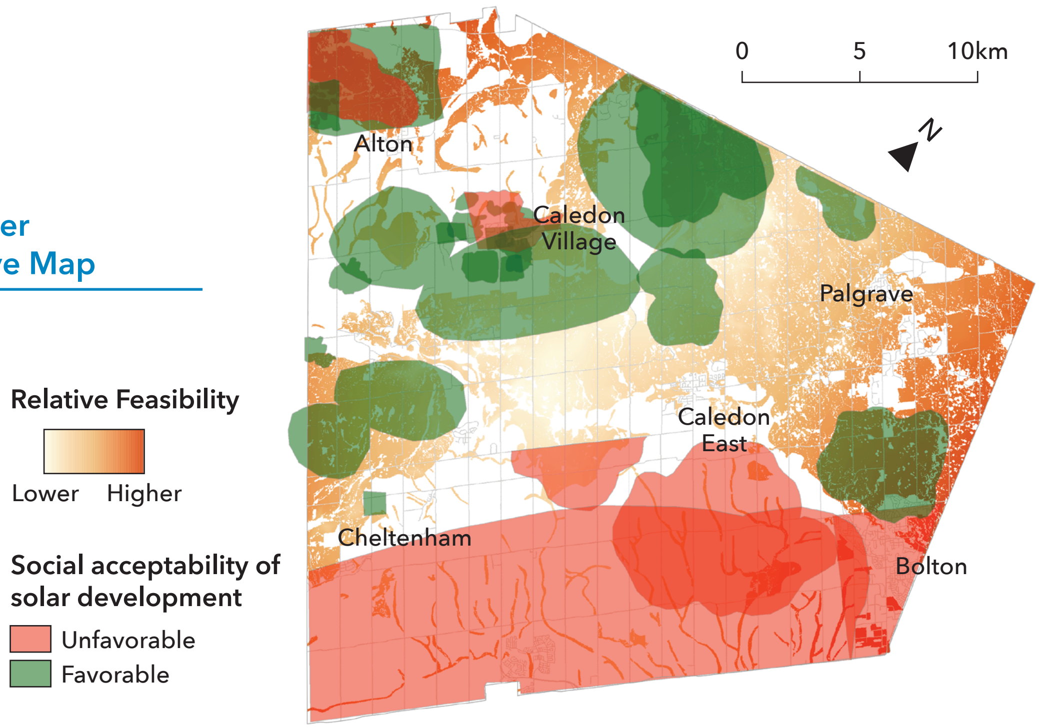
Figure 9
Community Perspective Map

This information provides a starting point for planners, policy-makers and developers as they enter into decision-making processes and work with communities on specific projects. Perhaps more importantly, the process helps to raise awareness about RE development, which gets the community thinking about the subject and prepared to enter into higher level conversations as specific projects are considered. Remember that public awareness raising leads to public action; the goal here is not only to get people thinking about RE, but to see opportunities and benefits for themselves in this transition.

Stakeholder Perspectives

We focus our stakeholder engagement efforts primarily on two stakeholder groups: farmers and naturalists / recreationalists. These two groups have historically been at the 'front lines' of support and opposition to RE systems, primarily because they have a very intimate relationship with the landscape that is so fundamentally altered by RE development. Focus-group style participatory mapping helped us to identify areas that individuals from these groups might find more or less concerning for new PV development. Participants were asked to make indications on their own individual maps, which we are then able to compile and discuss as a group (see below).

Figure 10
Stakeholder Perspective Map



Again, this information provides a starting point for planners, policy-makers and developers as they enter into decision-making processes and work with communities on specific projects. Most importantly, the focus groups brought individuals together for peer-to-peer learning around the topic. The focus-group style presents opportunities for networking and community building.

Capacity-Holder Perspectives

RE projects are only developed if/when individuals and organizations that hold 'capacity' facilitate them – e.g., if developers are willing to invest at a location; if the electric utility company enables connection; if planners zone accordingly; and so on. Similar to stakeholders, representatives of these key 'capacity holder' groups were asked to make indications on their own individual maps, which we are then able to compile and discuss as a group (see below).

