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REPORT

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White Paper: Best Innovative Practices for Achieving Energy Efficiency in Commercial and Multi-Family Buildings through Land Use Planning and Zoning Regulations, Policies, and Incentives

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Table of Contents

1.0 INTRODUCTION 4
1.1 Background 4
1.2 Objectives 5
1.3 Scope 6
1.4 Methodology and Organization 7
2.0 STRATEGIC POINTS OF INTERVENTION BY LOCAL PLANNERS: TECHNICAL 8
2.1 Basic Concepts 8
2.2 Larger-Scale Energy Efficiency: Compact Development 10
2.3 Renewable and Efficiency Ready Sites and Districts 13
2.4 Reuse of Existing and Historic Buildings 15
2.5 References 17
3.0 BARRIERS AND OBSTACLES TO IMPLEMENTING TECHNICAL INTERVENTIONS 18
3.1 Basic Concepts 18
3.2 General Barriers 19
3.3 Individual Building Barriers 21
3.4 Neighborhood / District Barriers 23
3.5 References 24
4.0 STRATEGIC POINTS OF INTERVENTION BY LOCAL PLANNERS: INSTITUTIONAL 26
4.1 Basic Concepts 26
4.2 Long-range Community Visioning and Goal Setting 26
4.3 Plan Making 27
4.4 Regulations and Policies 27
4.5 Incentives 28
4.6 Development and Redevelopment Work 28
4.7 Public Investment 29
4.8 Public Outreach and Education 29
4.9 Research and Development 30
4.10 References 32
5.0 PLAN MAKING 33
5.1 Basic Concepts 33
5.2 Climate Action Plans 33

5.3 Energy and Climate Planning Methodology....34
5.4 Local Examples of Climate and Energy Plans....36
5.5 References....37
6.0 REGULATIONS AND POLICIES....39
6.1 Basic Concepts....39
6.2 Examples of Sustainable Development Codes....45
6.3 Making a Market: ULI Approach to Benchmarking and Public Disclosure....49
6.4 References....52
7.0 INCENTIVES....58
7.1 Basic Concepts....58
7.2 AIA's Green Building Incentive Trends....59
7.3 Examples of Financial Incentives....64
7.4 References....69
8.0 DEVELOPMENT AND REDEVELOPMENT REVIEW....71
8.1 Basic Concepts....71
8.2 Project Review Checklists....71
8.3 Public-Private Partnerships....71
8.4 Redevelopment Plans and Projects....72
8.5 Berkeley, California Example....76
8.6 References....78
9.0 SUMMARY AND CONCLUSIONS....80

1.0 INTRODUCTION

1.1 Background

As part of Rutgers Center for Green Building's (RCGB) work with the USDOE-funded Energy Efficient Buildings Hub Project (EEB Hub), Rutgers is serving as the leader for the Codes and Standards subtask. The primary objectives of Subtask 6.2 are to assess regional codes and standards policy barriers to Advanced Energy Retrofits (AERs), and to develop and demonstrate strategies for overcoming them. The U.S. Department of Energy (DOE) and others have provided best practices for implementing energy efficiency measures through building codes. The American Planning Association (APA) has provided extensive guidance on how to use planning and zoning codes to achieve energy efficiency in multiple sectors. However, these efforts have been made in isolation of each other rather than providing integrated approaches.

In general, the combination of the above approaches can yield energy savings of greater than 30%, although several implementation challenges exist. Other local or regional factors that affect the policy environment for AERs and which may be altered through regional policy include the availability of rebates or other incentives for energy efficiency, the structure of utilities and their relationship to building codes, and provisions in contracting/procurement law.

The Codes and Standards work for the EEB Hub Budget Period 3 (Year 3) directly addresses the cumulative regulatory and policy environment (federal, state, local) from the perspective of the commercial building owner. It seeks to understand barriers to increasing the energy efficiency of the building stock of the greater Philadelphia region through this lens and to identify and pilot strategies to overcome these barriers. The Codes and Standards team will produce an actionable report that identifies barriers to AERs and provides strategic guidance on how to overcome them, while also testing a subset of these strategies through direct market engagement with building owners. Specific topic areas engaged by the Codes and Standards team in Year 3 include the following: code adoption, code slippage and compliance, planning codes/standards that impede or promote AERs, conflicts/synergies in historical preservation standards and AERs, historical/structural divisions in utility mandates and codes, and performance-based codes.

Several related papers and reports have been produced by the Energy Efficient Buildings Hub project that address the use of building codes and other measures to facilitate building energy efficiency:

- Rutgers Center for Green Building, David B. Hattis, David Listokin, Jennifer Senick, with the assistance of Michael Manzella. 2014. *White Paper: Energy Efficiency Provisions in Building Rehabilitation Codes for Commercial Buildings - Pennsylvania & New Jersey*. Prepared by the Center for Green Building at Rutgers University for the Energy Efficient Buildings Hub, Philadelphia, PA.

- EEB Hub Region Energy Code Gap Analysis: Preliminary Findings, A U.S. DOE Energy Innovation HUB Report, prepared by the Building Codes Assistance Project at the Alliance to Save Energy and the United Technologies Research Center, January 2013.
- 90% Compliance Pilot Studies, Final Report, June 2013, U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy (addresses implementation of state plans to achieve 90% compliance with model energy codes by 2017, including active training and enforcement programs, and annual measurement of the rate of compliance).
- Policy and Process Factors Impacting Commercial Building Energy Efficiency in Pennsylvania and New Jersey, October 2011, Greater Philadelphia Innovation Cluster (GPIC) for Energy-Efficient Buildings Policy Markets and Behavior Task Team, by Shari Shapiro and Cozen O'Connor.

The present literature search and white paper is intended to complement the above reports. The DOE HUB project website is a good source for relevant reports:
http://www.eebhub.org/

1.2 Objectives

Under the EEB Hub project, a Codes and Standards team is charged with developing a detailed and actionable evaluation of how local, state and federal building codes and national and international standards affect AERs in commercial (and multifamily) buildings for the greater Philadelphia region. The objective of this paper is to conduct and document a literature review to provide content about planning codes and standards for the introduction/background section as well as other related sections of the Report on Impact of Codes and Standards, a key deliverable for the Codes and Standards subtask. More specifically, the objective is to conduct a meta-level, up-to-date review of literature on best practices, including an evaluation of promising innovative practices, relating to requiring, facilitating or incentivizing energy efficiency in commercial and multi-family residential buildings through land use planning policies and zoning codes (but not building codes), as well as through incentives such as rebates, discounts, tax credits and public recognition programs.

In doing so, this paper intends to fill three gaps in the available literature on facilitating energy efficiency in buildings:

- The overwhelming majority of publications focuses on building codes as an effective means of achieving energy efficiency in buildings, as opposed to planning and zoning powers.
- Compact development and land use patterns are discussed extensively but almost exclusively in the context of improving energy efficiency in the transport sector, as opposed to the buildings sector.
- When planning and zoning barriers and solutions are addressed, it is almost exclusively in the context of enabling renewable energy installations on buildings and not energy efficiency

measures; even when the dialogue is labeled as also addressing energy efficiency, it does not do so substantively.

1.3 Scope

A relatively broad net was cast relative to land use and zoning powers and tools, including:

- Planning laws and regulations
- Zoning ordinances and codes
- Benchmarking and reporting
- Incentives, rebates and financing
- Information and education

Note that building codes were not a direct target of the review, except to the extent that they may be required or recommended by local planning departments in the context of benchmarking and reporting requirements for individual buildings or districts.

The present paper is intended as a companion piece to another literature review and white paper on the same subject but comparing and contrasting the regulatory and institutional framework in New Jersey and Pennsylvania for facilitating energy efficiency in commercial and multi-family residential buildings: "*Comparing And Contrasting New Jersey And Pennsylvania Regulatory And Institutional Frameworks For Land Use Planning And Zoning As They Relate To Facilitating Energy Efficiency In Commercial And Multifamily Buildings".* The descriptions and analyses of planning and zoning tools that can facilitate energy efficiency in commercial and multi-family residential buildings are elaborated more fully in this paper and thus serve as background for the companion paper.

The main focus of the review is existing commercial (including institutional) buildings and multi-family residential buildings (defined as multi-family buildings over four stories high). Ostensibly, planning and zoning tools would typically be more frequently and effectively applied to new buildings, thus the challenge of this task is to find useful applications to existing buildings where there is embedded or embodied energy to take advantage of. To meet this challenge, the review covered both new buildings, as well as existing buildings, in an attempt to find tools that may also be useful to existing buildings. This hybrid approach naturally led to evaluation of the application of planning and zoning tools to achieving energy efficiency in redevelopment project areas as a promising direction for planners.

In addition, the focus is on the energy efficiency challenge facing small- and medium-sized buildings, because large buildings are typically owned by larger landlords, including national and regional level real estate firms and REITs, who have more extensive resources to apply to energy efficiency goals, while small and medium buildings tend to be locally owned with less resources and thus can benefit more from local planning support. On the other hand, keeping the building

footprint constant, the taller a building is, the less will be the GHG emissions reduction benefit per square foot of floor area of any roof-mounted renewable energy system, reflective roof or green roof.

1.4 Methodology and Organization

The literature review was conducted at the local, regional and state levels, and included review of international as well as US examples. Identify and describe existing relevant planners' and government officials' tool boxes. In preparing the white paper, the author's charge was to take advantage of existing evaluations of these issues available from relevant organizations and their respective databases and websites, including for instance the American Planning Association, Urban Land Institute, Northeast Energy Partnership, and non-profit energy organizations. Google, Google Scholar and Google Books, as well as the websites of potentially relevant organizations, were examined for key words and phrases relating to energy efficiency in commercial and multi-family residential buildings. The literature review focuses on publications dated from 2010 to the present, except for seminal works dated earlier.

The information obtained from the literature search was then organized according to "strategic points of intervention", both technical and institutional. Technical points of intervention, which could also be described as technical solutions, are discussed in Section 2; these are the physical aspects of planning that can, if implemented and sustained, improve energy efficiency in existing, small and medium commercial and multi-family residential buildings. Section 3 discusses barriers and obstacles to implementing the technical points of intervention or technical solutions. Institutional points of intervention, or institutional solutions, are summarized in Section 4; these are areas where local government planners can traditionally intervene in public decision-making to facilitate, promote or require implementation of the technical points of intervention and thus actually achieve energy efficiency in existing, small and medium commercial and multi-family residential buildings. Both the technical and institutional points of intervention have been adapted from a series of related APA publications addressing climate change and energy efficiency. Sections 5 through 8 address individually the institutional strategic points of intervention, or institutional solutions, that are most critical for planners input – plan making, regulations and policies, incentives, and development review. Section 9 provides a summary and conclusions.

2.0 STRATEGIC POINTS OF INTERVENTION BY LOCAL PLANNERS: TECHNICAL

2.1 Basic Concepts

The American Planning Association (APA) *Policy Guide on Energy* contains several declarations relevant to the role of planning in facilitating energy efficiency in commercial and multi-family residential buildings. Relevant elements of the Policy are excerpted below:

- *2.0 Best Practices in Conservation & Efficiency. APA encourages planners and decision makers to make energy conservation and efficiency major criteria when making and evaluating plans, programs, projects, and policies. APA affirms that in the short- and mid-term energy conservation becomes a hallmark of energy policy while new infrastructure and technology introduce more long-term improvements and security into the energy system.*
- *13.0 Building Retrofit and Design. APA supports the use of and continued research into techniques, materials, and policies including building siting, that result in the construction of low- or "zero-" energy buildings and the efficient, affordable upgrading and retrofit of existing structures. Building siting, design, overall community layout, and water consumption are major factors in energy demand and consumption. Land use planning should be integrated with concerns regarding energy conservation and generation.*
- *16.0 Greenhouse Gas Emissions. APA endorses an 80 percent reduction in GHG emissions below 1990 levels by 2050 through carbon pricing or incentives. APA supports energy policies and programs that are consistent with that goal and does not support policies and programs inconsistent with that goal.*

APA issued a PAS Memo, *Integrating Energy and Climate into Planning,* providing useful background on climate change, how a community can assess its impact on climate change and vice versa, and what the implications are for community planning in terms of forms and patterns of development, infrastructure and utilities, transportation, economic development, natural resources, and building and site design. For the purposes of the present paper, these factors are termed "strategic technical points of intervention" which are in turn differentiated from the "strategic institutional points of intervention" discussed in Section 4. The PAS Memo asserts that building and site design can reduce GHG emissions in four ways:

- Maximizing reuse of existing buildings
- Using energy-efficient practices in construction and renovation of buildings
- Encouraging the use of more energy-efficient lighting and appliances
- Promoting renewable and efficiency ready building and site features

Below are verbatim excerpts from the PAS Memo providing more detail on the above four strategies. Note that the present author has taken the liberty of altering the order of their presentation to emphasize a logical progression of planners' involvement from the larger geographic scales of the overall community, neighborhood or district to the smaller scales of

individual sites and buildings. It can be argued that planners and planning departments have skills and responsibilities that are uniquely relevant and effective at the larger scales, while they must collaborate with other professionals and town departments to achieve goals at the smaller scales. However, planners have much to contribute at the smaller scales and can take leadership positions in many initiatives to implement the technical points of intervention outlined in this section by using the institutional points of intervention that will be revealed in Section 4 below.

- *Promoting "Renewable [and Efficiency] Ready" Building and Site Features. Making buildings and sites "renewable ready" involves identifying, creating, and preserving opportunities to install site-level renewable energy and efficiency technologies — appropriate locations for small wind turbines, solar panels, biomass-fired district heating, and geothermal heating and cooling, for instance. As individual parcels are likely to present different opportunities and constraints, neighborhood and district level energy solutions that allow benefits to be shared among users may be the most effective [emphasis added]. Site features that support energy efficient transportation choices, such as bicycle and pedestrian paths, bike racks, and well-designed transit stops are also important…In terms of adaptation, site design should consider trees that could provide shade and relief from increasingly warmer temperatures. Providing more green spaces and green roofs can also be a useful strategy for reducing the urban heat island effect.*

- *Maximizing Reuse of Existing Buildings. Reuse of existing buildings has significant energy benefits. Recent calculations indicate it can take between 25 to 60 years to recover the energy used in demolition and new building construction, as reported by the National Trust for Historic Preservation. Overall energy use for construction and embodied energy in building materials is an important but often overlooked source of GHG emissions.*

- *Using Energy-Efficient Practices in Construction and Renovation of Buildings. Adopting updated building codes can be an important step toward promoting energy-efficient buildings, but implementing and enforcing codes and better building practices can be the real challenge. Builders and contractors may lack the training and experience to properly install many best practice solutions. Inspectors may not have sufficient knowledge to monitor projects and installations, and permit processes may not require demonstration of actual performance that meets the standards. While many planners are not directly involved in enforcement of building codes, improvements in project reviews and technical assistance can be equally important, as can incentive programs that encourage more energy-efficient buildings. Planners, for example, can examine site plans to determine if the siting [orientation] of buildings will maximize passive solar use, and provide information on energy efficiency incentive programs.*

- *Encouraging the Use of More Energy-Efficient Lighting and Appliances. Appliance purchases are often consumer decisions, but incentives for incorporating energy efficient appliances in residential, commercial, and industrial projects can be an important strategy. Focusing on energy use from lighting, water heating, and refrigeration, for example, can yield substantial GHG benefits.*

The subsections below elaborate on some of the key points above.

2.2 Larger-Scale Energy Efficiency: Compact Development

The Benefits of Compact Development. As indicated in the first bullet in the above summary of *Integrating Energy and Climate into Planning, "As individual parcels are likely to present different opportunities and constraints, neighborhood and district level energy solutions that allow benefits to be shared among users may be the most effective."* However, *Planning for a New Energy and Climate Future,* which is the related but much more detailed full PAS Report that followed the PAS Memo, emphasizes an important additional technical point of intervention, namely the many advantages of compact development for facilitating energy efficiency: "*Compact mixed use development patterns consistent with "smart growth" principles inherently have many potential energy saving and GHG reduction benefits, but successful integration of energy and climate strategies into local development patterns will require considerable thought and attention. Planners and local communities will need to evaluate and integrate energy and climate considerations more explicitly and more rigorously than has been typically required in the past. The potential energy and climate benefits related to development patterns include:*

- *More efficient transportation systems*
- *More efficient heating and cooling of buildings*
- *Enhanced opportunities for renewable energy [and energy efficiency]*
- *Avoided land clearing and carbon storage losses*
- *Reduced infrastructure costs and energy use*
- *Reduced urban heat island effects*

Verbatim descriptions from the PAS Report are provided below for the buildings related benefits of compact development:

- *More Efficient Heating and Cooling of Buildings. Compact development patterns also tend to increase the proportion of attached and multi-unit buildings, both residential and commercial. Shared walls, as well as generally smaller unit sizes, create opportunities for lower energy use per capita. Other factors being equal, attached and multi-unit housing units tend to use significantly less energy for heating and cooling compared to detached houses.—by 20 percent or more, according to some estimates…Methodologies for estimating the energy use of different building types have been developed to compare different building types and configurations and to provide a sense of relative potential energy savings for*

heating and cooling attributable to density. Approximate values can be developed for a given area to compare large scale and long-term development scenarios.

- *Enhanced Opportunities for Renewable Energy [and Energy Efficiency]. Compact development can provide inherent energy efficiencies, but planners must also grapple with how and where energy is generated, transmitted, and distributed. Compact development generally enhances opportunities to deploy different types of renewable energy or energy efficiency-enhancing technologies. The cost of infrastructure to carry electricity from a renewable source is often a critical factor in determining its feasibility. The proximity of energy-demanding land uses created through compact development can increase the cost-effectiveness of installing new transmission and distribution infrastructure…*such as gas, water and steam pipes and low voltage electricity distribution lines.

- *Avoided Land Clearing and Carbon Storage Losses.* Clearing vegetation and disturbing natural soils create net additions of GHG to the atmosphere. Using existing sites can avoid these impacts.

- *Reduced Infrastructure Costs and Energy Use. Development patterns have consequences not only for infrastructure directly associated with energy bat also for the energy use associated with water, transportation, and other types of infrastructure. The manufacture, construction, maintenance, and operation of every linear mile of pavement or pipeline involve a substantial amount of indirect or "embedded" energy.* Estimating embedded energy and dollar savings of proposed compact development projects can provide the support needed to realize them.

The land use policies section of APA's Policy Guide on Planning and Climate Change also provides language very supportive of using compact development to facilitate energy efficiency and renewable energy, both at the overall community and individual building levels.

