

Angela Vitulli has eighteen years of experience in environmental and energy program development, program evaluation and performance measurement, with extensive expertise providing technical support to design and evaluate public policies that promote energy efficiency, renewable energy, and environmental sustainability. Ms. Vitulli is currently providing energy efficiency program evaluation oversight and review to Eversource, and is managing a multi-year contract for NYSERDA to provide evaluation services to the Agency's large portfolio of technology and market transformation programs, and energy codes programs. She is also managing a large evaluation of DOE's Building America program, a market stimulation program for energy efficient residential constructions. Ms. Vitulli developed the measurement framework for UNEP's Sustainable Public Procurement Program and wrote US EPA's frameworks for evaluating environmental and energy partnership and community-led programs. She has subject matter expertise in efficient and green building program design, and led the consulting teams supporting the Massachusetts Zero Net Energy Task Force in 2009 and the Massachusetts Sustainable Design Roundtable in 2006.

Ms. Vitulli has consulted with a diversity of clients including US federal agencies (DOE, GSA, EPA, SBA), state agencies (NYSERDA, Massachusetts Department of Energy Resources, Mass Department of Transportation), utilities (Eversource, Concord MA Municipal Light Plant), local governments (City of Burlington, VT) international agencies (UNEP, Natural Resources Canada, Canada Mortgage and Housing Corporation), NGOs (National Governors Association, Northeast Energy Efficiency Partnership), and private clients (Dunkin Brands). Ms. Vitulli is an active member of the American Evaluation Association (AEA), regularly presents at AEA conferences, and has held a leadership position within AEA's Environmental Program Evaluation Topical Interest Group.

Education

Master of Arts in Urban and Environmental Policy, Tufts University
Bachelor of Arts in Political Science, Tulane University, Phi Beta Kappa

Measurement and Evaluation Experience

For the **DEPARTMENT OF ENERGY'S BUILDING TECHNOLOGY OFFICE**, co-leading evaluation efforts for the Building America Program, which aims to improve the efficiency of new residential construction via R&D, large scale technology demonstration, peer-to-peer information exchange, and market diffusion of cost-effective, integrated building design and engineering approaches. The IEc team is conducting an in-depth quantitative analysis of the energy savings and other impacts of selected technologies and construction techniques, including net economic benefits, net environmental benefits, and estimation of other non-energy benefits. The study will ultimately assess the market adoption of supported technologies, the extent to which benefits can be attributed to BTO, and the return on BTO's investment relative to benefits. Additional, related analyses and projects include an analysis of builder callbacks related to moisture problems (and role that BA-practices play in avoiding callbacks); citation analysis of Building America publications and publications of associated building science experts; and concurrent strategic planning efforts to utilize information generated by the evaluation to inform near-term BTO program planning. Presented methodology at the American Evaluation Association conference in 2016; presenting findings at the IEPPEC conference in 2018.

For **EVERSOURCE**, providing energy efficiency program evaluation oversight and review, including reviewing evaluation work plans, proposed evaluation designs and survey research plans, and evaluation interim deliverables and final reports. IEC is providing feedback and recommendations to Eversource's evaluation contractors, to improve the technical quality of evaluation designs as well as the communications of evaluation results. Also assisting Eversource in developing and implementing research plans for a myriad of topics including non-energy benefits in low income settings, and measures development for home energy automation interventions.

For the **NEW BRUNSWICK OFFICE OF THE ATTORNEY GENERAL, PUBLIC INTERVENER'S OFFICE**, provided expert testimony on Demand Side Management (DSM) investments proposed by NB Power within their general rate application. Conducted analyses of cost-effectiveness and feasibility of the proposed portfolio, including comparisons with past performance and with programming of similar utilities. Developed an expert report and testimony, and assisted the Public Intervener in renewing and analyzing evidence provided by other stakeholders.

For the **MASSACHUSETTS DEPARTMENT OF TRANSPORTATION**, managing a comprehensive study of single occupancy vehicle commuting in the Commonwealth, to inform future state transportation policy. Developed taxonomy of interventions including outreach and information provision; transit expansion and improvement; congestion pricing; land use and parking restrictions. Conducted a review of evaluative literature on policy interventions. Developed case studies on successful interventions in other locations. Conducting large-scale survey of EZ-Pass holders to identify and address barriers to potential policy interventions identified in earlier tasks.

