



Case Study: Quadruple Bottom Line Project Evaluation Framework

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Synopsis Cornell University uses an internal proxy price on carbon emissions as part of its Quadruple Bottom Line sustainability framework. Cornell created the framework to evaluate physical infrastructure decisions and to help the university achieve carbon neutrality by 2035. The Quadruple Bottom Line (QBL) tool takes the traditional Triple Bottom Line sustainability framework—People, Prosperity, and Planet—and adds a fourth component—Purpose—to assess a project’s alignment with Cornell’s academic, research, and land-grant mission. Project managers consider the four impact areas, and score each project on a 1–5 scale in each area. ([See Appendix](#) for more details on QBL project evaluation areas.)

In 2015, senior leaders at Cornell used the QBL framework to evaluate 10 options for heating and powering the campus. The evaluation included the projected annual tons of greenhouse gas (GHG) emissions for each option, with a proxy price for each ton. The senior leaders used \$58/metric ton of carbon dioxide equivalent (MTCDE) as the proxy price. The final decision to pursue earth source heat combined with renewable power (wind, water, and solar) was both the least expensive and had the highest collective rating in the QBL evaluation framework.

This case study focuses on the QBL tool, showing how an internal carbon price is an important part, but only a part, of a comprehensive sustainability decision-making framework.

Timeline The Climate Action Plan (CAP) targeting carbon neutrality by 2035 was developed in 2009 by Cornell faculty, students, and staff with funding from the New York State Energy Research and Development Authority (NYSERDA). The Quadruple Bottom Line framework grew out of a CAP goal to integrate sustainability into Cornell’s core business decision-making process.

In 2015, Cornell Provost Michael Kotlikoff charged the Senior Leaders Climate Action Group (SLCAG) to analyze viable options for the Ithaca campus to achieve carbon neutrality by 2035. With support from Facilities and the Campus Sustainability Office, the Senior Leaders Climate Action Group developed and used the QBL tool to evaluate alternatives. It concluded that earth source heat combined with renewable energy was the best way to reach carbon neutrality.

In the fall of 2016, efforts began to incorporate QBL concepts into Cornell’s capital planning and project prioritization framework. Cornell also continues to incorporate the QBL framework into departmental project evaluations and purchasing and operational decision-making.

Determining a carbon price The QBL framework prices emissions based on the social cost of carbon. When evaluating on-campus projects, decision-makers apply the price to direct GHG emissions for each scenario under consideration. Economics faculty helped assess the social and capital toll of carbon emissions to more accurately compare the costs of carbon neutrality with the costs of fossil fuel use. The carbon price used depends on the timeframe of the particular analysis. A longer timeframe would raise the price. Cornell also considers changes in the estimates of the social cost of carbon.



The 2015 analysis of heating and power options applied an average cost of \$58/MTCDE. This was the average of published values at the time from the U.S. Environmental Protection Agency (IWGSCC, 2013) using a 3% discount rate from 2017–2056.

Report and Tools After evaluating the long-term benefits and risks of 10 options for heating and powering the campus with carbon-neutral sources, the Senior Leaders Climate Action Group issued its report, *Options for Achieving a Carbon Neutral Campus by 2035*. The final decision to pursue earth source heat combined with renewable power (wind, water, and solar) was the least expensive option and had the highest collective rating in the QBL evaluation. Since then, Cornell's Campus Sustainability Office and Facilities & Campus Services has worked on a suite of tools to help business managers in all departments and units adapt the QBL framework for sustainability-related decision-making at all scales, from paper product choices to new buildings. These tools are available online at sustainablecampus.cornell.edu/our-leadership/sustainability-framework. The Campus Sustainability Office is working to advance QBL integration across campus.

Appendix: Applying the QBL framework

The QBL sustainability framework is a decision-making methodology that quantifies the institutional value of a project by balancing four areas of priority: purpose, prosperity, planet, and people. Line items for each area of QBL are informed by the United Nations Sustainable Development Goals. Project managers score each project on a 1–5 scale in each QBL area, according to the questions below. Decision-makers then combine this QBL analysis with traditional financial analysis of projects to help clarify the benefits of possible solutions.

- *Does the solution meet the needs of People on campus, in the community, and in the world?* Is the solution a useful, scalable option to share with others? Does it help regional carbon reduction efforts? Does it create jobs? Does it increase or decrease quality of life through visual, infrastructure, transit, or community resource development?
- *Will the solution enhance overall Prosperity for the campus and our region?* What are the short-term, long-term, and socialized costs to the project? Does a solution mitigate future costs or uncertainties? Will this solution allow Cornell to plan for today and its future in an economically feasible way?
- *Does the solution support a sustainable Planet?* How does this solution ensure that Cornell fulfills its commitments to environmental sustainability and mitigating climate impact? What is the carbon reduction impact of this solution? Are there additional environmental and ecological benefits or risks related to land use, water, biodiversity, air quality, or waste?
- *Does the solution help Cornell fulfill its academic mission and Purpose?* How does the solution align with Cornell's educational and land grant missions? Does it create research and teaching opportunities? Is it aligned with existing programs? Will the solution attract research funding? Does it increase Cornell's reputation as a global institution addressing climate change, and finding solutions to challenging research questions across disciplines?

Among its many uses, QBL allows campus decision-makers to:

- Compare different projects, solutions, or products along many criteria, in a structured, easily documented way
- Ensure tradeoffs or changes to one area do not drastically reduce benefits or add hidden costs to the University in another area during all stages of project development
- Provide a more comprehensive framework for large and small projects, from evaluating campus-wide renewable energy solutions to assessing the benefits of banning plastic straws.



References

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