Providentially, the major climate change mitigation response for local and regional land use decisions involves the creation of a more compact urban form. The significance of such a development pattern on the mitigation of climate change is both complex and comprehensive. A more compact urban form has characteristics that al low for significant reductions in the amount of greenhouse gas emissions associated with buildings and the transportation, utility and service networks that support those buildings. These characteristics include:

- *Sufficient residential density to support multiple modes of transportation*
- *Proximity of land uses that encourage walking and bicycling*
- *More energy-efficient building types and unit sizes*
- *Provision of public open space that substitutes for more energy intensive private open space, such as lawns*

- *Less land consumed for development*

More efficient (and more energy-efficient) provision of public services, such as streets and utilities When a development pattern combines reductions in VMT through complementary land use proximity and street network connectivity with greater energy efficiency in building type, the synergy of such a land use arrangement has the potential to yield substantial dividends in climate change mitigation, in addition to benefits planners may be more familiar with, such as: pollution reduction, improved public health through promotion of pedestrian activity, enhanced tax base, greater service efficiency, housing affordability, and conservation of natural resources.

There are complications that result from creating a more compact land use pattern, such as the need for high-quality urban design standards, the potential for such concentrated land uses to contribute to the urban heat island effect, the need for public investment in infrastructure (parking garages, transit, streetscape, urban parks, etc.) to support more dense development, and the need for public investment/education in addressing the real or perceived concerns people may have with regard to urban living (quality of schools, crime, etc.). Planners must be conscious of all of these factors as they create regulatory requirements and incentives, land use and capital improvement plans, economic development incentives, and other implementation measures that encourage a more urban form. Failure to think holistically about dense development, particularly if such development is not commonplace in a community or region, can create unnecessary obstacles to and unintended consequences from the implementation of a compact development pattern.

Marketing the benefits of this type of development to the public and to the development community is also essential to the success of such a program. Outreach efforts explaining the purpose and benefits of a more compact urban form are often necessary to convince the public to accept what, in many cases, may be a new pattern of development.

Implementing Compact Development. There are a wide range of tools and techniques that planners can use to implement a more compact development pattern. These include:

- *Identifying and utilizing infill and brownfield sites for development*
- *Encouraging adaptive reuse of buildings that are functionally obsolete*
- *Revising codes and standards to allow small-lot, mixed use, and cluster development*
- *Facilitating transit-oriented development in areas served by extensive public transportation*
- *Employing urban growth or service boundaries, which limit where development may occur or where urban services such as water and sewer may be provided*

The land use section of APA's *Policy Guide on Planning and Climate Change* included the following declarations, all of which speak to the importance of compactness and density of

development as a significant planning tool in facilitating energy efficiency in commercial and multi-family residential buildings:

- Create more compact forms
- Integrate land use and transportation
- Promote mixed use development
- Develop centers with high density
- Establish transit-ready locations
- Facilitate job-housing proximity
- Create compact regions
- Plan infill development and redevelopment
- Redevelop brownfield sites
- Reform zoning and development standards
- Provide developer incentives
- Strategically locate public facilities

2.3 Renewable and Efficiency Ready Sites and Districts

This strategy holds for energy efficiency in existing buildings and new buildings, and can be applied at both the individual building/site and overall community/district scales. Planners can identify and pre-position existing buildings for adaptive reuse and districts of existing and new buildings for compact redevelopment and densification (or re-densification) to increase energy efficiency. Also, geothermal energy and co-generation with district heating can be considered energy efficiency measures that could be installed on existing buildings or in districts of existing and new buildings. In this regard, it is noteworthy that in its *Policy Guide on Energy* APA strongly supports such energy efficiency technologies that achieve their optimum benefits at the larger geographic scales:

- *11.0 Distributed Energy Generation. APA supports distributed energy generation systems that utilize community energy generation and "smart grid" public infrastructure that supports both conservation and energy efficiency.*
- *12.0 Smart Grid Technology. APA supports modernization of the nation's electrical grid that will allow for the efficient integration of innovative technologies such as renewable energy systems and electric vehicles, and makes it possible to offer dynamic electricity pricing options that can reduce strain on the grid while benefitting consumers. Advances in metering technology also create opportunities to provide consumers with access to more information about their electricity usage and costs, which can inform their decisions about energy consumption.*

According to Tobias and Vavaroutsos, et al. (2009) in their ULI publication on greening of office buildings:

"Smart grid technology will incorporate digital communication systems with the electric grid, allowing for two-way communication between the utility provider and consumers. This communication system enables real-time monitoring of electrical performance, both at the consumer level and at the utility level, making it possible to manage electrical capacity more efficiently and to improve service reliability."

Although the focus is on single family detached homes in a master planned community context, other district-scale insights can be gained from ULI's book on developing sustainable planned communities (Jo Allen Gause, Editor, 2007):

"Energy-saving strategies, both high- and low-tech, can be implemented across all aspects of community design…The development team can create a master plan in which it is easier to design buildings that optimize sustainable performance features. Likewise, a building that optimizes green performance features can have a favorable effect on a community's infrastructure, from size and cost to spatial need and required loads. As a sort of chicken and egg challenge, the linkage between building and context must be continuously guided and evaluated, if maximum performance is to be achieved at minimum cost."

The authors go on to cite community-scale planning for passive solar/wind orientation of buildings and landscaping as prime examples. In addition, they discuss community microgrids, and microturbines and cogeneration:

*"**Community microgrids**. Microgrids are an emerging type of energy (and water) infrastructure of a scale that lies comfortably between individual building systems and regional public utility systems. Traditional examples are the central heating and cooling plants for a college campus or a multibuilding corporate headquarters complex. The basic idea is that power, heating, and cooling systems designed at the neighborhood, block or district scale are fundamentally more efficient than those designed separately for individual buildings. It is often difficult to make gray water or power generation work within a single building because the capacity swings are too big between what is needed for peak requirement times and what is produced on average. But if the system spans several buildings that have different schedules and cycle occupancy, the various peaks can offset each other if on-site storage is supplied."*

*"**Microturbines and cogeneration.** Microturbines are basically compact gas turbine generators. Although not as clean as fuel cells, microturbines are less expensive and the power they produce is either grid-connected or stand-alone. Microturbines have the unique ability to produce electricity and heat simultaneously. When both these products are used, it is called cogeneration. Cogeneration, now being used in apartment complexes, condominiums, supermarkets, pools, and green campus development, captures heat thrown off of mechanical systems in large buildings that can be applied to other uses."*

Gause, et al. (2007) posit two systems for rating the energy efficiency of planned communities:

- ***Zero net resource use***. With zero net resource use the development must stay within its site's natural solar/wind budget in terms of kilowatt hours of electricity (and its water budget in volume of precipitation) unless offset by credits purchased through carbon transfer programs. For example, *"Lennar's Treasure Island south of San Francisco is planning to use PV panels and strict conservation measures to generate sufficient power during the day (contributing to the grid) to offset peak utilizations periods at night (drawing from the grid), resulting in a zero-net off-site consumption on an annualized basis".*
- ***Greenhouse gas neutral.*** With this standard, the development produces no net greenhouse gas emissions. *"The goal is for sufficient renewable energy to be produced on site from a variety of sources (biomass cogeneration, PVs, electric vehicles, and geothermal systems), so that the remainder of energy production that creates greenhouse gases is offset by other green power techniques such as the use of biodiesel fuels, power from Green Power-certified sources, and the purchasing of Green Power certification."*

Godschalk and Anderson (2012) have also contributed to dialogue on community or district scale energy planning:

"Large power plants are beyond the jurisdiction of most communities, but most communities can take advantage of those renewable energy technologies that lend themselves to local and distributed installations: solar, wind, biomass, and geothermal, among others.

"The new model of distributed renewable energy suggests that cities and communities represent not only places of consumption but also venues for production, and that every community could produce energy. Advancements in smart grids, smart meters, and grid informational technology make the collaborative sharing of small amounts of energy in a community possible. Buildings are increasingly designed to function as small power plants, and plus-energy homes and positive-energy buildings are becoming more common. In European cities, energy-efficient, decentralized combined heat and power (CHP) systems, as well as district heating and cooling systems, are common. Community planning plays an important part in identifying places where such renewable energy can be produced (e.g., Danish plans require designation of areas appropriate for wind production) and in ensuring that undue regulatory obstacles do not exist (e.g., modifying zoning ordinances and development codes to allow installation of solar panels, microturbines, green roofs, etc.)."

2.4 Reuse of Existing and Historic Buildings

The APA PAS Report, Planning for a New Energy and Climate Future, provides some additional notes on the advantages of reusing existing buildings in facilitating energy efficiency:

- *Taking Advantage of Embodied Energy. While older buildings may not be as energy efficient as buildings constructed today, they contain a great deal of embodied energy – that is, the*

energy it took to make their materials, transport them to their sites, and then build the building. If we consider theist quantities, the reuse of existing building can have significant energy benefits. Additionally, the National Trust for Historic Preservation reports that it can take 35 to 50 years to save the amount of energy lost when an older building is demolished…But typically a greater amount of energy is used to operate an older building than a newer one. This can be due to lack of adequate insulation, leaky windows and doors, and inefficient lighting fixtures and heating and cooling systems. Therefore, existing buildings should be renovated when possible to make them more energy efficient. Even historic buildings can incorporate many energy-efficient upgrades without losing their character. The National Trust for Historic Preservation has a number of guidance documents available on this subject.

- *Facilitating Compact Development.* Existing buildings play a key role in facilitating compact development and thus help to achieve the several advantages of compact development described above.

Tobias and Vavaroutsos, et al. (2009), strongly support green retrofit of historic buildings: *"In the context of green office retrofits, historic properties present challenges and opportunities. Given their embodied energy…, reusing existing buildings is inherently more sustainable than building new ones. Preserving and operating historic structures to their full potential is a smart investment in sustainability."* The energy efficiency advantages of historic buildings include (paraphrasing):

- Thick masonry walls that can help regulate indoor temperatures during the day
- Large windows and high ceilings maximize daylighting for building interiors
- Interiors that can be modified to remove perimeter offices to create an open floor plan or otherwise layouts that promote cross-ventilation

In a sidebar of Tobias and Vavaroutsos, et al. (2009), Ralph Dinola proposes five principles of sustainable preservation:

1. Repair rather than replace – at every scale
2. Rediscover and redeploy original green features of historic structures
3. Communicate with regulatory authorities early and often
4. Use incentives and grants to reinvest and improve returns
5. Look for opportunities at a district scale.

Relative to the last of these principles, i.e. the one perhaps most relevant to planners, Dinola says:
"Project teams should consider expanding the boundary of a project to include adjacent sites or even entire districts. This helps take advantage of economies of scale and capitalize on the potential for locating systems and technologies off site. Examples include tying into a district

central utility plant for heating, cooling, or power or placing renewable energy systems on an adjacent, non-historic building in order to protect a building's historic character. Rehabilitation of a single building in a historic district can also catalyze numerous other projects and transform a community."

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3.0 BARRIERS AND OBSTACLES TO IMPLEMENTING TECHNICAL INTERVENTIONS

3.1 Basic Concepts

The following outline is proposed as a means of organizing the literature reviewed relative to barriers and obstacles for planners in making the technical interventions (solutions) presented in Section 2 above that are needed to achieve local energy efficiency goals. The institutional interventions (solutions) presented in Section 4 below are proposed as the means of overcoming the barriers and obstacles presented in this section.

General

- Lack of definition or acknowledgement of energy concepts or goals
- Cost concerns
- Customer barriers
- Public policy and planning barriers
- Market Barriers
    - Time and hassle
    - Control
    - Conflicting incentives between landlords and tenants
    - Profits are small

Individual Building

Reuse of Existing Buildings

- Barriers to adaptive reuse
- Modifications to historic buildings

Inside of Building Envelope

- Building codes

On Outside of Building Envelope

- Floor area rules
- Projection limits from the sides of buildings
- Yard requirements
- Roof structure requirements
- Height restrictions

Building Site & Onsite Infrastructure

Obstacles to:

- Landscaping for windbreaks

- Energy efficient exterior lighting
- Exterior shading (glare and heat gain reduction)
- Energy efficient window treatments
- High reflectance hardscape materials
- Reflective roofing

Neighborhood / District

Obstacles to:

- Compact development
- Redevelopment

3.2 General Barriers

Perhaps the most pervasive barrier to being able to implement building energy efficiency measures through planning and zoning powers is that for most jurisdictions existing zoning codes are silent regarding the concepts of energy efficiency, renewable energy and sustainability. This reflects a disconnect between local plans and policies on the one hand and regulations, standards and codes on the other hand, thus limiting what a local government can achieve even if the comprehensive plan does address these concepts and has established a legal precedent or basis for also incorporating them into the zoning code.

The Center for Climate and Energy Solutions (CCES) website presents obstacles to climate-friendly buildings, including public policy and planning barriers, and policy options to promote climate-friendly buildings, including a section on standards and codes, which are provided verbatim below.

- *Cost Concerns. Estimates vary as to the financial cost and emissions-reducing potential for green building and energy efficient building practices, particularly because of the range of ideas and products and the degree to which specific technologies and designs are utilized. In many cases, the integration of efficient practices can reduce energy use in multiple elements of the building; for example, insulation and solar heating can reduce HVAC equipment costs and electricity costs, and strategic design can reduce the need for artificial lighting as well as improve air circulation.*

  New efficient buildings are estimated to have costs equal to or only slightly more than those for conventional buildings. For new buildings, it is estimated that the additional cost of state-of-the art, energy-efficient technology is less than 2 percent of the total building cost.[7] *For example, a 2006 study comparing the cost of LEED-certified buildings compared with the cost of non-certified buildings*[8] *found that LEED-certification is not a strong indicator of cost. Academic buildings with and without LEED certification can incur a wide range of costs on a square footage basis.*

Regardless of initial cost, efficient buildings can yield savings over the lifetime of the building through:

- *Reduced utility bills; average energy costs for high-performance buildings are 50 percent less than for comparable, conventionally designed buildings.*
- *Increased property value.*

- *Market Barriers. A variety of market barriers exist, including the "split incentive" barrier wherein there exists a disconnect between those that manage the building and those who must pay the utility bills. Thirty-two percent of households and 40 percent of commercial buildings are rented or leased; in these cases, tenants do not have much control over retrofits or building improvements, and landlords may not reap the benefits of more efficient technology.*[11]

  In addition, the prevailing fee structures for building design engineers cause first costs to be emphasized over life-cycle costs. Projects are often awarded in the first place to the team that designs the building that costs the least to construct; their fees are typically reduced if actual construction costs exceed the estimated costs.[12] *This practice tends to hinder energy efficiency because initial capital costs are typically higher for the installation of superior heating, ventilation, and air-conditioning systems that reduce subsequent operating costs.*

- *Public Policy and Planning Barriers. Policies and planning efforts that affect buildings are often implemented at the state or local level. Policies can be designed to encourage more climate-friendly buildings, but a variety of policies also exist that discourage making buildings more climate-friendly. For example, many utilities have incentives to generate and sell more electricity and little or no incentive to encourage energy efficiency, even if the energy efficiency options have lower costs.*

- *Customer Barriers. Lack of information about energy-saving opportunities and incentives, such as rebates and low-interest loans, can result in consumer underinvestment. In addition, lack of access to energy-efficient technologies (e.g., because a particular technology is not stocked in local stores) can limit the use of some technologies. Understanding these barriers may improve the feasibility of efficient construction and planning. With increasing availability of efficient technology and the growing popularity of green building techniques, it is becoming more and more important to address these barriers to the implementation of efficient and effective building technology.*

More on Market Barriers. In a ULI article, "Energy Efficiency Retrofits", John H. Vogel, Jr, explores why energy efficiency renovations are not happening faster and whether government has a role to expedite them, citing lessons from Europe. His barriers to retrofitting existing buildings are described verbatim below.

- *Time and hassle. Establishing a baseline of energy use and determining what factors affect future usage (retrofits, weather, occupancy, etc.) are complex questions, as is the overall energy efficiency system itself.*

- *Control. The energy management team needs some level of control of energy related equipment maintenance and tenant energy use behavior.*

- *Conflicting incentives between landlords and tenants. The landlord is responsible for capital costs of energy efficiency retrofits but the tenants benefit from the reduced operating costs whether they pay directly via sub-metering systems or indirectly through triple-net leases. With long-term leases or a single tenant, the problem can be resolved by having the tenant pay for the retrofit directly or compensate for some or all of the savings in additional rent.*

- *The profits are small. The author describes a scenario where a 20% reduction in energy costs yields a relatively small total dollar savings as compared to a potentially much more significant increase in revenue and profit if the same investment were made in fitting out and renting an additional increment of space.*

The Northeast Energy Efficiency Partnerships also focuses on the "split incentive" issue as a key barrier to achieving energy efficiency in commercial and multi-family residential buildings: *"One of the biggest barriers to achieving energy efficient savings in multifamily buildings is the challenge of the split incentive. Owners of multifamily buildings don't make efficiency investments because it's the renters who pay the energy bills. And renters don't make investments in property they don't won. The result is housing that wastes energy and costs more than it should…A report released earlier this year by think tankMN2020 notes, 'replacing the nearly 88,000 refrigerators over 10 years of are in Minnesota rental properties would save renters well over a staggering $3.7 million a year.' And that's just one appliance!"*

3.3 Individual Building Barriers

Reuse of Existing Buildings. As discussed in Section 2 above, facilitating the reuse of existing buildings is a key means of reducing energy use by taking advantage of the embedded energy in the original construction of the building including site and infrastructure. Iowa's Economic Development recommends two straightforward zoning code fixes:

- *Reuse Variances. Consider removing any existing barriers to reuse created by required zoning variances.*
- *Parking/Loading Requirements. Consider allowing existing parking quantities to satisfy parking requirements if an existing building is adapted for a different use.*

On Outside of Building Envelope. Research conducted in the development of New York City's new Zoning Resolution identified several obstacles – particularly floor area and building height

rules that prohibited use of rooftops for energy efficiency or green power improvements – to retrofitting existing commercial, residential and industrial buildings for energy efficiency, renewable energy and green building. The following code changes were made:

- *Relaxing floor area ratio rules to allow additional energy-efficient insulation of external walls in existing and new buildings without sacrificing buildable interior space, by exempting external wall insulation by up to 8 inches in thickness from floor area calculations*
- *Allowing sun shades and similar sun control devices to be affixed to external building walls to block summer sun but allow winter sun to pass, by permitting these devices to project up to 2.5 feet from the wall as long as they are above the first floor and do not cover more than 30% of the wall*
- *Allowing installation of boilers on rooftops where they operate more efficiently because they do not need the long, expensive and floor area consuming exhaust chimneys that are needed for basement boilers*
- *Permitting skylights on rooftops subject to 4-foot height limits and 8-foot setbacks from street walls*
- *Allowing solar panels and wind turbines to be installed on rooftops, as well as solar systems on building walls as long as they do not project out more than 10 inches nor occupy more than 20% of the wall area*
- *Improved access to and innovative use of rooftops, including recreational decks, green roofs, greenhouses and storm water detention systems, by relaxing building height and bulkhead and guard rail setbacks*

Similarly, as reported in the Office of Planning's Public Hearing Report, the existing Washington DC zoning code was reviewed to identify barriers to achieving energy efficiency goals. The following recommendations were made to address the barrier identified:

- *Increased Energy Efficiency. Consider requiring cutting-edge energy efficiency standards to be met for projects requesting density or height above matter-of-right limits (i.e. PUDs). New buildings requesting this density would be required to be designed to meet strict fossil fuel, GHG-emitting, energy consumption performance standards well below the regional average for that building type.*
- *Outdoor Lighting. To reduce energy consumption, adopt the standards of a Model Lighting Ordinance such as those suggested by the New England Light Pollution Advisory Group (NELPAG) or the International Dark-Sky Association (IDA).*
- *Sustainable Energy Features. Allow energy-related sustainability features (such as light shelves and photovoltaic panels) to project into setbacks and yards or exceed standard roof coverage limitations in all districts. Ensure that such projections meet a minimum vertical clearance above the ground.*
- *Renewable Energy Generation. Permit wind and solar generation accessory to all development in all zones and as a primary use of land in industrial, high density and*

government areas (with limitations to protect historic districts or national monuments from visual and other impacts).