For the **NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY (NYSERDA)**, managing a \$9 million, 3-year contract to evaluate programs within NYSEDA's Technology and Market Development (T&MD) portfolio, which includes: solar PV cost reduction, smart grid, advanced buildings technology development, energy codes and standards, and combined heat and power. Evaluation work includes logic modeling, metrics selection, formative evaluation/strategic planning and evaluability assessment; impact and process evaluation; and market assessment and characterization. Ms. Vitulli is also leading individual evaluations under the contract. She is managing a process evaluation of NYSEDA's Energy Codes program, which provides training to energy code officials, architects, engineers, and the building trades community, and technical support services to local governments, to implement NY State's stringent building energy codes. She managed process, market, and impact evaluation of NYSEDA's Advanced Buildings Technology Development program, which provides R&D subsidies to NY State firms developing and commercializing building energy efficiency technologies including next generation HVAC and new applications for LED lighting. She also oversaw evaluability assessment and evaluation planning for NYSEDA's industrial DR program.

Ms. Vitulli is also currently conducting research and analysis for NYSEDA in support of local government programming (Clean Energy Communities), including LED streetlight programs and commercial and residential retrofit programs.

For **Natural Resources Canada (NRCAN), Office of Energy Efficiency**, conducting strategic planning to assist the Agency in the development of a comprehensive, data driven approach to energy efficiency programming focused on the built environment, informed by experience of U.S. DOE's Buildings Technology Office, and underscored by NRCAN's efforts to coordinate programming cross-border with DOE. Through this study, IEC is assisting NRCAN in adapting BTO's "ecosystem" programmatic approach to implement the continuum of R&D, market stimulation, and codes and standards approaches to drive down energy use intensity of buildings and their components.

For **EPA's Office of Air**, managing a program evaluation of EPA's Climate Showcase Communities Project, with provided \$500,000 grants to 50 communities in the 2009-2010 timeframe to implement local climate change interventions including a variety of public sector, commercial, and residential energy retrofit program models, and residential behavior change programs. As part of the evaluation, IEC interviewing grantees to understand how and why some interventions succeeded while others struggled, and how program models have sustained post-grant and replicated by other local governments.

For **THE UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP) AND THE SUSTAINABLE PURCHASING LEADERSHIP COUNCIL (SPLC)**, co-developed a framework and supporting methodologies to measure sustainable public purchasing benefits and program outcomes including energy, environmental, social, and economic impacts. Conducted research on available methods and tools to assist sustainable procurement programs in estimating impacts. Presented framework and need for better measurement of sustainable procurement policy as plenary speaker at *Sustainable Brands: New Metrics* in October 2015 and as a session speaker at the Sustainable Purchasing Leadership Council Summit in May 2015. Facilitated UNEP/KEITI expert meeting on benefit measurement from sustainable procurement in Seoul, Korea in November 2015.

For **EPA's Office of Policy**, developed EPA's measurement guidance for community-based programs, including identification of standard metrics and reporting strategies for participation, engagement, capacity building, and environmental outcomes. This guidance was recently put to use to develop community-level projects under EPA's high profile Making a Visible Difference Initiative, which coordinated all EPA interventions and resources in play within 50 high priority, mostly low-income and EJ communities. Based on this real world application of the guidance, IEC is currently in the process of updating and expanding the guidance.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION SUPPORT DIVISION**, developing a white paper on practical alternatives to applying experimental designs to the evaluation EPA programs, as a resource for EPA managers to utilize in implementing the Agency's strategic approach in working with OMB on ICR issues. Conducted an analysis of methodological and practical barriers of applying experimental designs to EPA evaluations, based on a review of EPA's ICR experiences, a targeted literature review, and review of expert comments submitted to OMB on ICR issues. Presented a draft version of the paper at the Environmental Evaluator's Network Conference in June of 2011

For **EPA'S OFFICE OF PLANNING, ANALYSIS, AND ACCOUNTABILITY**, managed an accountability project to measure the energy and water conservation benefits of ARRA funding provided to EPA's State Revolving Funds for drinking water and clean water infrastructure, through the Green Project Reserve program. This analysis entailed review of funding documentation to mine applicable data; database development; and analyses and presentation of anticipated energy and environmental benefits, cost savings, and cost-effectiveness. The project also entailed a review of the information collection approach used by SRF, and development of recommendations for improving measurement moving forward.