Our capacity-holder focus-group allows us to identify specific areas that might be of common interest among these enablers, as you can see on the map. By engaging these individuals separately, rather than as part of community and stakeholder engagement, we reduce the chance that these 'experts' will dominate the conversation at a public meeting and ensure that we are separating their role as the audience of the community and stakeholder mapping stages, but also as contributors to the overall mapping process.

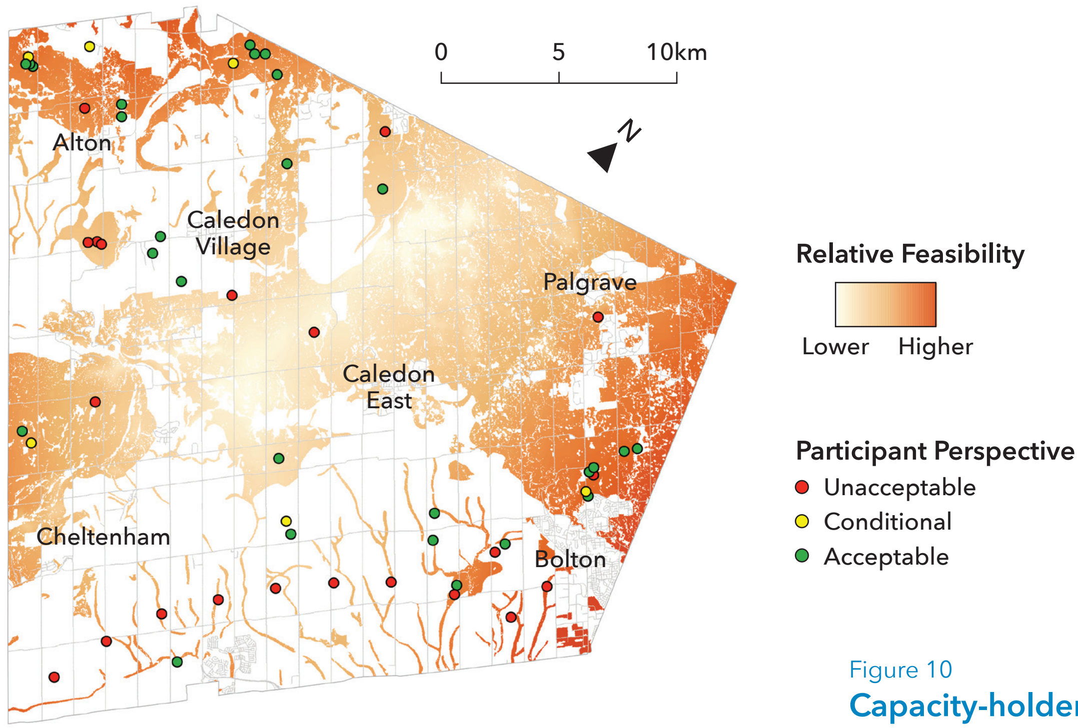


Figure 10
Capacity-holder Perspective Map

Phase 2 Summary

Renewable energy development has been subject to significant public opposition, expressed as site-level demonstrations, explosive town hall meetings, and Municipalities declaring themselves 'unwilling hosts' of wind farms. Opposition is common to all forms of development. But for many, the strength of the opposition to RE was surprisingly widespread given that opinion polls had previously showed widespread support for RE development. In literature this is called the 'social gap' problem: i.e., the gap between support in general, but opposition to specific projects. This gap was widened in Ontario in large part because communities did not feel they had a voice in the decision-making process, and the benefits of development were limited to land-owners and developers even as the impacts were felt by the entire community. One way to close the gap around opposition-support for renewables is to ensure meaningful engagement at the agenda-setting stage of RE development.

Our approach offers a method to do just that: to incorporate community and stakeholder voices into spatial and land-use planning process in a way that tries to balance the need to develop RE at scale, with the desire to limit its impacts on local landscapes and the people who derive meaning and livelihood from those landscapes. In theory, the outputs from all stages of participatory mapping can be combined, to show high density of 'green' and therefore willingness to accept a project. That said, these outputs do not provide answers – i.e., they do not in and of themselves make a decision about where the next RE system will be implemented. But they are a way to advance the conversation across communities and stakeholder groups, and they are crucial inputs into local land-use and energy planning.

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