- *Solar Access Protection. Limit discretionary (PUD) development that would block existing roof-mounted solar power generation or solar hot water facilities.*

Leanne Tobias and George Vavaroutsos, et al. (2009) discuss barriers to retrofitting existing office buildings:

- ***Financial considerations.*** *Building owners tend to focus on initial capital costs, without appropriately considering medium- to long-term costs and benefits. If owners utilize a very short investment time frame or do not accurately determine the overall rate of return on GHG emission abatement measures, the higher upfront cost of more energy-efficient equipment discourages their purchase and use.*
- ***Disconnect between costs and benefits.*** *If building owners bear the costs of GHG-reducing measures and the benefits, expressed as lower energy costs, accrue only to building tenants, there may be a disincentive to investment. If the benefit cannot be recouped by the cost-bearer, the investment will not occur*
- ***Lack of knowledge and experienced workforce.*** *A lack of practical understanding among building owners about energy efficiency and green building, including overestimates of the green first cost premium, hinder reductions in GHG emissions. While the WBCSD study indicated a high awareness of green building among real estate professionals and building owners, it also indicated that less than 13 percent of those surveyed had been involved with green building. The lack of experienced service providers ultimately raises the cost of GHG emission reductions.*
- ***Increase in risk and uncertainty.*** *The lack of practical green knowledge among real estate professionals compounds the problem of assessing green building and energy-efficient practices. Because some GHG emissions reductions rely on building practices that are perceived as new to a marketplace that is traditionally slow to adapt, there is uncertainty about both physical and financial performance. In addition, green or energy-efficient building practices may require the use of new suppliers and contractors, which could increase the risk profile for the application and lower the risk-adjusted financial returns from the retrofit.*
- ***Ignoring small opportunities for energy conservation.*** *Many small energy-saving measures are overlooked by building owners, especially in residential structures. At the aggregate level, the reduction in GHG emissions from such measures are substantial, but if the ROI for these measures does not satisfy owners' minimum return thresholds, the reduction will not be undertaken.*

3.4 Neighborhood/District Barriers

As discussed in Section 2 above, the absence of explicit reference to district energy systems in local zoning codes and the single-use orientation of traditional Euclidian zoning present

obstacles to the development neighborhood/district energy systems. The key to using neighborhood or district level plans and strategies to achieve energy efficiency in buildings is to encourage compact development. Following are two examples from very different places:

- *District Energy Systems. In addition to the energy efficiency recommendations reported above relating to the building envelope zoning rules, the Washington DC Office of Planning's Public Hearing Report reviewing the District's existing zoning code recommends expressly permitting district energy systems in all districts.*
- *Mixed-Use. Iowa Economic Development's Creating Energy Efficient Main Streets Guide says that the "Main Street district zoning code should allow for a variety of uses to diversify its economic base and encourage the reuse of historic commercial buildings and their upper floors. In many Main Street communities across the country, zoning codes may prohibit upper floor residential use. Upper story conversions may be opportunities for property owners to plan and implement energy efficiency improvements as well as encourage new office tenants and residents to walk, rather than drive, to commercial district stores, institutions and other attractions…Additionally, some zoning codes require excessive amounts of parking for upper floor conversions to occur. Reduce parking requirements and consider shared parking allowances or maximum parking requirements to encourage more walking and bicycling or increases density where appropriate."*

Gause, et al. (2007) cite barriers and obstacles for implementing energy efficiency measures; although their book is oriented toward single family detached homes in master planned communities, they offer additional insights that may be helpful for commercial and multifamily residential buildings:

- Inflexible local regulations
- Outdated market perceptions
- High development and entitlement costs
- Financing by formula
- High-density development without amenities

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4.0 STRATEGIC POINTS OF INTERVENTION BY LOCAL PLANNERS: INSTITUTIONAL

4.1 Basic Concepts

The American Planning Association (APA) has produced a series of guidance documents and policies for planners relating to energy and climate planning. The PAS Memo, *"Integrating Energy and Climate into Planning,"* states that: *"Planners have an important role to play in mitigating the effects of climate change and adapting to its unavoidable consequences. Taking action in these areas will not only help mitigate the climate change problem, but through various strategies could also help reduce our reliance on non-renewable energy sources, help communities better meet their energy needs, and improve environmental quality. There are many opportunities for planners to start integrating energy and climate issues in planning across issue areas and in different points in the planning process. This Memo provides the framework for planners to begin rethinking how they can address energy and climate."*

The PAS Memo and related documents lay out a conceptual framework for strategic institutional points of intervention and tools available to local government planners wanting to integrate energy and climate into community planning. This framework serves as a useful starting point, with some adjustments with insights from other literature, for organizing the present paper's more focused discussion of how planning can facilitate energy efficiency in commercial and multi-family residential buildings. Sections 5 through 8 address individually the points of intervention that are most critical for planners input – plan making, regulations and policies, incentives, development review – and Section 9 provides a summary and conclusions.

4.2 Long-range Community Visioning and Goal Setting

Planners often conduct visioning exercises that produce long-term goals and objectives that community leaders look to when considering policies and actions. Community visioning can be the first step in developing a comprehensive, neighborhood, or downtown plan. Whether part of a planning process or on its own, visioning is an important first chance to identify new opportunities and priorities related to energy and climate. Planners may include exercises to gauge the level of awareness and importance of energy and climate change to community members, consider how energy and climate issues can be addressed in the community, and determine how connected it is to other community goals and values. More specifically, energy and climate issues can be integrated into the visioning process through:

- Survey citizen attitudes
- Hold community workshops
- Connect community goals
- Run alternative scenarios

- Task force appointment

4.3 Plan Making

Planning departments prepare plans of all kinds that recommend actions involving infrastructure and facilities, land-use patterns, open space, transportation options, housing choice and affordability, and much more. Examining comprehensive plans and other planning documents to see if energy and climate change issues are addressed and integrated is an important step. Planners should consider including an energy and climate change element in the comprehensive plan, or integrating these issues within other elements. Marin County, California, for example has incorporated measures to address climate change in their recently updated countywide plan, which focuses on sustainability. Climate action plans also fall into this category of plan making. For these, planners should consider whether the GHG reduction targets established in the plan can be achieved with the strategies proposed. Plan-making points of intervention include:

- *Assessment and Analysis*. Baseline and trends for energy use and GHG emissions
- *Comprehensive Plans*. Goals and actions to guide community; energy and climate element
- *Area Plans*. Neighborhood, downtown, redevelopment district, corridors
- *Functional Plans*. Transportation, open space, utilities, school, economic development
- *Climate Action Plans*. Baseline, targets, strategies and policies for reducing GHG emissions
- *Energy Plans*. Overview of energy use and sources, strategies for energy security

4.4 Regulations and Policies

Planners write and amend regulations and policies that have an important influence on what, where, and how things get built and what, where, and how land and buildings get preserved. When updating regulations, planners should consider how zoning codes, building codes, subdivision codes, and other regulations, and ordinances address energy and climate issues and these could work to encourage energy-efficient and climate friendly forms of development. The two main steps to revising a regulation, code or standard to address energy and climate issues (Duerksen, 2008):

- *Remove Barriers*. Existing codes may inhibit reducing GHG emissions and using renewable energy, often unintentionally. The planning office can conduct a barrier audit to determine what regulatory obstacles exist. Some codes may prohibit wind turbines, for example, due to height restrictions. Other ordinances may prohibit mixed uses, accessory dwellings, and higher residential densities.
- *Enact Standards*. Setting appropriate standards to guide desired development is important. For example, standards can mandate the preservation of trees (which aid in carbon sequestration) and require new subdivisions and mixed-use development to include bike lanes and sidewalks.

4.5 Incentives

Create incentives: desired types of development can be fostered through incentives. For example, development that includes green roofs (which can help reduce the urban heat island effect while reducing heating and cooling loads in buildings) could receive a density bonus. Both the added density and green roofs could help a community meet its energy and climate goals. Concrete steps to employing incentives include creating a fact sheet for developers/residents on available federal, state and utility incentives and developing local incentives, including:

- Expedited plan review for projects that meet or exceed established energy and climate objectives
- A waiver of permit fees, rebates or other financial incentives to developers whose projects meet predetermined standards
- Provision of technical assistance to help developers meet new goals and standards
- Offering financing mechanisms for renewable energy improvements that works like a sidewalk assessment
- For cities that own their own utility offer rebates for purchasing energy-efficient appliances and encouraging the purchase or even the production of green power

4.6 Development and Redevelopment Work

Planners play an important role in development in their community. They review project applications for consistency with applicable plans and regulations and may be involved in public-private partnerships to develop new projects. While goals and standards for energy and climate should be addressed in plans and regulations, making sure these goals and standards are met or exceeded in the development process is important. Specific measures include:

- *Project Review Checklists*. Develop a checklist of energy and climate change standards or goals for new projects and, if mandatory standards are not used, then offer expedited plan review and permit-processing track for projects that meet or exceed the goals.
- *Public-Private Partnerships*. If serving on development team, planners can encourage energy efficiency, renewable energy and GHG emission reductions.
- *Redevelopment Plans and Projects*. Redevelopment is a major opportunity for intervention by local planners on behalf of energy efficiency in both individual buildings and districts.

Redevelopment is a major opportunity for energy efficiency. The NJ Redevelopment Handbook asserts that redevelopment plans can be used to promote green building design and site layout in particular and sustainable development in general, by either:

- Mandating achievement of some level of green building certification, or at least use of some level of sustainable design, in the redevelopment plan; or
- Offering incentives to redevelopers to seek green building certification or to incorporate green building design techniques in exchange for increased density or floor area for non-residential uses.

4.7 Public Investment

Towns, cities, and counties undertake major investments in infrastructure and community facilities. It is important for planners to be involved in the decisions for these public investments, as they can substantially affect the design and location of transit, streets, sidewalks, bikeways, schools, sewer and water facilities, and other public infrastructure and facilities. Planners can take an active role in their city's capital improvement program to make sure that public investments made in the community — including infrastructure, public buildings, and facilities—promote energy efficiency and reduce GHG emissions. Additionally, it is often important for cities to lead by example, showing that energy and GHG reduction goals can be met in public projects such as through energy efficient retrofits in public buildings, in order for private development to incorporate these goals in their own projects. Planners should influence public investment decisions regarding infrastructure and community facilities, particularly through the capital improvement program, to:

- Reduce overall energy use
- Facilitate renewable energy
- Encourage compact development
- Help reduce GHG emissions
- Adapt to climate change

The APA Policy Guide on Planning and Climate Change presents a green development policy on public building and infrastructure investments specifying the use of energy-and water-saving products, appliances, technology, and installation techniques as part of the construction bid process for all public building and infrastructure projects. Public buildings and infrastructure represent opportunities to implement green development in a highly visible fashion throughout the community. This communicates the community's commitment to green development and sets an example for the private sector.

4.8 Public Outreach and Education

Planners often lead community outreach and educational programs, often as part of community visioning or plan making processes. Whether a part of these processes or separate, planners should consider ways to engage the public in discussing energy and climate change and provide educational forums for citizens to learn how to make changes in their own lives to improve energy efficiency and reduce carbon emissions.

The *APA Policy Guide on Energy* presents a policy on education and consultation: APA members will take an important role in educating their communities on the interrelated issues of energy, climate change, and sustainability; the importance of understanding energy consumption patterns; and strategies for reducing consumption and emissions, ranging from energy efficiency and conservation to renewable energy technologies.

The *APA Policy Guide on Planning and Climate Change* provides several policies relevant to public outreach and education. It states: "In general, the public is quite supportive of energy efficiency for a wide variety of reasons, including financial benefit and social concern. Planners can initiate public awareness programs and campaigns to broaden awareness of the opportunities to achieve greater energy efficiency through structure design technology and alternative energy sources. Additionally, the public is becoming aware of the hazards associated with climate change and planners can effectively communicate how green development can sit and reducing the risks associated with these hazards." The relevant policies are:

- *Planning Schools.* Support updating planning school curricula to specifically address and prepare students for new approaches to planning associated with climate change adaptation and mitigation. Support ongoing professional development for professional planners dealing with tools and techniques associated with climate change planning. Accurately and explicitly recognize and discuss climate impacts and considerations in public participation processes related to long-range community visioning and goal setting, plan making, standards, policies and incentives, development work, and public investment. Support and encourage updates to primary and secondary curricula to educate and the next generation residents; planners and decision makers.
- *All Stakeholders*. Engage all affected stakeholder groups in initiatives to create and implement climate change plans to ensure that no group is isolated from the process.
- *Vulnerable Populations*. Support plans, standards, regulation, incentives, and investments to reduce the impacts of climate change on those populations most vulnerable to the impacts of climate change, including those dependent on subsistence agriculture and fishing.
- *Incentives and Education*. Support the creation of incentives, including appropriate tax credits and financing energy efficiency improvements with repayment through assessments on property tax bills, and education programs to encourage homeowners and developers to invest in green development improvements.

4.9 Research and Development

The Center for Climate and Energy Solutions strongly supports energy efficiency R&D. In the long run, the opportunities for a low-greenhouse gas energy future depend critically on new and emerging technologies. Some technological improvements are incremental and have a high probability of commercial introduction over the next decade (such as low-cost compact fluorescents). Other technology advances will require considerable R&D before they can become commercially feasible (such as solid-state lighting). The fragmented and highly competitive market structure of the building sector and the small size of most building companies discourage private R&D, on both individual components and the interactive performance of components in whole buildings. Two USDOE R&D programs address the needs:

- *Building Technologies Center*. The Oak Ridge National Laboratory's Buildings Technology Center was established by the USDOE and performs research into issues including heating

and cooling equipment, thermal engineering, weatherization, building design and performance, envelope systems and materials, and power systems.

- *Emerging Technologies*. This USDOE-sponsored program develops technology that would reduce energy use in residential and commercial buildings by 60-70 percent. Technologies are in fields including solid-state lighting, space conditioning and refrigeration, building envelopes, and analysis tools and design strategies that would facilitate the development of energy efficient buildings through software and computer-based building analysis.

More relevant to planning, though, the *APA Policy Guide on Energy* contains several declarations supporting research and development for energy efficiency in buildings:

- *Data and Measurement*. APA recognizes the importance of easy, consistent, and affordable access to energy data at the community level as an integral component of energy, sustainability, healthy communities, and climate planning. Further, APA recognizes the importance of measurement as a means to document communitywide energy consumption patterns; establish benchmarks; develop energy conservation and efficiency strategies, data security, and privacy; and regularly assess and benchmark performance and progress. APA also recognizes the importance of measuring impacts on the public's health.
- *Distributed Energy Generation*. APA supports distributed energy generation systems that utilize community energy generation and "smart grid" public infrastructure that supports both conservation and energy efficiency.
- *Smart Grid Technology*. APA supports modernization of the nation's electrical grid that will allow for the efficient integration of innovative technologies such as renewable energy systems and electric vehicles, and makes it possible to offer dynamic electricity pricing options that can reduce strain on the grid while benefitting consumers. Advances in metering technology also create opportunities to provide consumers with access to more information about their electricity usage and costs, which can inform their decisions about energy consumption.
- *Building Retrofit and Design*. APA supports the use of and continued research into techniques, materials, and policies including building siting, that result in the construction of low- or "zero-" energy buildings and the efficient, affordable upgrading and retrofit of existing structures. Building siting, design, overall community layout, and water consumption are major factors in energy demand and consumption. Land use planning should be integrated with concerns regarding energy conservation and generation.

The APA Policy Guide on Planning and Climate Change also addresses R&D for energy efficiency:

- *Communities and Climate Change Research*. Support research that improves the ability of communities to reduce their carbon footprint by quantifying their impacts on climate change and the effect of their actions to address this issue. Support the research and development of new modeling and scenario planning techniques that incorporate climate change impact

measurement. Support research into areas where communities can act proactively to adapt to climate change…Global research on climate change is rapidly increasing scientific knowledge about this issue and making more specific connections between climate change and human activities. As this research builds the knowledge base, it is important that people gain information about the ways they affect climate change. Communities need to know what current human actions are contributing the most GHG, so they can target those actions. Continuing research is needed so communities, neighborhoods and individual residents or businesses can take action in ways that will help to mitigate or adapt to climate change.

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5.0 PLAN MAKING

5.1 Basic Concepts

Consolidating and paraphrasing the American Planning Association (APA) series of guidance documents and policies relating to energy and climate issues:

Planning departments prepare plans of all kinds that recommend actions involving infrastructure and facilities, land-use patterns, open space, transportation options, housing choice and affordability, and much more. Examining comprehensive plans and other planning documents to see if energy and climate change issues are addressed and integrated is an important step. Planners should consider including an energy and climate change element in the comprehensive plan, or integrating these issues within other elements. Marin County, California, for example has incorporated measures to address climate change in their recently updated countywide plan, which focuses on sustainability. Climate action plans also fall into this category of plan making. For these, planners should consider whether the GHG reduction targets established in the plan can be achieved with the strategies proposed. Plan-making points of intervention include:

- *Assessment and Analysis. Baseline and trends for energy use and GHG emissions*
- *Comprehensive Plans. Goals and actions to guide community; energy and climate element*
- *Area Plans. Neighborhood, downtown, redevelopment district, corridors*
- *Functional Plans. Transportation, open space, utilities, school, economic development*
- *Climate Action Plans. Baseline, targets, strategies and policies for reducing GHG emissions*
- *Energy Plans. Overview of energy use and sources, strategies for energy security*

5.2 Climate Action Plans

The APA PAS Memo, *Integrating Energy and Climate into Planning*, provides the following guidance regarding climate action plans:

Climate action plans are en vogue these days, but planners should be cautious of viewing them as silver bullets. While climate action plans — which may include baseline information on GHG emissions, targets for reducing these emissions, and strategies for achieving GHG reduction goals — can be useful tools for communities, these plans alone may not be enough to fully address energy and climate issues. As Stephen Wheeler points out in "State and Municipal Climate Change Plans: The First Generation" (Journal of the American Planning Association, Autumn 2008), many of these early plans lack adequate strategies and measures, few address adaptation, and implementation is problematic. These plans also vary greatly in content, with many focusing on municipal strategies such as greening vehicle fleets and public buildings, without addressing important areas in land use and transportation where planners can help make a difference. This may be due, at least in part, to the fact that some of these plans are being

prepared outside of the planning department, sometimes with little input from planners. When possible, planners should take a leading role in the preparation of these documents to ensure a more comprehensive approach.