For the **NATIONAL GOVERNORS ASSOCIATION'S CENTER FOR BEST PRACTICES**, conducted evaluations of two policy academies, which are expert forums used by NGA to provide technical assistance to state governments to address complex policy. Ms. Vitulli evaluated the outcomes and impacts of a policy academy to implement energy efficiency programs for existing public buildings, and another policy academy with focused on land use and transportation policy integration. The evaluations used an interview-based approach in conjunction with review of extensive materials produced by states during the course of the policy academy process.

For the **EPA EVALUATION SUPPORT DIVISION AND THE OFFICE OF POLLUTION PREVENTION AND TOXICS**, managed an outcome evaluation of EPA's Environmentally Preferable Purchasing (EPP) Program. The evaluation

quantified trends in federal green purchasing, and associated environmental benefits, that can be attributed in whole or in part to the EPP program. The evaluation also seeks to examine the program's influence on the marketplace for greener products and services, as well as the Agency's experience of participating in utilizing voluntary consensus standards to facilitate green purchasing. A particular focus of the evaluation is on the program's success in developing and promoting market adoption of product sustainability standards in the electronics (EPEAT), building and construction products (including NSF, UL, and BIFMA standards), and hospitality sectors. IEc conducted a larger survey of federal procurement staff on attitudes and behaviors on green purchasing, and use of program standards and other resources. IEc also conducted numerous interviews with green purchasing contacts at state governments, universities, and other institutions, and collected information on procurement policies, standards, and specifications used by these organizations. Finally, IEc conducted a review of federal procurement data systems, availability of "green spend" data, and examined barriers to incorporating green criteria into procurement systems and underlying databases.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, GREEN BUILDING PROGRAM** and the **U.S. GREEN BUILDING COUNCIL (USGBC)** managed a review of the state of performance measurement among local government green building programs. Collected available data and conducted interviews with a group of 20 cities with green building requirements in place, including requirements based on LEED and EnergyStar. Found that these programs generally defined 'effectiveness' only in very broad terms, and that most cities did not set quantifiable targets for these programs. The predominant indicators of success used by local programs are the number of green buildings built, such as the number of LEED- or Energy Star-certified buildings, and the number of buildings permitted and constructed under the guidelines of the local green building program. A minority of cities also monitor various metrics related to energy use and greenhouse gas emissions. Produced a report with findings and recommendations that USGBC and/or EPA could implement to assist local governments in overcoming performance measurement challenges.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION SUPPORT DIVISION** and **OFFICE OF WATER**, contributed to an evaluation of Clean Water Indian Set-Aside (CWISA) Grant Program and the Drinking Water Infrastructure Grant Tribal Set-Aside (DWIG-TSA). These programs provide funding for wastewater infrastructure and drinking water infrastructure to American Indian tribes and Alaska Native Villages. This evaluation is intended to assess implementation of these tribal set-aside programs, suitability of existing program measures, and program outcomes. Ms. Vitulli developed the data management strategy for the evaluation, and contributed to the statistical analysis of program data.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION SUPPORT DIVISION** and **OFFICE OF SOLID WASTE**, directed a program evaluation of the WasteWise program, a voluntary program aimed at encouraging and rewarding reduction and better management of non-hazardous waste. The purpose of this evaluation is to assess the quality and implications of current data available to WasteWise, explore the attribution of partner accomplishments to the WasteWise program, and identify WasteWise activities that most benefit partners. This evaluation uses a mixed-methods approach, including a statistically valid survey to assess differences in waste behavior among long-term and more recent members of WasteWise. Ms. Vitulli's team also conducted quantitative analyses of existing program data, including self-reported waste data, and data on program awards and conference attendance. Qualitative approaches used for this evaluation include focus groups, interviews, and a literature review. Presented findings at the American Evaluation Association Conference, November 2011, and the Environmental Evaluator's Network Conference in June, 2011.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION SUPPORT DIVISION**, Ms. Vitulli contributed to a project exploring challenges to statistical analysis of voluntary environmental programs, including methodological and practical constraints. Advanced a proposal to use low-cost, practical options for

documenting program achievements, based on economic theory and the role of voluntary programs in addressing market failures. Developed a briefing package for senior EPA management and presented on project findings.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF POLICY and EVALUATION SUPPORT DIVISION**, conducted a review of lessons learned from EPA's experience evaluating community-based programs. EPA has conducted a number of evaluations of community-based programs, including environmental justice programs, the Community Action for a Renewed Environment (CARE) program, and the Community Based Environmental Protection (CBEP) program. IEC identified common hallmarks of successful community-based programs; reviewed outcomes associated with EPA funding and technical assistance; and identified several areas where EPA may want to conduct additional research, or develop additional measurement and evaluation tools, to integrate into current and future community-based programs.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION SUPPORT DIVISION**, co-directed a project to develop evaluation guidelines for the Agency's partnership programs. This effort included identifying program evaluation issues and challenges specific to partnership programs, and developing potential approaches to addressing them. Ms. Vitulli interwove content specific to partnership programs with basic instruction on program evaluation steps, to produce a guide that helps program managers understand the evaluation process and collaborate more effectively with their evaluation team.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION SUPPORT DIVISION and OFFICE OF INDOOR AIR**, conducted a program evaluation of the Indoor Air Quality Tools for Schools program, a voluntary program which provides outreach and guidance to assist school districts in preventing, identifying, and addressing IAQ challenges, with the intent to minimize asthma, allergy, and respiratory triggers in the school environment. The purpose of this evaluation was to assess the effectiveness of EPA's IAQ TfS program, and gain a better understanding of the health and environmental outcomes that can be realized from implementing IAQ management plans. The evaluation involved defining study groups, performing QA/QC of existing state data on the efficacy of IAQ management plans, designing a survey instrument to collect additional environmental and health indicator data from schools, conducting a statistical analysis of differences between study and control groups, and providing recommendations for improving the IAQ TfS program.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, GREEN BUILDING PROGRAM**, managed a review of the state of performance measurement among local government green building programs. Collected available data and conducted interviews with a group of 20 cities with green building requirements in place, including requirements based on LEED and EnergyStar. Produced a report with findings and recommendations that USGBC and/or EPA could implement to assist local governments in overcoming performance measurement challenges.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, EVALUATION SUPPORT DIVISION and OFFICE OF WATER**, Ms. Vitulli managed a program evaluation of innovative approaches that EPA and state and local governments have used to implement pollutant trading programs in impaired watersheds. Ms. Vitulli led a team in coordinating interviews of over 50 policy-makers, economists, and NGO representatives to inform the evaluation. Ms. Vitulli's team also reviewed operational, economic, and environmental data to examine how the programs are operating. IEC ultimately developed recommendations for how EPA could support WQT in the future, including regulatory, legal, and administrative issues that EPA can help address; suggestions for future tools and financial support; approaches to promoting the participation of nonpoint sources; and options for EPA to better measure progress of WQT programs.

For the **EPA NATIONAL ENVIRONMENTAL PERFORMANCE TRACK PROGRAM**, directed a large team of analysts who provided ongoing performance measurement support for this multi-media voluntary program for facilities with strong environmental records. Continually reviewed advances in environmental performance reporting protocols to inform the evolution of the program's data quality approach. As part of this work, helped to pilot test various reporting tools with Performance Track members, including the Facility Reporting Project based on GRI standards. Assisted EPA in making several changes in program data collection to improve data quality and facilitate confident aggregation of outcomes. Provided input into developing an online reporting system to track and analyze environmental and administrative data generated by program participants.

For the **Virginia Department of Environmental Quality**, provided support for developing a performance reporting system for its Environmental Excellence Program, a voluntary program designed to encourage and reward beyond-compliance environmental performance. Ms. Vitulli standardized reporting parameters and developed reporting instructions. Subsequently, Ms. Vitulli developed review guides and other tools for the program to use to ensure good data quality. Ms. Vitulli also provided preliminary performance measurement support to the program.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF BROWNFIELDS CLEANUP AND REDEVELOPMENT**, participated in an expansive project to quantify the environmental contributions of EPA's Brownfields program. Ms. Vitulli developed a taxonomy of potential environmental benefits associated with brownfields redevelopment, with a focus on the benefits of avoided sprawl. Ms. Vitulli reviewed methodologies for defining alternative growth scenarios, as well as methodologies for measuring reductions in mobile air emissions and runoff, to inform the development of an off-the-shelf package of methodologies that could be applied nationally to assess brownfields benefits.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF BROWNFIELDS CLEANUP AND REDEVELOPMENT**, developed environmental performance measures to better quantify and communicate the environmental results of the EPA Brownfields Program. Ms. Vitulli developed a set of indicators for each grant and loan program administered by the Brownfields Program, as well as a strategy for collecting and managing data on those indicators. EPA subsequently incorporated several of these indicators into Brownfields grant reporting requirements and forms.