Even in communities with good climate action plans, planners should consider the range of planning tools and techniques — as well as points in the planning process — to address energy and climate concerns. Additionally, comprehensive plans and zoning ordinances may need to be updated to ensure consistency with the goals of the climate action plan. Examples may include updating the land use map to allow for compact development to help in reducing vehicle miles traveled, or updating the zoning ordinance to allow small wind turbines. The following planning activities or strategic points of intervention will help planners focus their efforts to address energy and climate issues at the local level.

5.3 Energy and Climate Planning Methodology

APA Policy Guide on Planning and Climate Change. The APA climate policy provides several pointers regarding preparation of plans relating to energy and climate:

- *Climate Change Planning. State and local governments should pursue climate action plans, regulatory measures, incentives, technical standards and specifications, integration of climate change mitigation and adaption measures into comprehensive, neighborhood and regional plans, and other plans and programs in a regionally and/or locally appropriate fashion.*

- *State, Regional and Local Action on Climate Change. Planners support collaboration and coordination by state, regional and local governments and governmental agencies to set greenhouse gas emission goals; develop and implement plans to address climate change; and incorporate climate impacts, indicators, benchmarks and targets in plans and development reviews.*

- *Regional Coordination. Encourage coordination and collaboration in multi-jurisdictional planning initiatives to address climate change and its implications at a regional level, including adopting new requirements and structures for collective action on climate-related planning and projects.*

- *Education and Coordinated Information Resources for Planners, the Community and for Decision-Makers. Support updating planning school curricula to specifically address and prepare students for new approaches to planning associated with climate change adaptation and mitigation. Support ongoing professional development for professional planners dealing with tools and techniques associated with climate change planning. Accurately and explicitly recognize and discuss climate impacts and considerations in public participation processes*

related to long-range community visioning and goal setting, plan making, standards, policies and incentives, development work, and public investment. Support and encourage updates to primary and secondary curricula to educate and the next generation residents; planners and decision makers.

- *Address Time Frames and Uncertainty. Planners support policies requiring climate change plans that provide a framework for decision-making and actions which prepare communities to mitigate and adapt to climate change, but which are flexible enough to address the continuing complexities and uncertainties of pace and degree of change. New planning and stakeholder participation methods are needed to help communities embrace and address this complexity and uncertainty, including longer planning horizons and the generation and consideration of multiple scenarios, indicators and triggers to guide action.*

- *Identify Greenhouse Gas Impacts. All levels of government should seek to identify and quantify estimated greenhouse gas emissions for various courses of action. Where emissions cannot be precisely quantified, plans should discuss the impacts of recommendations on greenhouse gas emissions on a qualitative basis. Climate planning elements should be incorporated in comprehensive plans, public investments, regulations and incentives, and environmental and development review processes.*

- *Use Inter-Disciplinary Approach. Establish opportunities for collaboration among design professionals (e.g., planners, architects and engineers), scientists, social scientists, economists, academics, and other key professions to develop and carry out plans that address climate change mitigation and adaptation. Increase coordination with other organizations and utilization of collective data, benchmarks and regulatory standards.*

- *Address Stakeholder Involvement in Plans and Actions for Climate Change Mitigation and Adaptation. Engage all affected stakeholder groups in initiatives to create and implement climate change plans to ensure that no group is isolated from the process.*

- *Support Social Equity and Environmental Justice. Support plans, standards, regulation, incentives, and investments to reduce the impacts of climate change on those populations most vulnerable to the impacts of climate change, including those dependent on subsistence agriculture and fishing.*

- *Evaluate Fiscal Policies. Evaluate tax, fee and other fiscal policies, including a land value tax, at all levels of government that have the impact of encouraging sprawl; change such policies where feasible.*

USDOE Guide to Community Energy Strategy Planning. This USDOE guidance is a very comprehensive and excellent guide to local energy strategy planning. Although it does not explicitly address the role of planning and planners in facilitating energy efficiency at either the building or community level, presumably preferring to remain neutral on who should do what, it does make several recommendations for community-level energy plan making (in Step 6 Appendix: Policies, Programs and Projects to Consider) that would typically require the involvement of planners, as follows:

- *Establish codes, policies, and platforms to support the CESP goals:*
  - *Establish stretch codes – enact more-stringent energy efficiency requirements on building codes where cost-effective, or ensure good enforcement of current codes to gain the savings they offer.*
  - *Establish time-of-sale energy use disclosure requirements.*
  - *Adopt renewable-energy-friendly ordinances and permitting requirements, including support for community-scale projects.*
  - *Enact energy-smart zoning – including walkable downtowns, village centers, limitations on fragmentation of open spaces and farmland.*
  - *Include unambiguous statements of the jurisdiction's commitment to energy efficiency and new clean energy facilities in the CESP, so investment uncertainties and expenses are reduced in permitting and regulatory proceedings.*

- *Adopt a Sustainable Transportation Plan for the jurisdiction, to include:*
  - *Complete Streets policy to ensure transportation planners and engineers consistently design and operate the entire roadway with all users in mind.*
  - *Bicycle and pedestrian planning.*
  - *Mass transit planning.*
  - *Parking requirements that enhance commuting and alternate transportation options.*

5.4 Local Examples of Climate and Energy Plans

APA's Energy and Climate Database can be a useful starting point for researching examples of local climate and energy plans:

> *[The database] provides examples of communities that have taken steps to integrate energy and climate change issues into planning, states that have addressed climate change issues in plans or policies, and other relevant documents to help planners understand and address energy and climate change…You can search this database by region, state, type of planning tool, topic, time frame, scale, or community size, using the search options in the left-hand column. Results are sorted according to relevance. If you have too many or too few results returned, try narrowing or broadening your search parameters. Resources are regularly being added to this database, so check back*

> *periodically to find new resources…The Planners Energy and Climate Database was developed by APA's Green Communities Research Center, in collaboration with the Environmental and Energy Study Institute, as part of the Planning for a New Energy and Climate Future research project. The database is maintained by APA's Research Department…To suggest a case study or document for the database, or for questions about the database, e-mail ecdatabase@planning.org.*

Note that the database does not appear to have been updated since its original posting, but it may serve as a good starting point for finding more up-to-date materials for the same localities. Also, it is unclear how, or how well, the database search function works when selecting for multiple parameters in that a multiple parameter search appears to yield neither the union nor intersection of the respective sets of references selected; however, the search categories provide a useful framework for research, especially the "planning tool" category, in that the tool categories are very similar to the categories recommended in the companion PAS Memo, *Integrating Energy and Climate into Planning*:

- Incentives
- Education & Community Involvement
- Plan making
- Project Review
- Policy
- Assessment/Study
- Agency Coordination

5.5 References

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6.0 REGULATIONS AND POLICIES

6.1 Basic Concepts

Consolidating and paraphrasing the American Planning Association (APA) series of guidance documents and policies relating to energy and climate issues:

Planners write and amend standards, policies, and incentives that have an important influence on what, where, and how things get built and what, where, and how land and buildings get preserved. When updating regulations, planners should consider how zoning codes, building codes, subdivision codes, and other regulations, and ordinances address energy and climate issues and these could work to encourage energy-efficient and climate friendly forms of development. Planners should also examine codes to make sure they do not prohibit clean energy generation, such as through solar panels or wind turbines. These structures are sometimes restricted or prohibited because of height or aesthetic reasons. Additionally, providing incentives such as expedited plan review, rebates, and other financial incentives can help encourage developers to make new development more energy efficient. The three main steps to revising a code to address energy and climate issues (Duerksen 2007):

- *Remove barriers. Existing codes may inhibit reducing GHG emissions and using renewable energy, often unintentionally. The planning office can conduct a barrier audit to determine what regulatory obstacles exist. Some codes may prohibit wind turbines, for example, due to height restrictions. Other ordinances may prohibit mixed uses, accessory dwellings, and higher residential densities.*
- *Create incentives. Foster increased density and encourage use of new technologies*
- *Enact standards. Setting appropriate standards to guide desired development is important. For example, standards can mandate the preservation of trees (which aid in carbon sequestration) and require new subdivisions and mixed-use development to include bike lanes and sidewalks.*

The PAS Report, Planning for a New Energy and Climate Future, lists opportunities by type of regulation or policy include:

Zoning Code

- Minimizing impervious surfaces to reduce heat island effects and runoff
- Mixing land uses to shorten and reduce vehicle trips*
- Increasing development densities, especially around transit*
- Accommodating solar orientation
- Allowing a variety of housing types to reduce work trips*
- Reducing parking requirements through shared parking*
- Requiring landscaping, mature tree preservation, and open space

Subdivision Regulations

- Promote street connectivity
- Require sidewalks and bike lanes or paths
- Protect environmentally sensitive areas
- Block standards
- Right-of-way width
- Roadway design
- Storm-water management
- Open space

PUD Regulations (for master planned communities and mixed use developments)

- Mixing of land uses, densities and housing types*
- More compact development*
- Preservation of open space

When updating your regulations, think about how zoning codes, building codes, and other ordinances address energy issues. Consider how these ordinances could work to encourage mixed use development, transit-oriented development, and green building. Also, make sure your codes do not prohibit clean energy generation, such as through solar panels or wind turbines. These structures have sometimes been restricted or prohibited in existing codes due to height or aesthetic reasons.

As can be seen, many of the zoning code and PUD regulations (with asterisks) relate to compact development and, whether intended by the Report's authors or not, they can significantly influence building energy efficiency as well as save energy in the transport sector.

The APA climate policy picks up on this tack in its green development policies:

- *Regulatory requirements. In many cases, it may be appropriate to establish regulatory requirements that implement green development goals and objectives. For instance, many communities mandate LEED certification, open space preservation, landscaping, water-saving fixtures, and the installation of cool roofs.*
- *Regulatory reform. Often, existing code requirements or design guidelines inhibit the use of certain energy-efficient technology. For example, lot width standards may preclude optimal passive solar structure orientation or historic preservation guidelines may prohibit roof-mounted solar collectors and skylights. Existing regulatory provisions, such as local flood damage mitigation standards, should be reevaluated to ascertain their continued validity in light of potential climate change effects. Planners should examine their codes' compatibility with existing and emerging technology and make adjustments where appropriate.*

The July and August 2013 issues of APA's Zoning Practice provide very useful guidance on the practice of sustainable zoning. In the July 2013 issue, Garvin outlines a process for developing a sustainable zoning code by first Implementing a comprehensive sustainability planning process utilizing community outreach to produce a local definition of sustainability and a policy framework of local preferences to guide planning decisions and then develop or revise the zoning, subdivision and land development regulations, ordinances and bylaws to implement sustainable priorities. Gause addresses two energy-related components of sustainability zoning: (1) to encourage compact, mixed use development; and (2) to facilitate renewable energy and energy efficiency, discussed below.

Encourage compact, mixed use development patterns. Communities can adapt existing zoning codes to encourage compact development through changes to the zoning districts, development standards (i.e., those standards typically applicable across multiple districts, such as parking or landscaping), and administrative approval processes:

- *Mixed use zoning districts and uses. Older more traditional zoning codes may first need the addition of a new mixed use district (or series of mixed use districts with differing densities and use mixes) that permit both residential and nonresidential uses in the same structure or in closer horizontal proximity than current regulations would allow…In traditionally suburban communities, where the zoning standards reflect large-lot residential development, revisions may also need to be made to the dimensional standards (e.g., lot size, yard setbacks, and impervious coverage) in the existing zoning districts to accommodate development on smaller lots.*
- *Infill development standards. Many zoning codes inhibit the creation of compact development through regulatory provisions that inadvertently limit or restrict small-lot or infill development. This may occur because of existing suburban lot-size or dimension requirements in the zoning districts, but it is reinforced by additional regulations approved to the lot, such as design or development standards, inflexible minimum landscaping or screening buffers, mandatory onsite open space dedications, building frontage or orientation standards, excessive minimum parking requirements, and prohibitions of narrow streets or driveways can all contribute to the prevention of infill development.*
- *Administrative approvals. Developers want predictability in the development process and a product that does will in the local market…[C]ommunities can further encourage desirable development by establishing an expedited review process for site plans that meet the new standards…The new districts and standards can be adopted as optionally applicable in designated areas of the community, and development applications that conform to the zoning requirements can be reviewed through an expedited administrative process.*

Renewable energy and energy efficiency.

- *Use definitions and standards. To encourage the use of renewable energy sources such as wind and solar power generation, these uses should be defined in the code and added to the table of uses in appropriated zoning districts either as primary or accessory uses, as determined by the community.*
- *Energy conservation and production development standards. Most zoning code changes necessary to encourage site and structure energy conservation take place in the development standards. Site design standards can be updated to encourage the use of passive solar energy through better building placement in relationship to the sun (solar orientation) as well as passive cooling through building placement in relationship to the wind along with the preservation of placement of trees and landscaping to enhance shade…Currently, the most commonly requested small-scale forms of renewable energy production are wind power, solar power, and geothermal pumps. Updating the code to allow geothermal pumps may be easiest. The systems permitted in the community should be specified (i.e., open or closed loop); location and setback requirements for above-ground and below-ground components should be identified. Screening requirements should also be established…There are multiple sources of model wind and solar regulations available to local planners, and the big issues to consider for a zoning update include: (1) changing maximum height limits both to allow solar panels on rooftops and to permit wind turbines obstacle-free access to the wind, (2) determining whether wind turbines(s) and solar panels or arrays are a primary or accessory use and whether permitting will be required, and (3) addressing the use of wind and solar systems in conjunction with nonconforming uses.*

Farr (2013) provides additional detailed guidance on bridging the gap between what sustainability plans say and what codes to by producing code-ready sustainability plans. He presents the two parts of code-ready sustainable planning: high performance planning and code-specific recommendations:

- *High-performance planning. Describes a planning process rooted in evidence-based sustainability metrics. Given that recent research documents show our land –development patterns contribute to physical activity levels, pedestrian and bike safety, housing and transportation affordability, and climate resiliency, high-performance planning is necessary to quickly increase the planning profession's effectiveness in a time of tight budgets and sometimes strident opposition.*
- *Code-specific recommendations. Are plan policies and action items written in language strong and precise enough to guide the development of regulatory provisions that will help achieve the plan's goals and objectives. In other words, code-specific recommendations provide clarity about how a particular recommendation will be implemented.*

In a ULI Article, *Tackling Energy Efficiency Regulations,* author Tony Liou lists three types of legislation that require *the "curbing of greenhouse gas emissions or the adoption of more energy efficiency building standards":*

- *Requiring buildings to curb carbon emissions*
- *Mandating that federal tenants lease space in green buildings*
- *Requiring new structures to adhere to higher and higher energy efficiency standards*

Liou credits California's Global Warming Solutions Act of 2006 as being the "poster child" in that it sets statewide GHG reductions targets and employs a cap-and-trade system as a market-based economic incentive for achieving the needed reductions. In addition, California has been updating its Buildings Standards Code Title 24 to require energy efficiency standards, technologies and methods to reduce energy usage of new buildings. The Federal Energy Independence and Security Act of 2007 requires federal agencies to build, renovate and lease to EPA Energy Star label or LEED certification standards.

The USEPA report, *Essential Smart Growth Fixes for Urban and Suburban Zoning Codes*, contains chapters on several of the strategic points of intervention for planners to use in facilitating energy efficiency in commercial and multifamily residential buildings:

- Allowing or requiring mixed use
- Increasing density and intensity in centers
- Designating and supporting of preferred growth areas and development sites

As points of intervention for energy efficiency in buildings, the APA guidance summarized above is the better starting point. However, once committed to mixed use, increasing density and designating growth areas, this EPA report will provide detailed guidance for implementation.

ICLEI posts on its website a Municipal Clean Energy Toolkit that includes a section on Energy Efficiency and another on Ordinances/Bylaws which includes the checklist below of steps for reviewing and improving zoning regulations to facilitate energy efficiency in buildings, etc. The checklist is provided verbatim below. The report also presents several sample ordinances/bylaws but they address only renewable energy zoning adjustments.

	Zoning Ordinance/Bylaw Checklist
√	***Step 1 - Identify Types of Clean Energy:*** *Work with municipal staff and community stakeholders to identify the various types of clean energy your municipality is interested in installing – both short term and long term. Information on clean energy types can be found on the Clean Energy Overview page.*
√	***Step 2 - Review Current Policies:*** *Review existing local and utility policies to see if there is any language that enables or prohibits the installation of clean energy systems.*
√	***Step 3 - Evaluate Obstacles:*** *What obstacles to the adoption of clean energy systems exist: complex permitting process? High permitting fee? Cumbersome zoning requirements? Meet with clean energy installers to learn more. Once obstacles are identified, work to create systems to overcome obstacles.*
√	***Step 4 - Review Sample Ordinances:*** *Check with surrounding municipalities and surrounding communities to see who has ordinance/bylaw and zoning language that may be applicable to your jurisdiction. (Below are some sample wind and solar ordinances/bylaws). Remember to seek advice from municipal counsel and municipal leagues before proceed with the creation of your ordinance/bylaw.*
√	***Step 5 - Pass New or Update Existing Zoning Ordinance/Bylaw Language:*** *Draft and pass new ordinance/bylaw and zoning language if necessary, or update existing language to encourage the installation of clean energy systems. Remember to educate the community about your proposed change or about the new ordinance/bylaw to ensure you have community support for your clean energy installation.*
√	***Step 6 - Advertise New/Revised Clean Energy Zoning Ordinance/Bylaw****: Once you've altered zoning and/or passed new clean energy ordinances/bylaws, make sure that you let your community know.*

The 2007 article, *The Sustainable Community Development Code Comes to the Rescue*, is quite dated at this point, but is a seminal discussion in the field authored by Chris Duerksen, a leading land use lawyer who has pioneered in rewriting zoning codes to facilitate sustainability, renewable energy and energy efficiency, including the Sustainable Community Code still being developed by the Rocky Mountain Land Use Institute at the University of Denver School of Law.

Duerksen critiques traditional Euclidean zoning as being able to protect communities from incompatible uses but stifle mixed use development and its traffic and air pollution reduction benefits and force uses apart thus contributing to sprawl. He also points out that form-based codes often neglect natural resource issues. As a solution, Duerksen recommends building on the

best attributes of the existing approaches but address a wider range of issues like energy, climate change, etc.