Sustainability Program Development and Analysis Experience

For **DUNKIN' BRANDS**, overseeing the development of an energy use and greenhouse gas (GHG) baseline, and helping develop energy and GHG targets. IEc collected and organized energy consumption records for over 50 corporate-owned facilities and restaurants from 2010 to 2014 using EPA Portfolio Manager. Ms. Vitulli's team reviewed energy consumption records for errors using various techniques identify outliers across time and across stores. Developed a methodology to estimate to replace missing and erroneous data points. Calculated the company's annual greenhouse gas footprint from 2010 to 2014 for reporting in the Dunkin' Brands 2014 Corporate Social Responsibility (CSR) report and Carbon Disclosure Project. Created the accompanying CSR report data displays and text. In tandem with this project, analyzed energy consumption trends, and worked with various corporate stakeholders at Dunkin' Brands to identify energy conservation and efficiency projects for environmental impact reduction and operational spend savings. Currently collecting data from a statistical sample of energy use and water use from franchised stores, to inform the development energy use and water use targets for the company and franchisees.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) OFFICE OF POLLUTION PREVENTION AND TOXICS**, under subcontract to Resolve, co-managing technical support for piloting EPA's Guidelines for selecting ecolabels

and standards for federal purchasers. This 18-month effort involves providing technical analysis and independent assessment of standards for three product category panels (for flooring, furniture and paints and coatings). IEC developed the procedures, materials, and communication approach for assessing participating standards and labels, and will carry out assessments starting in May 2016. Additional support includes development of product category literature reviews, input into scoring and weighting approaches, ad-hoc research and analysis requested by panel members, and development of final reports from the pilot effort.

For the **EPA OFFICE OF POLLUTION PREVENTION AND TOXICS**, managing a team that provides comprehensive program development and implementation support. This includes research and analytical support to develop an Agency-level policy framework for product sustainability, and analysis of the environmental benefits and financial feasibility of proposed EPA policy positions. IEC conducts technical reviews of product environmental and trade standards, including standards for building and construction products, electronics, and appliances. Managed a technical review of existing green products online tools and ecommerce platforms, and developed a concept and mockups for EPA's desired institutional purchaser tool to improve uptake of standards among government purchasers.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, SAFER CHOICES PROGRAM**, conducted market research to understand green cleaning drivers within the hospitality industry and impressions of Safer Choice, and identify potential opportunities for scale up and partnership in the sector. Managed desk research and interviews with experts and sustainability contacts at US hotels and casinos, as well as group purchasing organizations that serve the hospitality market. Developed recommendations for improving program market penetration within the sector.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA) OFFICE OF POLICY AND EVALUATION SUPPORT DIVISION**, managing a literature review and synthesis of evaluative literature on product-service systems, including their potential and realized environmental benefits, cost implications, and implementation considerations for public sector procurement. This project is a pilot project of EPA's Architecture for Environmental Evaluation, (ArchEE). ArchEE will be an open-access repository of evaluations and other evaluative knowledge that can be analyzed and synthesized to support evidence-based practice, and improve transfer and use of evaluative knowledge for environmental management

For the **DISTRICT OF COLUMBIA OFFICE OF PROCUREMENT**, managed a team that provided technical support for the development of the District's award-winning sustainable purchasing policy and specifications. The IEC team conducted research into the environmental benefits and feasibility of different standards/ecolabels, and other SPP approaches, for nine product and service categories. We developed recommended policy and specifications, and developed guidance, training materials, solicitation and contract language, reporting forms, and internal documentation. As part of this project, reviewed the District's Ariba e-procurement system to identify opportunities for better integration of sustainability requirements. Presented specifications and lessons learned at the 2015 Sustainable Procurement Leadership Council Summit and at a keynote session at the Sustainable Brands New Metrics conference in 2015.