When incorporating sustainability into a zoning code, the following steps should be considered (paraphrasing Duerksen):

- Removing obstacles to sustainability
- Creating incentives to foster increased density and encourage use of new technologies
- Enacting standards that require certain actions or preventing harm

Examples:

- Portland, Oregon – give developers a height bonus if they install green roofs
- Austin, Texas – give developers points toward meeting design standards for commercial developments that use "cool" roofs

Recommendations

- Develop a sustainable community plan as a foundation for a sustainable zoning code
- Review existing zoning code and remove obstacles to sustainability
- Develop optional mixed use zoning districts with associated incentives
- Start with "low-hanging fruit" and offer a menu of voluntary instead of mandatory standards
- Require "carbon neutral" developments where carbon emissions are offset by tree plantings

6.2 Examples of Sustainable Development Codes

Rocky Mountain Land Use Institute (RMLUI) Sustainable Community Development Code Framework. RMLUI has been developing a Sustainable Community Development Code Framework. The following is a verbatim summary of the code taken from RMLUI's website:

Approach
The sustainable community development code framework is sustainable at its core, multi-disciplinary in its approach, and contextually oriented. It fully encompasses environmental, economic, and social equity. It is innovative and distinctive by linking natural and man-made systems, incorporating useful features of other zoning systems, for example, performance and form based, and responds to regional climate, ecology, and culture.

The basic organization and approach to each topic is to examine relevant obstacles, incentives, and regulations. The first row of every topic identifies obstacles to achieving stated goals that might be found in a zoning code, for example, bans on solar panels as accessory uses. The second row suggests incentives that might be created to achieve a goal, for example, increased density in a multi-family development that installs green roofs. The third focuses on regulations that might be adopted to ensure progress in a particular area, for example, mandatory water-conserving landscape standards.

Each row is divided into five columns. The first three columns suggest levels of effort for the three basic approaches noted above. For example, a good (bronze) level of effort in removing obstacles to small-scale wind turbines might be removing height limits on accessory structures in some residential districts. Up the scale, a silver level might be to prohibit private covenants in subdivisions that do not allow small-scale wind turbines. The highest level of effort (gold) could allow wind-turbines as a by-right use in many zone districts subject to specific performance standards related to issues such as noise. The fourth and fifth columns in each section provide key references and code examples/citation with hyperlinks.

Table of Contents
The code framework has the following eight major sections:

- Environmental Health and Natural Resources
- Natural Hazards
- Land Use and Community Character
- Mobility and Transportation
- Community
- Healthy Neighborhoods, Housing, and Food Security
- Energy
- Livability

The Energy section contains subsections on:

- Renewable Energy: Wind (small- and large-scale)
- Renewable Energy: Solar (including solar access)
- Energy Efficiency and Conservation

Significantly, there is no further information available on the website for the Energy Efficiency subsection and personal communication with Chris Duerksen, who is leading the Sustainable Community Development Code, revealed that the subsection has not yet been started. The Environmental Health and Natural Resources section contains a subsection on Climate Change that has been complete and makes the recommendations below relative to the role of land use regulations in controlling GHG generation. The webpage for the Climate Change subsection includes a table presenting actions defining Bronze (good), Silver (better) and Gold (best) "Achievement Levels".

- *Encouraging development patterns that allow less reliance on autos for mobility and result in reduction in vehicle miles traveled and corresponding greenhouse gas emissions*
- *Preserving existing trees that can sequester carbon dioxide, and require eh planning of new trees*
- *Promoting alternative energy generation such as solar and wind power that do not generate greenhouse gases as do oil, gas, and coal-fired power plants*

The code website also cross-references two communities, Salt Lake City and Washington DC, where sustainable development codes following the RMLUI framework are being piloted. These are reported in the local examples section below.

New York City's New Zoning Resolution. In the article, *New York City's Zoning Resolution Becomes Greener*, paraphrased here, the New York City Council approved the Zone Green Amendment to the City's Zoning Resolution eliminating zoning obstacles to retrofitting existing commercial, residential and industrial buildings for energy efficiency, renewable energy and green building. Previously, the Zoning Resolution, especially the floor area and building height provisions, had prohibited use of rooftops for energy efficiency or green power improvements and amenities. Now allowed are:

- Relaxing floor area ratio rules to allow additional energy-efficient insulation of external walls in existing and new buildings without sacrificing buildable interior space, by exempting external wall insulation by up to 8 inches in thickness from floor area calculations
- Allowing sun shades and similar sun control devices to be affixed to external building walls to block summer sun but allow winter sun to pass, by permitting these devices to project up to 2.5 feet from the wall as long as they are above the first floor and do not cover more than 30% of the wall
- Allowing installation of boilers on rooftops where they operate more efficiently because they do not need the long, expensive and floor area consuming exhaust chimneys that are needed for basement boilers
- Permitting skylights on rooftops subject to 4-foot height limits and 8-foot setbacks from street walls
- Allowing solar panels and wind turbines to be installed on rooftops, as well as solar systems on building walls as long as they do not project out more than 10 inches nor occupy more than 20% of the wall area
- Improved access to and innovative use of rooftops, including recreational decks, green roofs, greenhouses and storm water detention systems, by relaxing building height and bulkhead and guard rail setbacks

Salt Lake City's Sustainable Code Revision Project. Salt Lake City is incorporating sustainability provisions into their zoning and subdivision ordinances. The City's Office of Sustainability is also working on an overall energy efficiency/conservation strategy. Some of the changes this effort is accomplishing include:

- Creating incentives for compact, mixed-use development patterns that reduce the need to drive to work thereby shrinking greenhouse gas emissions;
- Removing barriers to solar and other alternative energy sources that decrease reliance on foreign oil and help cut greenhouse gas emissions;

- Promoting alternative means of transportation like bicycling and walking that can improve community health while helping reduce air pollution;
- Protecting trees that absorb greenhouse gases and reduce storm water runoff and pollutants, and
- Encouraging water-conserving landscaping.

In particular, Salt Lake City has undertaken a Sustainable Code Revision Project to incorporate sustainability provisions into zoning and subdivision ordinances. The table in Annex A to this section summarizes the code topics being revised, how they are being revised and the status of revision efforts.

Washington, DC's Zoning Review Project. Paraphrasing the website of the report's consultants, Clarion Associates, *the Washington, D.C., Office of Planning, is undertaking, a major zoning ordinance update, "Zoning Review Project", including diagnosis of the District's current regulatory framework as it relates to creating a sustainable community. The overall Zoning Review Project includes a substantial citizen participation effort with 20 working groups, one of those being the 60-person Sustainability Working Group. The team's code diagnosis on sustainability issues addresses seven substantive areas:*

- *Energy conservation – Light Shelves*
- *Energy conservation – Exterior Lighting*
- *Solar Access and Solar Energy Systems*
- *Natural Ventilation and Outdoor Living*
- *Wind Energy Conversion Systems – Ground Mounted*
- *Wind Energy Conversion Systems – Roof Mounted*
- *District Energy*

Each of the above areas was evaluated in terms of (1) what current code changes are needed to remove obstacles to achieve sustainability, (2) what code changes could create incentives and encourage voluntary actions in new development, and (3) what new regulations could be enacted to ensure progress toward the goal of sustainability.

The current zoning code is largely silent on energy efficiency and renewable energy, creating unintended regulatory barriers to implementing these strategies. There are three distinct areas of the code where appropriate language might appear: the statement of purpose of the zoning code, the definitions, and the standards regulating each zone district. In addition, there are a number of energy-related topics that the current zoning does not thoroughly address, including public lighting, noise and heat. The recommendations made regarding these topics propose that they be addressed through zoning, though the customary practice in D.C. may be to address them in other regulations. This section suggests a range of potential zoning code revisions related to energy conservation and renewable energy production, and provides examples, as

appropriate, of communities that have enacted similar measures. The suggested revisions would remove barriers and reconcile inconsistencies with adopted regulations and guidance, enact standards that codify guidance or that address location- and use-specific issues, and create incentives that support energy conservation and renewable energy production.

Specific recommendations relating to energy efficiency in buildings include:

- *Increased Energy Efficiency. Consider requiring cutting-edge energy efficiency standards to be met for projects requesting density or height above matter-of-right limits (i.e. PUDs). New buildings requesting this density would be required to be designed to meet strict fossil fuel, GHG-emitting, energy consumption performance standards well below the regional average for that building type.*
- *Outdoor Lighting. To reduce energy consumption, adopt the standards of a Model Lighting Ordinance such as those suggested by the New England Light Pollution Advisory Group (NELPAG) or the International Dark-Sky Association (IDA).*
- *Sustainable Energy Features. Allow energy-related sustainability features (such as light shelves and photovoltaic panels) to project into setbacks and yards or exceed standard roof coverage limitations in all districts. Ensure that such projections meet a minimum vertical clearance above the ground.*
- *Renewable Energy Generation. Permit wind and solar generation accessory to all development in all zones and as a primary use of land in industrial, high density and government areas (with limitations to protect historic districts or national monuments from visual and other impacts).*
- *Solar Access Protection. Limit discretionary (PUD) development that would block existing roof-mounted solar power generation or solar hot water facilities.*
- *District Energy Systems. Expressly permit district energy systems in all districts.*

6.3 Making a Market: ULI Approach to Benchmarking and Public Disclosure

ULI Article, Tackling Energy Efficiency Regulations. Author Tony Liou recommends creating a market mechanism that encourages investment in energy efficiency projects. Liou features energy efficiency rating disclosure as the best market mechanism and distinguishes public from private disclosure mechanisms. He cites Seattle, New York City, the District of Columbia and Austin as having required public disclosure of building energy efficiency ratings through the EPA Energy Star Portfolio Manager website while California and Washington State require private disclosure between property buyer and seller, lessor and lessee, or lender and borrower. The objective is to get a higher sale price for a property because it is more energy-efficient and thus has a lower operating cost; however, even if this is less likely to be happening in the current economy, lower operating costs and promoting sustainability are benefits in their own right.

ULI Green Print Center / Foundation. *ULI Joins Forces with Greenprint Foundation to Create ULI Greenprint Center for Building Performance. ULI is enhancing its commitment to*

environmentally conscious development with the transfer of the activities and assets of the Greenprint Foundation into the newly formed ULI Greenprint Center for Building Performance. With this action, announced in January, ULI is continuing the operation of a unique industry-to-industry initiative through which leading real estate professionals exchange information and measure individual building and portfolio performance on the basis of energy use and carbon emissions.

The ULI Greenprint Center will be incorporated into ULI's broader Climate, Land Use, and Energy (CLUE) initiative. The center will carry on the Greenprint Foundation's mission, which is to lead the global real estate community in the use of greenhouse gas–reduction strategies that support the Intergovernmental Panel on Climate Change (IPCC) goals for global greenhouse gas stabilization by 2030. The ULI Greenprint Center will continue to advance the Greenprint Foundation's goal of a 50 percent reduction in building emissions by that year. The energy used in buildings represents one-third of all global energy consumption….

"With the support and resources of ULI, the ULI Greenprint Center will lead the global property markets in reducing greenhouse gas emissions in a meaningful and measurable way," says Weidner. "More importantly, it can help change the behavior of the population at large."

The flagship product of the Greenprint Foundation is its Greenprint Performance Report, which includes the Greenprint Carbon Index® (GCX), a tool used by foundation members to gauge relative progress in reducing greenhouse gas emissions over time. The first volume of the report was introduced in 2009 as a baseline measurement product. The second volume, issued in 2010, had results for 1,623 properties in the Americas, Europe, and Asia, and covered 334 million square feet (31 million sq. m) of commercial space. It showed a 0.6 percent reduction in greenhouse gas emissions from the previous year on the comparable portfolio of submitted properties.

The international scope and size of the report, including the GCX, make it one of the real estate industry's largest, most verifiable, transparent, and comprehensive energy benchmarking tools. It is unique in that it provides an open standard for measuring, benchmarking, and tracking energy use and resulting emissions on a building or portfolio basis. Carbon-equivalent emissions are measured in kilograms per square meter of space per year; the analysis is conducted for each building or group of buildings, and then reported in the aggregate for each property asset type—office, industrial, retail, multifamily, and hotels.

"The voluntary information exchange between Greenprint Foundation members that informs the report reflects ULI's time-tested tradition of sharing knowledge for the benefit of the industry," says ULI CEO Patrick L. Phillips. "We look forward to building on the collaborative spirit and effort that has formed the basis for the Greenprint Foundation and its carbon index. Through the

ULI Greenprint Center for Building Performance we are aiming to fill a void of information on the value of investments in energy conservation and greenhouse gas reductions. We are extremely excited about the ability of this new center to demonstrate that environmentally sound building practices make economic sense."

The ULI Greenprint Center will assume the foundation's existing research program and ongoing engagement with owners of commercial real estate toward value-enhancing carbon reduction strategies. ULI trustee Charles B. Leitner III, formerly the president and CEO of the Greenprint Foundation, will be chairman of the ULI Greenprint Center and cochairman of the advisory board for ULI's CLUE initiative.

"The creation of the center will enable both organizations to jointly leverage their resources to keep the Greenprint Foundation's momentum going," Leitner said. "I see the ULI Greenprint Center's work as becoming the global real estate industry's diary of its efforts to dramatically lower the impact of buildings on the environment. We will continue to promote increased awareness of innovative technologies and best operating practices to reduce energy consumption and carbon emissions. Through this center, ULI can help position the land use and real estate industry as part of the solution to climate change."...

An excellent example of making markets, the Architecture 2030 challenge has spurred formation of four 2030 Districts in the U.S., including ones in Pittsburgh, Seattle, Cleveland, and Los Angeles. These districts are comprised of groups of building owners and managers working to achieve 50% reductions in energy use, water use, and transportation emissions by the year 2030, with corresponding improved indoor air quality, increased returns on investment, and successes in regional economic development.

In the Pittsburgh 2030 District, for example, property partners owning 100 buildings totaling 30 million square feet (55% of the District's square footage), supported by 30 community and resource partners, have committed to the 50% reduction goals. According to the Pittsburgh Green Building Alliance, *"The Pittsburgh 2030 District is an interdisciplinary public-private-nonprofit collaborative working to create a groundbreaking high performance building district in Downtown Pittsburgh. With the Architecture 2030 Challenge providing property performance targets, the Pittsburgh 2030 District seeks to prove that high performing buildings are the most profitable buildings in Pittsburgh. District partners will do this by developing realistic, measurable, and innovative strategies to assist district property owners, managers, and tenants in meeting aggressive goals that keep properties and businesses competitive while operating buildings more efficiently, reducing costs, and reducing the environmental impacts of facility construction, operation, and maintenance."*

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ANNEX A: RESULTS OF SALT LAKE CITY SUSTAINABLE CODE REVISION PROJECT

Code Topic	Details	Status

Transit-Oriented and Mixed Use Development	• Transit Oriented Development- promote walkable, mixed use areas around transit nodes.
	• Zoned on North Temple and on 400 South.
	• Minimum densities and heights.
	• Encourage activation of streets (outdoor dining, design of buildings - entrances, balconies, mix of uses, etc.)
	• Encourage mix of uses.
	• Incentive is through process: The more design criteria you meet, the less process:
	  ○ Fastest process - over the counter review,
	  ○ Medium length process - administrative hearing,
	  ○ Slowest process - planning commission hearing.
		Adopted 8/11/2010

Urban Agriculture	• Allow community gardens and urban farms in various zoning districts, including residential. • Allow seasonal farm stands in more districts (mixed use zones, commercial, downtown) • Removed language that limited community gardens to only those that served underprivileged people.	Adopted 4/26/2011 and 5/3/2011
Renewable Energy	• Identifies solar and wind generating systems as a standalone / principal use and allows them in various zones including manufacturing, public lands, airport, institutional and some commercial zones. • Allows solar and wind generating systems as an accessory use in various zoning districts including residential neighborhoods and historic districts where specific criteria are met.	Adopted 4/26/2011 and 5/3/2011
Accessory Dwelling Units	• Allow in residential zones as a permitted use. • Must be within 1/2 mile of a fixed transit station. • Must be owner occupied. • Specific size and design standards are required.	Adopted 9/18/2012
Street, Pedestrian and Bicycle Connectivity	• Part of Subdivision Rewrite. • For new subdivisions with 25 or more lots, 50% of the lots must be oriented for solar access. • Requires smaller blocks to increase street connectivity. • Requires pedestrian and bike access ways and street connections to surrounding development (whether business or community centers like schools, libraries, recreation centers, etc.)	Planning Commission recommended approval. Attorney's Office is working on draft ordinance for Transmittal Packet. This project was folded into the Subdivision and Site Development Ordinances Rewrite.

Water Efficient Landscape	• Regulations to require smart use of water for landscaping. • Requires an inspection of irrigation system for new development prior to occupancy. • Requires grouping plants with similar water needs together in a landscaped area.	In City Council Office. Waiting for additional information from Public Utilities.
Tree Protection	• Regulations to protect "specimen" trees. • Allows modification of setbacks in order to save tree when new development is proposed. • During development, specimen tree has to be protected. • If allowed to remove specimen tree, additional trees have to be planted to make up for the loss of the specimen tree.	In City Council Office. Waiting for additional information from Public Utilities.
Recycling and Waste Reduction	• Regulations to promote recycling. • New construction or remodeling/expansion by 1,000 square feet of multi-family, mixed use and non-residential uses are required to have space for recycling facilities. • Existing uses can convert a percentage of parking in order to allow space for recycling facilities. • New construction of a certain size (and all demolition) must submit a construction waste plan prior to work and must ensure that at least 55%, by weight, of construction or demolition debris will be recycled or reused.	In Council Office waiting for review and action.
Transportation Demand Management	• Regulations to encourage a decrease in the number of vehicular trips. • Includes a maximum and minimum parking requirement for all development (except single family and two family residential). • Requires one electric vehicle parking	Transmitted to City Council. Waiting for briefing date.

	space for every 50 parking stalls.
	• Requires bike parking amount based on the use (rather than the same percentage for all uses).
	• Requires preferred parking locations for carpool/vanpool vehicles and bicycles.
	• Allows more or less parking required when TDM strategies are implemented, such as:
	  ○ Providing car and bike sharing programs;
	  ○ Selling units independently from parking stalls;
	  ○ Installing showers/lockers;
	  ○ Developing on-site facilities to decrease need to use car during the day (such as exercise areas, on-site daycare, cafe).	

Outdoor Lighting	• Regulations to decrease night sky pollution and decrease energy required to produce lighting. • Includes a maximum amount of lighting per development that allows adequate lighting, but not over lighting, of a site. • Requires auto shut off and lighting reduction devices for after hour uses. • Includes lighting standards to ensure lighting is directed appropriately, shielded to decrease light pollution and ensure glare is reduced.	Waiting for Council review of Transportation Demand Management petition. The lighting requirements are closely tied to parking.