For the **CITY OF BURLINGTON, VT**, managed an analysis of municipal opportunities and potential programs to reduce greenhouse gas emissions through changes in building energy policy, renewable energy policy, green infrastructure policy, and transportation policy. IEC's work on the above tasks included a review of Burlington's key planning documents, literature review, identification of relevant programs in other cities, and interviews with Burlington officials as well as officials in other cities. IEC developed case studies of

building-level EE programs, as well as land use and transportation programs, implemented by other local governments, and derived lessons learned applicable to Burlington's efforts. The Burlington Department of Planning and Zoning used the results of this analysis to select policies to move forward with in implementing the City's climate action plan. Subsequent to this project, the City adopted a Downtown and Waterfront master plan that included incentivizing adaptive downtown building reuse, adopting state-of-the-art building energy efficiency standards, and pursuing the development of a District Energy System that links the downtown with the nearby biomass generator.

For the **MASSACHUSETTS EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS**, led the consulting team supporting the Governor's Massachusetts Zero Net Energy Building Task Force, which was charged with developing public policy recommendations to move Massachusetts towards a zero net energy real estate climate by 2030. Managed a series of working groups on public sector, commercial, and residential construction; arranged facilitation support for the task force; and identified and responded to research needs. Assisted the Task Force in synthesizing recommendations and developing the Task Force's report to the Governor. Implementation steps to date include the two state-funded ZNEB demonstration projects, and passage and adoption of the Massachusetts "stretch" building code by several cities and towns.

For the **NORTHEAST ENERGY EFFICIENCY PARTNERSHIP**, managed a project to identify barriers and opportunities for the wider adoption of zero net energy buildings (ZNEB) in the public building sector in the Northeast. Project consisted of a focus group, interviews, and literature review. Synthesized results across these areas to develop a "roadmap" of critical near-term and medium-term steps that Northeast states can take in order to pave the way for a longer-term market transformation.

For **EPA's Office of Research and Development**, provided research support to the Science and Technology Policy Council's Sustainability Working Group. Reviewed sustainability frameworks developed and implemented by external organization to identify common elements of sustainability frameworks and practices that may be relevant to EPA's ongoing effort to institutionalize sustainability. Subsequently, provided additional research and writing support to the Working Group, and assisted in preparing their final report.

For **U.S. Environmental Protection Agency, Office of Strategic Environmental Management**, managed the development of analytic scenarios to characterize the range of GHG savings that could result from the scale-up of select sustainable purchasing and building-level energy efficiency opportunities: (1) purchases of green power, (2) participation in ENERGY STAR Commercial Buildings, and (3) purchases of ENERGY STAR desktops, laptops, and monitors. For each activity, defined low, medium, and high scale up scenarios, developed a methodology for estimating GHG impacts, collected available data, documented assumptions used where data were unavailable, and distilled and communicated findings. Utilized Portfolio Manager as an input to the ENERGY STAR Commercial Buildings analysis, and used standard GHG conversions across scenarios from EPA's Greenhouse Gas Equivalencies Calculator. Developed and delivered easy-to-follow spreadsheets to document our work and allow our clients to readily adjust scenarios and perform their own sensitivity analyses.

For **District of Columbia**, analyzed proposed stormwater regulations, which emphasize the use of low impact development (LID) stormwater management techniques and increased requirements for on-site stormwater retention and treatment. Analyzed likely changes in development costs attributable to the proposed regulations, while accounting for the likely effects of other new policies including: the District's green building law; new green building and stormwater management requirements for federal buildings; and similar stormwater management and green infrastructure programs in neighboring jurisdictions. Conducted

research on implementation of similar requirements in pioneering cities to discern any measurable effects on real estate development.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF SUSTAINABLE COMMUNITIES AND THE AGENCY'S GREEN BUILDING PROGRAM**, managed program support including:

- Analysis of the environmental benefits and financial feasibility of green building practices, including sustainable siting and smart growth practices, as well as energy use, water use, materials selection, waste management, and indoor air quality practices.
- Technical assistance applying EPA's recommended green building practices with on-the-ground construction projects in EPA regions.
- Comparative analyses of green building standards systems, approaches, and requirements, including LEED (NC, EB, and ND), ASHRAE 189, CHPS, Green Globes the International Green Construction Code (IgCC), and the forthcoming ASTM standard on minimum sustainable building requirements.
- Support developing and organizing EPA's comments on draft green building standards and codes.
- Development of online tools and networking solutions to help EPA organize green building research and administer EPA's green building program.

For the **Montgomery County, Maryland Dept. of Environmental Protection**, provided support to develop an environmental leadership program for office and retail businesses. Provided strategic planning support; facilitated a stakeholder meeting to gain input into program design; and developed program applications specific to owner-occupiers, property managers, and tenants. As many aspects of greening office and retail businesses involve green buildings operations and management, conducted research in this area and developed program applications that capture the diverse range of actions that tenants and property managers can take on their own, as well as actions that require coordination between tenants and property managers.