7.0 INCENTIVES

7.1 Basic Concepts

Consolidating and paraphrasing the American Planning Association (APA) series of guidance documents and policies relating to energy and climate issues:

Consider other incentives to encourage new development to demonstrate energy efficiency and reduced carbon emissions. Some communities have offered rebates and other financial incentives. Providing incentives such as expedited plan review, rebates, and other financial incentives to developers whose projects meet predetermined standards can help encourage developers to make new development more energy efficient. Desired types of development can be fostered through incentives. For example, development that includes green roofs (which can help reduce the urban heat island effect while reducing heating and cooling loads in buildings) could receive a density bonus. Both the added density and green roofs could help a community meet its energy and climate goals. A fact sheet can be created for developers/residents on available federal, state and utility incentives. Incentives can include:

- *Expedited plan review for projects that meet or exceed established energy and climate objectives*
- *A waiver of permit fees, rebates or other financial incentives to developers whose projects meet predetermined standards*
- *Provision of technical assistance to help developers meet new goals and standards*
- *Offering financing mechanisms for renewable energy improvements that works like a sidewalk assessment*
- *For cities that own their own utility offer rebates for purchasing energy-efficient appliances and encouraging the purchase or even the production of green power*

The APA Policy Guide on Climate Change contains three policies relevant to creating incentives for energy efficiency in buildings:

- *Evaluate tax, fee and other fiscal policies, including a land value tax, at all levels of government that have the impact of encouraging sprawl; change such policies where feasible.*
- *Green Roofs. Encourage and incentivize the use of green roofs in the development of landscaping and building regulations.*
- *Incentives and Education for Green Development. Support the creation of incentives, including appropriate tax credits and financing energy efficiency improvements with repayment through assessments on property tax bills, and education programs to encourage homeowners and developers to invest in green development improvements.*

7.2 AIA's Green Building Incentive Trends

AIA's Green Building Incentives Trends report (2008 and 2012 editions) provide one of the most comprehensive guidance documents on creating energy efficiency and renewable energy incentives. The 2008 edition contains a Local Green Building Incentives Quick Reference Matrix (pages 19-20) providing types of incentives and web links for each of 34 cities and towns in 16 states with nearly half of the localities being in California. About half of the incentives relate to expedited or discounted permits and another quarter relate to density bonuses. Other incentives include floor area bonuses, property tax abatements, reimbursement of LEED certification costs. A minority of jurisdictions offer two or three incentives. Some key quotes:

- *When developing incentive packages, it is best to incorporate a variety of techniques that will target a wide spectrum of builders, developers, owners, and operators.*
- *The key is that these incentives must be easy to understand, simple to pursue, and strong enough to make the whole process worthwhile.*
- *[T]he most important factor is that the mix of programs a community or state provides makes green building easier and smarter than non-green construction.*

The 2012 edition is the best source discovered on incentives for green building and updates the 2008 AIA publication summarized above. The Executive Summary is provided below in its entirety as is much of the Green Building Incentives section.

EXECUTIVE SUMMARY
Green Building Incentive Trends: Strengthening Communities, Building Green Economies is a guidebook to assist local government leaders to develop successful green incentives for their communities. Local governments in recent years have already implemented numerous "green incentives." These programs have met with varying levels of success. This report seeks to analyze those initiatives and provide best practice examples. Its goal is to provide a focused analysis on the green incentives that work best for different communities.

This report is a more in-depth examination of the state of green incentives that follows up a 2008 report, Local Leaders in Sustainability: Green Incentives. The American Institute of Architects (AIA) developed the 2008 report in conjunction with its partners at the Developers Roundtable in Washington, D.C. to provide an overview of the different green building incentives that were in use throughout the country.

State and local government green building incentives can range from options that are virtually cost-free to those that involve direct local government investment. An examination of these green incentives indicates that the most attractive incentives to the private sector are tax incentives, density bonuses, and expedited permitting. Tax Incentives are the reduction of taxes for implementing specific green measures and certifications. Density/Floor Area Ratio Bonuses are

the provision of height bonuses, floor/area ratio bonuses, reductions in landscaping requirements, and counting green roof space as landscaping/open space in return for achieving a certain green building rating. Expedited Permitting is the streamlining of the permitting process for building, plan, and site permits on projects with specific green measures and certifications.

The findings of this report indicate that selecting appropriate incentives depends primarily on a local government's financial situation and its desired impact on the building industry. Regardless of which incentive is pursued, it is vital that any policy be as simple as possible to implement. Green incentives work best when combined with robust advocacy efforts and strong support from the public. Strengthening Communities, Building Green Economies also focuses on five key areas of green incentives, which include the financial costs, oversight structure, local political and cultural environment, limits to power, and industry engagement.

Green incentive trends are explored in-depth in the case study component of this publication. The case studies are meant to provide those in the public sector with actionable data because one of the ultimate purposes in collecting this information is to create quantifiable best practices that communities can use as they create or strengthen their own green incentive efforts.

The programs that were chosen for the case studies in this report provide a cross-section of American green building policy. A particular focus has been placed on replicable best practices and regional diversity. Local communities have the ability to choose their own incentives and, while they have taken many ideas from others, on the whole they have been quite inventive in developing unique green building programs. The incentives profiled in the following pages follow
This model and break down along four key focus areas: financial assistance, land use credits, government process incentives, and education and marketing assistance. The profiled communities include:

- *Bernalillo County, NM, Impact Fee Reduction*
- *Cincinnati, OH, CRA Property Tax Abatement*
- *King County, WA, Green Building Grants*
- *Santa Barbara County, CA, Innovative Building Review and Financing*
- *Arlington County, VA, Density Bonus*
- *Chicago, IL, Expedited Permitting*
- *San Diego County, CA, Fee Discounts and Expedited Review*
- *Alameda County, CA, Critical Design Assistance*
- *Sarasota County, FL, Broad Green Building Promotion*

Since the 2008 Local Leaders in Sustainability: Green Incentives publication, significant changes have taken place with respect to the ways that local governments leverage incentives to

promote green building. The key conclusions are that funding is limited, green building is becoming "normal," and some incentives have outlived their useful life and are now ineffective. A holistic approach is important, energy efficiency and renewable energy incentives have attracted critical attention, and the regulation of green building through codes is gathering steam.

The city and county examples highlighted in this publication indicate that local green building incentives can be useful tools for shifting the local building market toward green, sustainable development.

GREEN BUILDING INCENTIVES SECTION
The AIA and its partners undertook a comprehensive review of local government green building incentives in 2008. At that time, the AIA gathered a group of leading architects, developers, real estate financiers, retailers, and building owners to identify active incentives that had a wide appeal to both the public and private sectors.

This report builds on those insights, as well as the work of the National Association of Counties (NACo) and several other organizations, including Cushman & Wakefield, the National Renewable Energy Laboratory (NREL), the American Council for an Energy-Efficient Economy (ACEEE), and the National Association of Industrial and Office Properties Research Foundation (NAIOP). For more information on the associated work, please see the Works Cited section at the end of this publication.

State and local government green building incentives can range from options that are virtually cost-free to those that involve direct local government investment. The following is a list of the most common incentive types offered by local governments across the United States:
- *Tax Incentives;*
- *Bonus Density;*
- *Expedited Permitting;*
- *Net Metering;*
- *Feed-in tariffs;*
- *Grants (including fee subsidization);*
- *Loans;*
- *Insurance;*
- *Technical Assistance/Design Assistance;*
- *Permit/Zone Fee Reductions;*
- *Rebates and Discounts on Environmental Products (e.g., Energy Star); and*
- *Leasing Assistance.*

An examination of these green incentives indicates that the most attractive incentives to the private sector are:

- *Tax Incentives. The reduction of taxes for implementing specific green measures and certifications*
- *Density/Floor Area Ratio Bonuses. The provision of height bonuses, floor/area ratio bonuses, reductions in landscaping requirements, and counting green roof space as landscaping/open space in return for achieving a certain green building rating; and*
- *Expedited Permitting. The streamlining of the permitting process for building, planning, and site permits on projects that achieve specific green measures and certifications.*

Local governments have also found that the most effective way to extend the life of incentive programs is to leverage private money through loan programs. These programs often consist of either a revolving loan program, where smaller low-interest loans are granted for green projects and financed through a large loan pool, or a loan loss reserve fund, which may increase available incentive dollars by spreading risk to various interested parties.

SELECTING APPROPRIATE INCENTIVES

The reader is referred to this section for discussions of factors influencing the selection of incentives:

- Financial costs
- Oversight structure
- Local political and cultural environment
- Limits to power
- Industry engagement

IMPLEMENTING INCENTIVE PROGRAMS

The criteria listed in the previous section are imperative for communities to examine as they develop their incentive programs. Equally important, however, are the steps communities undertake to implement the programs once they are developed. Similar to the same considerations for the incentive criteria, the structures of administration and oversight within each city or county government can differ widely. Therefore, each local government should establish a clear line of incentive development, implementation, and facilitation that can be easily communicated to the development community. Green building incentive programs may be developed by several departments or agencies within the local government, but the administration of the programs themselves is more effective when it is centralized in one place throughout the entire process.

Once a local government has identified the entity responsible for the incentive program, the implementation process can begin. To aid in this process, the following implementation steps and questions have been developed as a checklist that can assist communities in ensuring their

green building incentive programs are robust and publicly accessible. This is not an exhaustive list, nor should every step or question be considered mandatory, but it should help point communities toward successful incentive program adoption.

Identify the need.
a. Does the city have environmental goals that could be addressed through development incentives?
b. Are there successful programs in other counties or cities that could address a need in the local district?
c. Is there interest from the development community for particular incentives?
d. Have stakeholders provided feedback about government processes or oversight that could be addressed through an incentive program?
e. Establish a working group within the local government charged with representing internal stakeholders and reaching out to external stakeholders.

Research the need.
a. Has a similar incentive been implemented successfully or unsuccessfully in another place? Perform a "gap analysis" of an existing incentive from another jurisdiction to understand how the incentive may need to be adapted to the local community.
b. Could the incentive's benefits be multiplied through synergies with other existing incentive programs?
c. Could an incentive address a significant number of projects, rather than a token amount, across a diversity of project types, budgets, and locations within the city or county?
d. How is the need currently met, if at all? Is this expected to change and, if not, what will allow that to occur or prevent that from happening?

Gather feedback and criteria.
a. Engage external stakeholders through public meetings, question and answer sessions, and more informal meetings. Document this process and track changes in a draft of the incentive, with changes or suggestions referenced to the stakeholder who submitted it.
b. Communicate each draft of the incentive during the incentive development process through an email list that is publicly accessible.
c. Establish criteria for the incentive as part of this feedback process.
d. Undertake an internal cost-benefit analysis for the expected life of the incentive as part of a feasibility process. Such an analysis could also be provided by external parties, such as consortiums of industry stakeholders, where appropriate.
e. Establish a timeline for the incentive, including dates for stakeholder engagement, implementation, availability, due dates for applications and decisions on awards, and program cessation.

Develop the incentive.
a. Develop a formal draft of the incentive for final review and comment.
b. Ensure that relevant internal local government staff and departments have signed off on the incentive program and that necessary political processes have been duly followed.
c. Provide all research and feedback documentation, such as meeting minutes and draft markups of the incentive, in a freely available manner, such as a public website.

Release the incentive.
a. Release the final version of the incentive program through various media and hold a public meeting to explain the program and answer questions about its implementation and application process and criteria, if appropriate.

Review the incentive.
a. Once the incentive is active, it is important to track its success by accounting for the number of projects that take advantage of the program, cost to the local government, and the increase in green building practices the incentive encourages.
b. Solicit feedback from developers who have participated in the incentive program in order to make ongoing improvements to the incentive process, perhaps as part of a second round for the program.
c. Regardless of whether the results of the program were satisfactory, it is important to document the lessons learned from the program in order to inform the development of future incentives.

While each local government will naturally develop its own approach to green building incentive programs, these are worthy questions to consider. Analyzing the feasibility and lessons learned is important because the main goal of developing any green incentive policy is to reach a day when it is no longer needed, because green building has become the way all buildings are designed and built. The following section offers details on some communities that are well on their way toward a market where sustainable building has become a norm.

7.3 Examples of Financial Incentives

USDOE Guide to Community Energy Strategic Planning. The Guide outlines the following options for community energy efficiency incentives:

- *Establish EE or RE financing programs to provide loans to consumers – requires seed money for establishing a loan fund, but ongoing fund balances are maintained as long as there are no defaults. For example:*
    - *Revolving loan programs*

- *Seed money is invested in energy projects, and the revolving fund is recapitalized using either the actual savings of the projects, the estimated savings of the projects, or a balance transfer from the general fund of unspent energy dollars*
- *This type of support is long-lived relative to the ongoing cost of a rebate program.*
- *Loan-loss reserve funds to provide assurance for mainstream loan programs – public funds used to secure private lending for energy efficiency and renewable energy that might not otherwise occur, and with loan terms that are better than market rate*
- *Seed money is invested but only drawn down in the case of loan default to primary lender, so fund should be long-lived.*
- *Can provide critical initial support for market development – mainstream financial institutions realize the value of efficient energy activities and begin to provide products that reflect this value.*

o *Interest rate buy-downs of loans made through mainstream loan programs – public funds used to create more favorable lending terms for borrowers*

- *Loans are made by mainstream borrowers, and the government pays a percentage of the interest rate off at the time of the loan, giving borrowers a very low rate*
- *This approach requires a lot of money because funds spent to buy down interest rates do not revolve in any way*

o *Property Assessed Clean Energy (PACE) programs*
- *Businesses and/or residents make EE and RE upgrades using capital provided by the local government and repaid through property assessments.*
- *Obligation for repayment remains with the property that received the improvement – rather than with the borrower – even if property is sold.*
- *Please note: due to federal scrutiny many, residential PACE programs have suspended operations. To date, Commercial PACE programs have not been directly affected.*
- *To establish a PACE program, a community's state must have passed enabling legislation; to determine if PACE is an option for you visit: http://pacenow.org/wp-content/uploads/2012/08/PACE-Programs-and-Legislation-at-a-glance_August2012.pdf*

o *Provide incentive or rebate programs for residential or business building new construction or retrofit EE or RE activities.*

- *Provide funding for community-level efficient transportation initiatives such as improved signal timing; re-engineering traffic congestion areas; intelligent transportation systems.*

Urban Land Institute Articles. In his Urban Land Article, *Tackling Energy Efficiency Regulations,* author Tony Liou, states that the objective of tax breaks and monetary incentives is to reduce the cost and decrease the payback period of energy efficiency and renewable energy projects. The Energy Policy Act of 2005 provides a per square foot tax deduction for new or existing commercial buildings where interior lighting, building envelope, heating, cooling, ventilating, or hot water systems are installed to reduce total energy costs by 50% or more in comparison with a building meeting minimum requirements set by ASHRAE Standard 90.1-2001. In addition, SBA offers loans of up to $5.5 million to small to medium real estate owners for investments in energy efficiency or renewable energy projects on existing or new buildings. The best sources for rebates and incentives are DOE's Database of State Incentives for Renewable & Efficiency (DSIRE) and the local utility.

Liou also cites the federal ARRA of 2009, for its provision of the Energy Efficiency and Conservation Block Grant program. However, this program has been suspended for the past 3 years. He also mentions the NJHMFA Weatherization Assistance Program as providing financial assistance for energy efficiency improvements to multifamily rental housing properties that have an existing first mortgage with the NJHMFA. A southern California (jurisdiction not given) program funds energy and water audits of low-income multifamily buildings after which the building owners had to compete for DOE funds to implement the projects.

In its Incentives and rebates webpage, Salt Lake City introduces the SLC Green Program as embracing several incentives and rebates related to sustainability, energy efficiency and renewable energy, including:

- *Revolving Loan Fund. The Salt Lake City Revolving Loan Fund's purpose is to stimulate business development and expansion, encourage private investment, promote economic development, and enhance neighborhood vitality in Salt Lake City by making low-interest loans available to businesses. Loans are available for… [E]nergy-efficient equipment upgrades and building retrofits,* among other things.
- *Expedited Green Building Plan. In keeping with Mayor Becker's focus on sustainability, the Salt Lake City Building Department is now able to offer expedited plan review as an incentive to build "Green." The new Expedited Plan Review program is designed to reward energy efficient and environmentally friendly construction by reducing plan review turnaround time for projects which meet the program requirements. By recognizing that time equals money for many projects, this program offers tremendous savings for the applicant, while doing the right thing for the environment; once again demonstrating Salt Lake City's*

commitment to improve building sustainability. To qualify for expedited plan review your project must meet the following criteria:

- *New permit applications must meet the design criteria for LEED (Leadership in Energy and Environmental Design) Silver or greater as established by the U.S. Green Building Council (USGBC) for commercial development.*
- *Residential applications are required to meet an Energy Star Home Energy Rating System (HERS) rating of 85 or better.*

In the Urban Land article, *Energy Upgrade Incentives in Cities***,** author Warren Diven states that *California's 2009 Assembly Bill 811 gives all municipalities and counties in the state the ability to offer low-interest loans for energy-efficiency projects and solar panels to homeowners and commercial property owners secured by contract assessments levied on the owners' properties. The bill helps close the gap between the willingness of property owners to retrofit their buildings or homes and their ability to afford such upgrades. Owners borrow money from a city or county participating in a contract assessment program to pay for their new energy-efficient products, and the long-term payment of the loans is linked to owners' property taxes. A participating municipality or county may issue bonds secured by the contract assessments to raise money for the loans, access general and redevelopment funds, or otherwise raise capital.*

- *The process to establish an AB 811 program is multifaceted and requires establishing the jurisdiction of the district, holding public hearings, designating the type of improvements to be financed, prioritizing the types of property owners who will receive financing, raising the capital, and marketing the program. Depending on staffing and budgetary resources, this process could take years. With states facing unprecedented financial problems combined with the depressed real estate market, many municipalities may not place an AB 811 program at the top of their priority list."*

The author cites several examples of local governments in California having taken advantage of the new law to set up sustainable financing districts, including Palm Desert, Berkeley, Sonoma County, and Riverside County. A variety of program structures are possible, including cities developing and administering their own programs, to outsourcing those functions to the private sector or relying on their counties to administer a program for multiple municipalities.

In the Planning article, *Net Zero and Eco-districts*, the author states that *"Expanding net-zero building concepts to neighborhoods, campuses, or military installations certainly aligns with sustainability and self-sufficiency goals. By working at a larger scale, those involved may be able to adopt more cost-effective capital investment project such as cogeneration and tri-generation power plants, which combine heat, cooling and power into a district heating and cooling system, smart microgrids, or on-site renewables…*

A possible means of financing neighborhood- or district-level sustainable energy projects is through a Property Assessed Clean Energy (PACE) program wherein loans for residential and commercial energy projects are repaid through property tax assessments; at the time of the article, however, only California and Colorado had PACE programs in place for commercial properties.

In his Urban Land article, *Giving as Good as They Get: Zero-Energy Districts, a*uthor Brad Berton provides an excellent example – the Fort Collins Zero Energy District, or FortZED -- of how different levels of government and academia can partner with the private sector to develop and demonstrate synergies among organizations and innovative technologies with the goals of reducing energy use and GHG emissions. The players are the New Belgium Brewing Company, Fort Collins Utilities, Colorado State University (including Engines Lab), Brendle Group (consultants), and the USDOE's Renewable and Distributed Systems Integration (RDSI) initiative (funding). *"FortZED covers much of the city's downtown area, the CSU campus to the south, and the Poudre River corridor to the northeast—home to New Belgium."* The article surprisingly does not mention the role of local planners but, with an area that large and diverse, it is a good assumption that planners would typically be needed to facilitate the project in various ways.