For the **MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS SUSTAINABLE DESIGN ROUNDTABLE**, researched state-level sustainable building programs to inform the development of a public sector green building program in Massachusetts. Ms. Vitulli conducted in-depth case studies of programs implemented in California and Minnesota, and distilled best practices and lessons learned applicable to the Massachusetts context. Ms. Vitulli and her colleagues presented findings for the Sustainable Design Roundtable in the Fall of 2005, and co-wrote the final project report and proposed action plan for the Governor. As a result of this project, the Governor of Massachusetts signed an executive order mandating a green building standard for state-funded construction.

For the **MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS**, managed an analysis of the Commonwealth's pilot efforts to procure and install waterless urinals at public buildings. Analyzed implementation experience, as well as the costs and environmental benefits of the technology. Developed recommendations as to how and where waterless urinal procurement and installation should be scaled-up in public buildings.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF SUSTAINABLE COMMUNITIES**, managed a project to integrate indicators of smart growth, walkability, and transit access to incorporate into real estate listing databases. This work included indicator identification, conducting feasibility research including interviews with real estate industry leaders, pilot testing indicators with local multiple listing services and consumer-facing real estate listing websites, and developing an implementation strategy. The project also entailed

working with developers of online tools such as Walk Score, Transit Score, and the H+T (Housing and Transportation) Affordability Index to explore the feasibility of scaled up integration of these tools into real estate listings. IEC presented this work at the New Partners for Smart Growth Conference in February 2011.

For the **CANADA MORTGAGE AND HOUSING CORPORATION**, coordinated research on the relationship between smart growth concepts and the propensity of communities to facilitate “aging in place” for senior residents. Based on the findings of a literature review and focus groups with seniors, IEC developed a set of indicators to measure the extent to which a community’s built environment affects seniors’ health, quality of life, and well-being. IEC interviewed 30 planners and other experts who provided feedback on the indicators and helped to refine them. After conducting a pilot test with two communities to gather feedback on the utility of the indicators and the availability of the data required to support their use, IEC developed a revised set of indicators. Local planners can use these indicators as a tool for setting goals related to the built environment needs of an aging population and for tracking progress against those goals. Ms. Vitulli presented on the results of this research to the CMHC’s National Housing Research Committee in Ottawa November 2007.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF RESOURCE CONSERVATION AND RECOVERY**, managed a research effort to develop a national-level estimate of food waste generation, diversion, and disposal using the best available existing data. IEC constructed “bottom up” estimates of waste generated using state-level waste surveys, and estimated food waste managed through food donation, food rescue, and composting. IEC also explored available data and data gaps on source reduction and industrial uses of food waste (e.g., recycling yellow grease). EPA used IEC’s report to inform understanding of the component of food waste that lays outside of the MSW realm, and to inform the Agency’s status quo methodologies used to estimate food waste and diversion for the Agency’s biennial report on MSW in the U.S.

For the **WASHINGTON DEPARTMENT OF ECOLOGY**, provided strategic planning support for the development and implementation of a voluntary program targeting a broad audience (e.g., industrial and office-based businesses, small and large businesses, environmental leaders and businesses just getting started on the path to environmental improvement). Ms. Vitulli applied lessons learned from her experience with non-regulatory programs to advise Washington state in developing a program framework and tiers, program criteria and performance measurement tools, and appropriate incentives for different types of members.

For the **GEORGIA DEPARTMENT OF NATURAL RESOURCES**, provided support to the Partnership for a Sustainable Georgia, a voluntary program designed to promote beyond-compliance environmental performance. Ms. Vitulli provided a services to the program including developing an operations handbook to guide program work flow, revising program applications and annual reporting forms to reduce redundancies and increase compatibility with sister programs, and developing supplemental materials to assist program applicants and members to understand and comply with program criteria.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, NATIONAL CENTER FOR ENVIRONMENTAL ECONOMICS (NCEE)** and in partnership with Resources for the Future, researched issues surrounding the integration of cleanup and reuse at contaminated properties, including the characterization of reuse, factors that motivate and impede redevelopment, and economic and social impacts of reuse. Ms. Vitulli reviewed federal, state, and local programs that address contaminated properties, including Brownfields, Superfund, RCRA, underground storage tank, and voluntary cleanup programs. Ms. Vitulli conducted scoping research, identified gaps in existing research and data collection, and recommended topics for two in-depth research papers. Assisted in planning and hosting the workshop, Estimating the Community Impacts from the Reuse of Contaminated Properties, attended by EPA cleanup program managers and academics. Finally, Ms. Vitulli wrote an in-depth