In his Urban Land article, *LEED for the Neighborhood*, author Brad Berton focuses on LEED-ND projects featuring adaptive use and redevelopment of obsolete and blighted properties and infill areas into mixed-use residential development in sustainability-minded districts that include open space, parks, and transit access. *"The residential developments combine market-rate residences with units subsidized to varying degrees to make them affordable for moderate-income renters and buyers. Some projects have qualified for low-income housing tax credits, tax-exempt housing revenue bond financing, or both—and in some cases, historic preservation tax credits…Many inaugural residents of these new communities also get easy access to services from public agencies and nonprofits, including providers of health care, and employment and educational assistance."*

In his Urban Land article, *Energy Efficiency Retrofits*, John Vogel, explores why energy efficiency renovations are not happening faster and whether government has a role to expedite them, citing lessons from Europe. His barriers to retrofitting are described in Section 3 above. Vogel cites the German and UK governments as having been much more aggressive than New York City and San Francisco who have focused on incentivizing developers to build energy-efficient buildings. He cites programs of standardized reporting, banning certain products and providing low-cost financing:

- *Standardized reporting*. The UK initiated a program requiring all companies using over 6,000 MWH of half-hourly metered electricity in 2008 to report annually on their electricity use and submit a footprint report online thus encouraging tenants and landlords to cooperate

on energy efficiency. The Czech Republic requires energy audits by large energy users thus reinforcing the national ESCO market…

- *Providing access to low-cost financing*. KfW makes low-cost financing available to German banks who then on-loan it to residences and businesses who must commit to reducing energy usage by 20% through energy efficiency projects.

Vogel warns against setting unrealistic targets and requiring specific products rather than general outcomes as approaches to avoid. Government can impose reporting requirements and access to low-cost financing, but energy prices, tenant requirements and climate change can be more important factors influencing building owners. The "Green Lease" is recommended as better aligning landlord and tenant interests:

- *One approach might be to create a three-party agreement among the landlord, an energy management company, and the local utility. The energy management company would finance and install a new furnace, for example, and also guarantee a 20 percent savings. The utility company would serve as an intermediary and add a green finance charge to the building utility bill, which would repay the energy management company over a fixed period.*
- *From the owner's perspective, this arrangement means his building gets a new heating system without any expenditure on his part. From the tenants' perspective, their utility bill goes down because the energy savings from the new furnace are greater than the new green finance charge. From the energy management company's perspective, additional, profitable business is obtained. The utility company receives a fee for acting as a financial intermediary and a reduced need to build new power plants. Something like this arrangement with a green finance charge billed by a utility might provide a useful framework.*

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8.0 DEVELOPMENT AND REDEVELOPMENT REVIEW

8.1 Basic Concepts

The present literature search focuses more on redevelopment, as opposed to development review checklists, as a major opportunity for intervention by local planners that is not addressed in detail by the series of APA publications on climate and energy sustainability.

Planners play an important role in development in their community. They review project applications for consistency with applicable plans and regulations and may be involved in public-private partnerships to develop new projects. While goals and standards for energy and climate should be addressed in plans and regulations, making sure these goals and standards are met or exceeded in the development process is important. Specific measures include:

- *Project Review Checklists. Develop a checklist of energy and climate change standards or goals for new projects and, if mandatory standards are not used, then offer expedited plan review and permit-processing track for projects that meet or exceed the goals.*
- *Public-Private Partnerships. If serving on a development team, planners can encourage energy efficiency, renewable energy and GHG emission reductions.*
- Redevelopment Plans and Projects. Redevelopment is a major opportunity for intervention by local planners on behalf of energy efficiency in both individual buildings and districts.

8.2 Project Review Checklists

Sustainable Jersey (SJ) has developed a model green development checklist that communities can use to encourage and review both development and redevelopment project proposals relative to green planning and design criteria. The checklist provides negative and positive criteria at the regional, site and building levels. Regional level considerations include physical location, development status, and connectivity to infrastructure such as transportation, community facilities and green space. Site planning criteria cover, among other things, green roofs, tree planting, and measures to minimize heat island effects. Building level criteria address green building certification, building orientation, efficient heating and cooling, geothermal energy, enhanced daylighting, efficient lighting, occupant controls, efficient building envelope, Energy Star-labeled building products, and onsite energy generation.
www.sustainablejersey.org

8.3 Public-Private Partnerships

According to the APA's Planning for a New Energy and Climate Future, "*Planners may serve as leading team members on public-private partnerships, and there they have an important role to play in creating developments that are energy efficient and reduce GHG emissions. Planners*

might find ways to reduce the extent of impervious surfaces; facilitate placement of buildings close to transit stops, bike paths, and sidewalks; preserve trees; and encourage the use of renewable energy on-site, among other things."

8.4 Redevelopment Plans and Projects

NJAPA's Redevelopment Handbook: A Guide to Rebuilding New Jersey's Communities. (By Stan Slachetka and David G. Roberts for the New Jersey Department of Community Affairs and New Jersey Chapter of the American Planning Association, 2011). The Second Edition of the NJ APA Redevelopment Handbook contains new Section 14, Sustainable Redevelopment that defines sustainable development and addresses sustainability and redevelopment, green rating systems and incorporating sustainability in redevelopment plans. According to the Handbook, *"…redevelopment of existing sites, infill development next to existing developed areas of the community, and community connectivity, including proximity to public and other essential services, are important factors in site selection as they support energy efficiency and reduce auto dependency."* Thus, redevelopment equates to sustainable development, because redevelopment projects:

- *Use existing sites, avoiding greenfields,*
- *Promote development where there is existing infrastructure,*
- *Create infill development, with opportunities for community connectivity,*
- *Reuse existing buildings where possible, and*
- *Are transit oriented.*

The Handbook strongly supports the use of LEED-Neighborhood Design (LEED-ND) to measure the sustainability of neighborhood development, because it *"reflects the most current research and ideas about green, sustainable, and well-designed neighborhoods [including]*:

- *Smart growth and land use planning*
- *Transportation options, including pedestrian and transit linkages*
- *Sustainable design and livable cities*
- *Environmental and natural resource protection*
- *Housing affordability*
- *Climate change and action*
- *Equity and social justice*
- *Public health*

More specifically, LEED-ND awards points for projects that support additional density and that are located near existing community resources. LEED-ND "*has been used more widely than the other rating systems in redevelopment planning… [and] is particularly suited to redevelopment, especially when applied to redevelopment plans for transit villages, town centers, or*

neighborhood and downtown revitalization." It is noteworthy, though, that the LEED-ND criteria do not explicitly or directly address energy efficiency of neighborhoods or districts.

The Handbook adds that redevelopment plans can be used to promote green building design and site layout in particular and sustainable development in general, by either: (1) mandating achievement of some level of green building certification, or at least use of some level of sustainable design, in the redevelopment plan; or (2) offering incentives to redevelopers to seek green building certification or to incorporate green building design techniques in exchange for increased density or floor area for non-residential uses. The Handbook indicates that the incentives approach is more commonly used and successful, *"particularly if it is perceived that the certification may provide a marketing edge or reduce operating costs."*
http://njplanning.org/wp-content/uploads/RED-Policy-Guide2.2.12.pdf

Proposed New SJ Action: Energy Efficiency Targets for Redevelopment Projects. The Local Redevelopment and Housing Law[1] empowers municipalities to act to improve areas in need of redevelopment. Redevelopment plans and associated project approvals provide an opportunity to incorporate specific energy efficiency measures into redevelopment projects. As part of a negotiated redevelopment agreement, energy efficiency measures can be suggested or required, making local redevelopment and housing law a potent tool for addressing energy efficiency retrofits.

Ultimately the municipal governing body has the power to initiate the investigation as to whether an area is in need of redevelopment and to adopt a redevelopment plan or amend an existing redevelopment plan. In some cases a municipal redevelopment agency or municipal housing authority is authorized to execute redevelopment powers. The municipal planning board has the power to make recommendations concerning the redevelopment plan. The redevelopment agency/committee and or housing agency, if they exist, should also be involved. Other commissions or boards, such as the sustainability committee, or Environmental Commission, can initiate this action and work with the planning board to incorporate energy efficiency targets into the redevelopment plan. Municipal staff (including professional consultants), especially the Zoning Official, Construction Code Official, and Planner, should also be involved.

Language to amend the redevelopment plan can be prepared to incorporate energy efficiency targets (minimum 15% reduction) into redevelopment projects. For example, a municipality can recommend or require achieving 15% or 20% reduction in energy use in redevelopment areas. A 15% target can help projects meet the requirement of NJ's Clean Energy's Pay for Performance program (see Resources) and earn associated incentives. For new construction, this is accomplished through developing an energy reduction plan for each project by developing a

[1] N.J.S.A. 40A:12A-7 Title 40A. Municipalities and Counties. Ch.12A- Local Redevelopment and Housing Law. L.1992, c. 79 (State of NJ Department of State http://www.nj.gov/state/planning/resources-statelaws.html)

simulated computer model of the planned building and designing it to perform 15% better than a minimally code-compliant building. For existing buildings, the energy reduction plan must define a comprehensive package of measures capable of reducing the existing energy consumption of the building by a minimum of 15%.

Other possible incentives that a municipality could offer directly include density bonuses, flexible zoning, and/or a higher level of acknowledgement through an energy efficiency recognition program. Achieving a 15-20% energy use reduction can also help projects earn LEED certification and qualify for an ENERGY STAR label.

Lincoln Park Coast Cultural District. According to the NJAPA Redevelopment Handbook, "Lincoln Park Coast Cultural District (LPCCD), a nonprofit community development corporation centered within the neighborhood immediately surrounding Lincoln Park in Newark,…one of the first pilot project to test the LEED-ND rating system…and only neighborhood to plan to achieve LEED-ND Gold Certification..., encompasses several LEED-certified buildings with a high percentage of deed-restricted affordable dwelling units and a form of urban agriculture that provides organically grown produce to the neighborhood. http://njplanning.org/wp-content/uploads/RED-Policy-Guide2.2.12.pdf

APA Policy Guide on Planning and Climate Change. APA recommends several measures where planners, acting through the development and redevelopment review process, can influence energy efficiency in buildings: *Providentially, the major climate change mitigation response for local and regional land use decisions involves the creation of a more compact urban form. The significance of such a development pattern on the mitigation of climate change is both complex and comprehensive. A more compact urban form has characteristics that allow for significant reductions in the amount of greenhouse gas emissions associated with buildings and the transportation, utility and service networks that support those buildings.* The land use section of the *Climate Policy* includes the following policies, all of which speak to the importance of compactness and density of development as a significant planning tool in facilitating energy efficiency in commercial and multi-family residential buildings:

- Create more compact forms
- Integrate land use and transportation
- Promote mixed use development
- Develop centers with high density
- Establish transit-ready locations
- Facilitate job-housing proximity
- Create compact regions
- Plan infill development and redevelopment
- Redevelop brownfield sites
- Reform zoning and development standards

- Provide developer incentives
- Strategically locate public facilities

There are complications that result from creating a more compact land use pattern, such as the need for high-quality urban design standards, the potential for such concentrated land uses to contribute to the urban heat island effect, the need for public investment in infrastructure (parking garages, transit, streetscape, urban parks, etc.) to support more dense development, and the need for public investment/education in addressing the real or perceived concerns people may have with regard to urban living (quality of schools, crime, etc.). Planners must be conscious of all of these factors as they create regulatory requirements and incentives, land use and capital improvement plans, economic development incentives, and other implementation measures that encourage a more urban form. Failure to think holistically about dense development, particularly if such development is not commonplace in a community or region, can create unnecessary obstacles to and unintended consequences from the implementation of a compact development pattern…Marketing the benefits of this type of development to the public and to the development community is also essential to the success of such a program. Outreach efforts explaining the purpose and benefits of a more compact urban form are often necessary to convince the public to accept what, in many cases, may be a new pattern of development.

Gause, et al. (2007) provide several excellent case studies of sustainable planned communities that incorporate multiple elements promoting energy efficiency and renewable energy in commercial and multifamily residential buildings. Brewery Blocks development in Portland, Oregon, features:

- Transit-oriented urban infill neighborhood
- Redevelopment of former brewery
- LEED-certified buildings
- Central chiller
- Solar design
- Green roofs
- Recycling and salvage of existing buildings and materials
- Recycling of construction waste

The Greenwich Millennium Village in London, United Kingdom, features:

- Affordability
- Brownfield development
- On-site cogeneration plant
- Passive solar design
- Green building features
- Extensive use of recycled materials
- Water savings

- Recycling of construction wastes

8.5 Berkeley, California Example

Green Building Requirements for Commercial and Multifamily Residential Buildings

The following is taken verbatim from the website of the Berkeley Office of Energy and Sustainable Development and reflects utilization of regulations and policies, as well as development and redevelopment review, to achieve energy efficiency goals in commercial and multifamily residential buildings.

Building Sustainably. *Green buildings provide healthy, comfortable building interiors that maximize savings through the efficient use of energy and water and limit construction impacts on the natural environment. The City of Berkeley requires that new buildings, alterations, and additions meet the requirements of the California State Green Building Code (CAL Green). In addition, Berkeley has supplemental green building policies that ensure that we continue to divert waste from landfills, reduce energy and water usage in our buildings, and help our community meet our environmental and Climate Action Plan goals.*

Green building requirements for projects requiring a Zoning Use Permit (UP) or Administrative Use Permit (AUP) are listed below and provided in Green Building Requirements.

Green Buildings. *A green building takes a holistic approach to design, siting, construction, and operation to enhance the well-being of its occupants and minimize the negative impacts on the community and natural environment.*

- ***Green Building Checklist:*** *Required for large development projects. Residential projects use GreenPoint Rated Checklist (including multifamily) and commercial projects use LEED (Leadership in Energy and Environmental Design) Checklist.*
- ***Green Building Consultations:*** *Consultations are voluntary. The Planning Department offers free green building consultations to help you improve your project. To schedule an appointment, contact greenbuilding@cityofberkeley.info.*
- ***LEED Gold (or equivalent) for Downtown Projects:*** *New buildings and additions in the downtown area require LEED Gold certification or equivalent as described in the Green Building Provisions of the Downtown Mixed-Use District Zoning Ordinance.*

Energy *An energy-efficient building reduces greenhouse gas emissions, lowers utility bills, and improves comfort.*

- ***Energy Conservation Analysis:*** *Required for large commercial projects and recommended for multifamily and mixed-use projects. A free analysis is available through PG&E's Savings By Design program. For multifamily projects, receive energy design assistance and cash incentives, see Heschong Mahone Group.*

- ***Energy Conservation Measures RECO/CECO:*** *RECO/CECO requires existing buildings to make updates to save energy and water when properties are remodeled or sold. Residential projects must comply with RECO and commercial projects must comply with CECO.*

Energy Conservation in Municipal Buildings

The following is taken verbatim from the website of the Berkeley Office of Energy and Sustainable Development and reflects utilization of regulations and policies, as well as public investment, to achieve energy efficiency goals in municipal buildings.

How the City of Berkeley is Reducing Greenhouse Gas Emissions from Municipal Operations. *While municipal operations contribute to less and 1% of the community-wide greenhouse gas inventory, the City plays an important role in providing leadership and demonstrating implementing actions.*

The City of Berkeley is committed to meeting its Climate Action Plan goals of decreasing greenhouse gas emissions by 33% below 2000 levels by 2020 and 80% by 2050 and by creating a healthy and sustainable community. Track our progress at: www.cityofberkeley.info/climateprogress. For more information about other Climate Action Plan see: www.cityofberkeley.info/climate

Building Energy Use. *The City of Berkeley is actively working to reduce the amount of energy used in municipal facilities. Check out progress towards reducing municipal building energy use and associated greenhouse gas emissions. Energy use reductions are accomplished by retrofitting existing buildings for energy efficiency, encouraging energy smart behavior, and by including energy efficient design as a key element in new construction and rehabilitation projects. The importance of design, construction, operation and maintenance of municipal buildings is reflected in the City's Green Building Resolution, adopted by Council in 2003, the Environmentally Preferable Purchasing Policy adopted in 2004 and the Precautionary Principal Ordinance adopted in 2006.*

- ***Retrofits on City-Owned Buildings:*** *Existing City-owned buildings have become more efficient since 2000 with total energy consumption per square foot decreasing 18 percent between 2000 and 2010. Municipal energy targets will be met by a combination of comprehensive energy efficiency retrofits, retro-commissioning of existing buildings, and the development of the full potential for on-site generation.*
- ***Benchmarking with Energy Star:*** *In order to manage energy use of municipal buildings, the City monitors consumption using the EPA's Energy Star Portfolio Manager, an interactive energy management tool that tracks energy usage. The City annually rates performance for all buildings using the Energy Star rating system. The rating system's 1–100 scale allows everyone to quickly understand how a building is performing — a rating of 50 indicates average energy performance, while a rating of 75 or better indicates top performance. Top*

performing buildings are eligible for Energy Star Certification. The goal of the City is to have all eligible municipal buildings energy star certified.

Renovation and New Construction. *Berkeley requires that all new municipal construction and remodels achieve a LEED Silver certification or higher. In addition, municipal remodels and new construction must meet green specifications and use green cleaning supplies and building materials.*

- *Four branch libraries are undergoing major renovation work or complete rebuilding. Each of these projects has undergone include energy efficiency measures and employ passive energy techniques such as daylighting and natural ventilation, and where possible, renewable energy is included to reduce or eliminate energy and natural gas consumption. Projects will also take advantage of all utility rebates as applicable to reduce project costs.*
- *The new animal shelter will incorporate many water and energy efficient designs and equipment will be EnergyStar rated. Strategies such as daylighting, passive ventilation, and high-efficiency solar thermal heating will be used. Pre-planning has ensured that there will be space and electrical connections available for renewable energy in the future.*

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9.0 SUMMARY AND CONCLUSIONS

Overview

The information obtained from the present literature search was organized according to "strategic points of intervention", both technical and institutional. Technical points of intervention, which could also be described as technical solutions, are discussed in Section 2; these are the physical aspects of planning that can, if implemented and sustained, improve energy efficiency in existing, small and medium commercial and multi-family residential buildings. Section 3 discusses barriers and obstacles to implementing the technical points of intervention. Institutional points of intervention, or institutional solutions, are summarized in Section 4; these are areas where local government planners can traditionally intervene in public decision-making to facilitate, promote or require implementation of the technical points of intervention and thus actually achieve energy efficiency in existing, small and medium commercial and multi-family residential buildings. Both the technical and institutional points of intervention have been adapted from a series of related APA publications addressing climate change and energy efficiency. Sections 5 through 8 address individually the institutional strategic points of intervention that are most critical for planners input – plan making, regulations and policies, incentives, and development and redevelopment review.

Technical Interventions and Solutions

APA's PAS Memo, *Integrating Energy and Climate into Planning,* asserts that planners can reduce GHG emissions in four ways through building and site design:

- Promoting renewable and efficiency ready building and site features
- Maximizing reuse of existing buildings
- Using energy-efficient practices in construction and renovation of buildings
- Encouraging the use of more energy-efficient lighting and appliances

In promoting renewable and efficiency ready building and site features, the PAS Memo focuses mainly on how to identify, create and preserve opportunities for energy production technologies, such as cogeneration and geothermal. However, the Memo goes on to say, *"As individual parcels are likely to present different opportunities and constraints, neighborhood and district level energy solutions that allow benefits to be shared among users may be the most effective."* In addition to enhanced opportunities for renewable energy and energy efficiency, APA's *Planning for a New Energy and Climate Future* pointes out several other potential energy and climate benefits of analysis of development patterns and planning at the neighborhood and district level, including:

- More efficient transportation systems
- More efficient heating and cooling of buildings
- Avoided land clearing and carbon storage losses

- Reduced infrastructure costs and energy use
- Reduced urban heat island effects

More specifically, the land use section of APA's *Policy Guide on Planning and Climate Change* included the following measures to promote compactness and density of development as a significant planning tool in facilitating building energy efficiency:

- Create more compact forms
- Integrate land use and transportation
- Promote mixed use development
- Develop centers with high density
- Establish transit-ready locations
- Facilitate job-housing proximity
- Create compact regions
- Plan infill development and redevelopment
- Redevelop brownfield sites
- Reform zoning and development standards
- Provide developer incentives
- Strategically locate public facilities

Thus, the strategy of renewable and efficiency ready buildings and sites should be expanded to include neighborhoods and districts. The expanded strategy would hold for energy efficiency in existing buildings and new buildings, and would be applicable at both the individual building/site and overall neighborhood/district scales. Planners can identify and pre-position existing buildings for adaptive reuse and districts of existing and new buildings for compact redevelopment and densification (or re-densification) to increase energy efficiency. Technologies that support neighborhood//district scale energy efficiency include: geothermal energy, microturbines and cogeneration, distributed energy generation, smart grid technology, and community microgrids.

Maximizing reuse of existing buildings, likewise, should be expanded to include explicitly adaptive reuse of historic buildings and districts. The APA PAS Report, *Planning for a New Energy and Climate Future*, states that reusing existing buildings takes advantage of embodied energy and facilitates compact development. Similarly, Tobias and Vavaroutsos, et al. (2009) state that, *"In the context of green office retrofits, historic properties present challenges and opportunities. Given their embodied energy…, reusing existing buildings is inherently more sustainable than building new ones. Preserving and operating historic structures to their full potential is a smart investment in sustainability."* The energy efficiency advantages of historic buildings include:

- Thick masonry walls that help regulate indoor temperatures during the day
- Large windows and high ceilings that maximize daylighting for building interiors

- Interiors that can be modified to remove perimeter offices to create an open floor plan or layouts that otherwise promote cross-ventilation

Relative to the last of these principles, i.e. the one perhaps most relevant to planners, Dinola says: *"Project teams should consider expanding the boundary of a project to include adjacent sites or even entire [historic] districts. This helps take advantage of economies of scale and capitalize on the potential for locating systems and technologies off site. Examples include tying into a district central utility plant for heating, cooling, or power or placing renewable energy systems on an adjacent, non-historic building in order to protect a building's historic character. Rehabilitation of a single building in a historic district can also catalyze numerous other projects and transform a community."*

Barriers to Technical Interventions and Solutions

The following outline is proposed as a means of organizing the literature reviewed relative to barriers and obstacles for planners in making the technical interventions (solutions) presented in Section 2 that are needed to achieve local energy efficiency goals. The institutional interventions (solutions) presented in Section 4 are proposed as the means of overcoming the barriers and obstacles presented in Section 3 and summarized here.

Barriers and obstacles have been organized into three categories: general, individual building level, and district-level. General obstacles include:

- Lack of definition or acknowledgement of energy concepts or goals
- Cost concerns
- Customer barriers
- Public policy and planning barriers
- Market barriers (including time and hassle, control issues, conflicting incentives between landlords and tenants, and small profits

At the individual building level, there are several barriers and obstacles that make it difficult to:

- Adaptively reuse, or modify, historic buildings that take advantage of previously embodied energy
- Install renewable energy and energy efficiency measures inside the building envelope
- Install renewable energy and energy efficiency measures outside the building envelope (due to floor area rules, projection limits from the sides of buildings, yard requirements, roof structure requirements, and height restrictions)
- Install energy efficient building site and onsite infrastructure, such as landscaping for windbreaks, energy efficient exterior lighting, exterior shading (glare and heat gain reduction), energy efficient window treatments, high reflectance hardscape materials, and reflective roofing

Neighborhood and district level barriers relate to inhibiting:

- Compact development
- Redevelopment

Institutional Solutions and Interventions

APA has produced a series of guidance documents and policies for planners relating to energy and climate planning. The PAS Memo, *Integrating Energy And Climate Into Planning*, and related documents lay out a conceptual framework for strategic institutional points of intervention and tools available to local government planners wanting to integrate energy and climate into community planning. This framework has served as a useful starting point, with some adjustments based on insights from other literature, for organizing the present paper's more focused discussion of how planning can facilitate energy efficiency in small and medium commercial and multifamily residential buildings. The institutional points of intervention are paraphrased below. Sections 5 through 8 addressed individually the points of intervention that are most critical for planners input – plan making, regulations and policies, incentives, and development and redevelopment review.

- *Long-range Community Visioning and Goal Setting. Include exercises in your community visioning process to gauge the level of awareness and importance of energy and climate change to your community members. Consider how energy and climate change can be addressed in your community and how it is connected to other community goals and values.*

- *Plan Making. Examine comprehensive plans and other planning documents to see if energy and climate change issues are addressed and integrated. Consider including an energy and climate change element in your comprehensive plan or creating a climate action plan for your community.*

- *Regulations and Policies. When updating your regulations, think about how zoning codes, building codes, and other ordinances address energy issues. Consider how these ordinances could work to encourage mixed use development, transit-oriented development, and green building. Also, make sure your codes do not prohibit clean energy generation, such as through solar panels or wind turbines. These structures have sometimes been restricted or prohibited in existing codes due to height or aesthetic reasons.*

- *Incentives. In addition to an expedited plan review, consider other incentives to encourage new development to demonstrate energy efficiency and reduced carbon*

emissions. Some communities have offered rebates and other financial incentives to developers whose projects meet predetermined standards.

- *Development and Redevelopment Work. Create a checklist of energy and climate change goals for new projects. For projects that exceed these goals, consider an expedited site plan review and permit processing track.*

- *Public Investments. Take an active role in your city's capital improvement program. Make sure that the public investments that will be made in your community – including infrastructure, public buildings, and facilities – promote energy efficiency and reduce GHG emissions. It is often important for cities to lead by example, showing that these goals can be met in public projects, in order for private development to incorporate these goals in their own projects.*

- *Public Outreach and Education. Engage the public in discussing energy and climate change and provide educational forums for citizens to learn how to make changes in their own lives to improve energy efficiency and reduce carbon emissions.*

- *Research and Development. In the long run, the opportunities for a low-GHG energy future depend critically on new and emerging technologies. Some technological improvements are incremental and have a high probability of commercial introduction over the next decade. Other technology advances will require considerable R&D before they can become commercially feasible. The fragmented and highly competitive market structure of the building sector and the small size of most building companies discourage private R&D, on both individual components and the interactive performance of components in whole buildings [and districts].*

Plan Making

Consolidating and paraphrasing APA's series of guidance documents and policies relating to energy and climate issues:
Planning departments prepare plans of all kinds that recommend actions involving infrastructure and facilities, land-use patterns, open space, transportation options, housing choice and affordability, and much more. Examining comprehensive plans and other planning documents to see if energy and climate change issues are addressed and integrated is an important step. Planners should consider including an energy and climate change element in the comprehensive plan, or integrating these issues within other elements. Climate action plans also fall into this category of plan making. For these, planners should consider whether the GHG reduction targets established in the plan can be achieved with the strategies proposed. Plan-making points of intervention include:

- *Assessment and analysis. Baseline and trends for energy use and GHG emissions*
- *Comprehensive plans. Goals and actions to guide community; energy and climate element*
- *Area plans. Neighborhood, downtown, redevelopment district, corridors*
- *Functional plans. Transportation, open space, utilities, school, economic development*
- *Climate action plans. Baseline, targets, strategies and policies for reducing GHG emissions*
- *Energy plans. Overview of energy use and sources, strategies for energy security*

Excellent resources for incorporating energy and climate issues in plan making include APA's *Policy Guide on Planning and Climate Change* and USDOE's *Guide to Community Energy Strategy Planning*.

Regulations and Policies

Consolidating and paraphrasing the APA's series of guidance documents and policies relating to energy and climate issues:
Planners write and amend standards, policies, and incentives that have an important influence on what, where, and how things get built and what, where, and how land and buildings get preserved. When updating regulations, planners should consider how zoning codes, building codes, subdivision codes, and other regulations, and ordinances address energy and climate issues and how these could work to encourage energy-efficient and climate friendly forms of development. Planners should also examine codes to make sure they do not prohibit clean energy generation, such as through solar panels or wind turbines. These structures are sometimes restricted or prohibited because of height or aesthetic reasons. Additionally, providing incentives such as expedited plan review, rebates, and other financial incentives can help encourage developers to make new development more energy efficient.

In his 2007 article, *The Sustainable Community Development Code to the Rescue*, Duerksen critiques traditional Euclidean zoning as being able to protect communities from incompatible uses but stifles mixed use development and its traffic and air pollution reduction benefits and forces uses apart thus contributing to sprawl. He also points out that form-based codes often neglect natural resource issues. As a solution, Duerksen recommends building on the best attributes of the existing approaches but addressing a wider range of issues like energy, climate change, etc. When incorporating sustainability into a zoning code, Duerksen recommends the following steps be considered:

- Removing obstacles to sustainability
- Creating incentives to foster increased density and encourage use of new technologies
- Enacting standards that require certain actions or preventing harm

The APA PAS Report, *Planning for a New Energy and Climate Future*, lists opportunities for addressing energy efficiency in buildings by type of regulation or policy:

Zoning Code

- Minimize impervious surfaces to reduce heat island effects and runoff
- Mix land uses to shorten and reduce vehicle trips
- Increase development densities, especially around transit
- Accommodate solar orientation
- Allow a variety of housing types to reduce work trips
- Reduce parking requirements through shared parking
- Require landscaping, mature tree preservation, and open space

Subdivision Regulations

- Promote street connectivity
- Require sidewalks and bike lanes or paths
- Protect environmentally sensitive areas
- Create environmentally sustainable block, right-of-way width, and roadway design standards
- Introduce green infrastructure for storm-water management
- Preserve or create open space

PUD Regulations (for master planned communities and mixed use developments)

- Mix land uses, densities and housing types
- Preserve or create more compact development
- Preserve or create open space

The APA climate policy picks up on this tack in its green development policies:

- *Regulatory requirements. In many cases, it may be appropriate to establish regulatory requirements that implement green development goals and objectives. For instance, many communities mandate LEED certification, open space preservation, landscaping, water-saving fixtures, and the installation of cool roofs.*
- *Regulatory reform. Often, existing code requirements or design guidelines inhibit the use of certain energy-efficient technology. For example, lot width standards may preclude optimal passive solar structure orientation or historic preservation guidelines may prohibit roof-mounted solar collectors and skylights. Existing regulatory provisions, such as local flood damage mitigation standards, should be reevaluated to ascertain their continued validity in light of potential climate change effects. Planners should examine their codes' compatibility with existing and emerging technology and make adjustments where appropriate.*

The July and August 2013 issues of APA's Zoning Practice provide very useful guidance on the practice of sustainable zoning. In the July 2013 issue, Garvin outlines a process for developing a sustainable zoning code by first Implementing a comprehensive sustainability planning process

utilizing community outreach to produce a local definition of sustainability and a policy framework of local preferences to guide planning decisions and then develop or revise the zoning, subdivision and land development regulations, ordinances and bylaws to implement sustainable priorities. Garvin addresses two energy-related components of sustainability zoning:

- *Encourage compact, mixed use development patterns*. Utilize mixed use zoning districts and uses, infill development standards, and administrative approvals
- *Renewable energy and energy efficiency*. Utilize use definitions and standards, and energy conservation and production development standards

Other useful resources include USEPA's *Essential Smart Growth Fixes for Urban and Suburban Zoning Codes,* and ICLEI's *Municipal Clean Energy Toolkit.* Section 6 also provides summaries of several examples of sustainable development codes, including the Rocky Mountain Land Use Institute's *Sustainable Community Development Code*, as well as recent initiatives in that vein by New York City, Salt Lake City and Washington, DC.

"Making a market" by requiring or incentivizing commercial and multifamily residential buildings to benchmark and publicly disclose their energy efficiency has been reviewed extensively in ULI's *Urban Land* magazine and strongly supported by ULI through its Green Print Center / Foundation.

Incentives

APA's series of guidance documents and policies relating to energy and climate issues *encourages planners to consider incentives that would encourage development [and redevelopment] to demonstrate energy efficiency and reduced carbon emissions, e.g. providing a density bonus to developments including green roofs which can help reduce the urban heat island effect while reducing heating and cooling loads in buildings. A fact sheet can be created for developers/residents on available federal, state and utility incentives which can include:*

- *Expedited plan review for projects that meet or exceed established energy and climate objectives*
- *A waiver of permit fees, rebates or other financial incentives to developers whose projects meet predetermined standards*
- *Provision of technical assistance to help developers meet new goals and standards*
- *Offering financing mechanisms for renewable energy improvements that works like a sidewalk assessment*
- *For cities that own their own utility, offer rebates for purchasing energy-efficient appliances and encouraging the purchase or even the production of green power*

The AIA's *Green Building Incentive Trends* is a very comprehensive resource on the topic; some key points include:

- *When developing incentive packages, it is best to incorporate a variety of techniques that will target a wide spectrum of builders, developers, owners, and operators.*
- *The key is that these incentives must be easy to understand, simple to pursue, and strong enough to make the whole process worthwhile.*
- *The most important factor is that the mix of programs a community or state provides makes green building easier and smarter than non-green construction.*
- *State and local government green building incentives can range from options that are virtually cost-free to those that involve direct local government investment. The following is a list of the most common incentive types offered by local governments across the United States: tax Incentives, bonus density, expedited permitting, net metering, feed-in tariffs, grants (including fee subsidization), loans, insurance, technical assistance/design assistance, permit/zone fee reductions, rebates and discounts on environmental products (e.g., Energy Star), and leasing assistance.*
- *An examination of these green incentives indicates that the most attractive incentives to the private sector are: tax incentives, density/floor area ratio bonuses, and expedited permitting.*
- *Local governments have also found that the most effective way to extend the life of incentive programs is to leverage private money through loan programs. These programs often consist of either a revolving loan program, where smaller low-interest loans are granted for green projects and financed through a large loan pool, or a loan loss reserve fund, which may increase available incentive dollars by spreading risk to various interested parties.*
- *Factors influencing the selection of incentives include: financial costs, oversight structure, local political and cultural environment, limits to power, and industry engagement.*

Development and Redevelopment Review

Based on the series of APA publications on climate and energy sustainability*, "Planners play an important role in development in their community. They review project applications for consistency with applicable plans and regulations and may be involved in public-private partnerships to develop new projects. While goals and standards for energy and climate should be addressed in plans and regulations, making sure these goals and standards are met or exceeded in the development process is important." Specific measures include:*

- *Project Review Checklists. Develop a checklist of energy and climate change standards or goals for new projects and, if mandatory standards are not used, then offer expedited plan review and permit-processing tracks for projects that meet or exceed the goals.* Sustainable Jersey has developed a model green development checklist that communities can use to encourage and review both development and redevelopment project proposals relative to green planning and design criteria. The checklist provides negative and positive criteria at the regional, site and building levels.
- *Public-Private Partnerships. If serving on a development team, planners can encourage energy efficiency, renewable energy and GHG emission reductions.* According to APA's

Planning for a New Energy and Climate Future, "Planners may serve as leading team members on public-private partnerships, and there they have an important role to play in creating developments that are energy efficient and reduce GHG emissions."

- *Redevelopment Plans and Projects*. Redevelopment is a major opportunity for intervention by local planners on behalf of energy efficiency in both individual buildings and districts. According to NJAPA's *Redevelopment Handbook: A Guide to Rebuilding New Jersey's Communities,* "*Redevelopment of existing sites, infill development next to existing developed areas of the community, and community connectivity, including proximity to public and other essential services, are important factors in site selection as they support energy efficiency and reduce auto dependency."* Thus, redevelopment equates to sustainable development, because redevelopment projects: "*Use existing sites, avoiding greenfields; promote development where there is existing infrastructure, create infill development, with opportunities for community connectivity; reuse existing buildings where possible; and are transit oriented."* The Handbook adds that redevelopment plans can be used to promote green building design and site layout in particular and sustainable development in general, by either: (1) mandating achievement of some level of green building certification, or at least use of some level of sustainable design, in the redevelopment plan; or (2) offering incentives to redevelopers to seek green building certification or to incorporate green building design techniques in exchange for increased density or floor area for non-residential uses.

Conclusions

APA has produced a series of guidance documents and policies for planners relating to energy and climate planning. The PAS Memo, *"Integrating Energy And Climate Into Planning,"* states that: *"Planners have an important role to play in mitigating the effects of climate change and adapting to its unavoidable consequences. Taking action in these areas will not only help mitigate the climate change problem, but through various strategies could also help reduce our reliance on non-renewable energy sources, help communities better meet their energy needs, and improve environmental quality. There are many opportunities for planners to start integrating energy and climate issues in planning across issue areas and in different points in the planning process."*

It can be argued that planners and planning departments have skills and responsibilities that are uniquely relevant and effective to address building energy efficiency at the larger scales – neighborhood, district, community. However, addressing building energy efficiency issues at the larger scales is often overlooked or not as well developed as at the individual building and site scale. So, there are significant opportunities for planners to intervene, integrate and innovate. It is noteworthy that planners also have much to contribute at the smaller scales and can take leadership positions, or otherwise collaborate with other professionals and departments (architects and landscape architects, energy engineers and public works departments, and builders and developers), on many initiatives to implement the technical points of intervention

outlined in Section 2 by using the institutional points of intervention described in Section 4 to overcome the barriers and obstacles outlined in Section 3.

In these respects, it is recommended that:

- Training curricula and programs be developed, for student and practicing planners, covering both the neighborhood, district and community scale and individual building and site scale.
- Reinforce recent and ongoing initiatives to develop sustainable community plans and codes by addressing in more depth and detail how building energy efficiency can be facilitated at the neighborhood, district and community scales.
- Develop a technical tool box to assist practicing planners in identifying, creating or preserving opportunities to facilitate building energy efficiency at the neighborhood, district and community scales.