research paper and gave a presentation at the workshop on the characterization of reuse at contaminated properties and composed a summary of the workshop.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, NATIONAL CENTER FOR ENVIRONMENTAL ECONOMICS**, assessed the fiscal impacts of alternative residential development scenarios for Monroe County, Florida, including the costs and revenues associated with land preservation. This analysis included an evaluation of the county's costs and revenues associated with growth, and compared these costs to the land acquisition costs and foregone property tax revenues of a no-growth scenario.

Communications Experience

For the **GENERAL SERVICES ADMINISTRATION**, provided analytical and communications support to the Research into Practice Program in the Office of Federal High Performance Green Buildings. This program aims to deliver information on evidence-based practices to improve building performance to those that can use it (e.g., federal facility managers, EHS staff, and IT managers), in a form that is useful to them. Reviewed academic literature on topics related to the environmental performance of buildings, conducted scenario-based analyses using available energy statistics and standard GHG coefficients, and crafted new communications pieces that convey the key information clearly and succinctly for a variety of audiences. Topics addressed included process and plug loads, water conservation, lighting controls and daylighting, and building operations and maintenance.

Also for GSA, Ms. Vitulli conducted research and developed business case communication pieces on the Agency's planned green building investments. Developed a white paper on the business case for making large investments to modernize the GSA building stock to incorporate energy efficiency and water efficiency features, including analyses of benefits from reduced energy costs, potential worker health and productivity gains, and space consolidation savings.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF RESOURCE CONSERVATION AND RECOVERY**, managed the development of a green parking guide to provide information on fundamental parking planning and design concepts to local government decision-makers, and connect this audience to existing resources on the environmental benefits and cost-effectiveness of green parking approaches, including: planning and zoning aspects, on-site stormwater management techniques, alternatives to asphalt parking surfaces, and water efficient landscaping and irrigation. The content of the guide includes the environmental and cost impacts associated with conventional parking lots, and the benefits of green parking lot development techniques. Integrated an environmental benefits analysis that IEC conducted of a large green parking lot pilot study, including reduced greenhouse gases from minimizing parking and providing alternative transportation (e.g., carpooling and biking); reduced GHG emissions from solar parking lot lighting; and the lifecycle environmental benefits of using alternatives to asphalt paving.

For the **EPA OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE (OSWER)** and its GreenScapes program, led a team that developed the business case for of environmentally-preferable landscaping and groundskeeping activities ("greenscaping"). Ms. Vitulli directed research on the baseline utilization of greenscaping and conventional landscaping activities in areas including material procurement, maintenance, and landscape design. IEC subsequently developed a ranking tool for EPA to use to compare landscaping performance among firms, and developed materials for members to communicate greenscaping activities to EPA in a standard format. Subsequently, Ms. Vitulli oversaw the development of a series of Excel-based models designed to help firms estimate costs and savings associated with implementing greenscaping practices.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF RESOURCE CONSERVATION AND RECOVERY**, led a team that developed a user-friendly Excel-based model of food waste management options, financial impacts, and environmental benefits. The model is designed for use by restaurants, cafeterias, restaurants and other institutions with significant food waste volumes to determine site-specific, cost-effective options for environmentally preferable food waste management, including donations to food banks and rescues, composting, and collecting yellow grease for manufacture of biodiesel.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, GREEN BUILDING PROGRAM**, managed the development of EPA's Green Homes website, <http://www.epa.gov/greenhomes>, which provides homeowners and home buyers with credible, non-commercial, peer-reviewed introductory information on residential green building and green home practices. Developed the website's communications approach and organization with EPA. Managed research and content development, website programming, and an extensive peer review process.

For the **U.S. ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF SUSTAINABLE COMMUNITIES**, assisted in developing a guidebook for developers on financing brownfields redevelopment. As part of this project, Ms. Vitulli identified innovative financing arrangements to demonstrate how to combine public and private funding sources for brownfield sites. She also synthesized technical information on funding options, development planning, and environmental considerations into a format accessible to conventional developers