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The supportive programmes your city needs to drive toward zero-carbon buildings

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To accelerate the pace of the transition to zero-carbon buildings, cities need to enable the market to meet efficiency standards for new and existing buildings, and encourage stakeholders to go beyond required standards. By extending technical support, building knowledge and awareness, providing financial and non-financial incentives and facilitating access to finance, cities can help developers, building owners and other stakeholders overcome barriers to higher ambition in building energy performance. Common barriers include the upfront cost, lack of knowledge on how to implement energy efficiency measures and 'split incentives' between building owners and tenants.

This article first looks at the need for a preliminary analysis, then outlines the main ways to encourage and support building sector stakeholders to raise ambition on energy performance towards a zero-carbon building goal. It explains ways to develop local capacity, financing options, and ways to incentivise stakeholders to work towards the zero-carbon goal.

Preliminary analysis

Undertake a detailed analysis to understand the existing local market for building energy efficiency

A market analysis will pinpoint gaps and obstacles that are preventing the building industry and building owners from investing in zero-carbon buildings, and identify policy areas over which the city has control

to address these issues. If you don't have significant expertise within the city governm[illegible] you will need to engage a third-party expert to assist in this market study, such as a university, public agency or private company.

Your market analysis should include:

- **Local market conditions.** This includes the level of investment already flowing into building energy efficiency projects locally, the main players and existing local jobs in this field, any energy service companies operating locally or in the region, the biggest local challenges impeding higher building efficiency (for the building industry and building owners, and in existing buildings and for new buildings), and approaches that have been successful locally and in other jurisdictions.

- **The current policy and regulatory environment.** Map existing supportive policies at national, regional and local levels, and any policies that will impede the uptake of energy efficiency measures. For example, high subsidies on grid electricity will make it more difficult to finance these investments through energy bill savings.

Capacity development

Provide guidance and training, and establish partnerships with the building industry, to help develop the local market

Accelerating the transition to zero-carbon buildings requires suppliers in the local market with the right skills, knowledge and resources to provide materials, equipment, technical and financial services. Suppliers may also need to shift their business models from selling products to selling managed product–service offerings, such as energy performance contracts.

In many areas, there is a considerable lack of workforce training for zero-carbon buildings. Cities can support stakeholders and develop the local market by providing guidance and training to fill this gap.

To develop appropriate market development initiatives, cities first need to conduct local labour market studies and engage with stakeholders to understand the supply side of the market, including their concerns as well as market, policy or other barriers and considerations.

The primary approaches cities can take to support the building industry and develop the local market are:[1]

- **Technical, sales and marketing training** through dedicated centres or programmes. This can include offering training through local colleges and training institutes, providing guidance on curricula development, establishing dedicated 'green collar' funds to finance workforce training, supporting the development of marketing materials, creating a resource centre to help train the

trainers, and promoting workforce inclusion by tailoring programmes towards low-income or other disadvantaged groups in the labour market.

- **Requiring relevant training and qualifications, or giving preference to suppliers with these qualifications, when building contracts and permits are awarded.** Cities can incentivise and reward local suppliers that have participated in relevant training by including them on preferred or pre-approved vendor lists. Cities can also require developers to have relevant qualifications and training to gain approval for a building permit, for example. For public buildings, cities can require that contractors join a pre-approved list before allowing them to bid for building work undertaken by the city, or review bidders with these qualifications more favourably.

- **Setting workforce standards or certifications** to build trust and ensure quality. In addition to requiring training and qualifications at the point of contracting or permitting, cities can require the local building workforce to meet minimum standards of training in building energy efficiency in addition to, for example, the health and safety standards many cities require. This can include relevant tradespeople, who can be required to have qualifications to become approved installers of energy efficiency systems or products, to ensure quality.

- **Develop ambitious performance-based building codes, set 'stretch' codes to work towards zero-carbon building goals, or add a voluntary zero-carbon appendix to a mandatory building code.** These measures support industry by demonstrating how zero-carbon goals can be achieved in the city, taking into account climate and the current state of the market, and indicate what future mandatory requirements will look like. Cities can adopt or adapt internationally recognised standards such as the Zero Code or Passive House. Read *How to set energy efficiency requirements for new buildings* for more information about these options.

Vancouver city

In Vancouver, the Zero Emissions Building Exchange (ZEBx) Centre for Excellence opened in 2018 to build the local market's capacity for delivering these buildings. ZEBx aims to be a one-stop-shop, arming local industry with the tools necessary to get to zero-carbon buildings and accelerating market transformation by identifying opportunities, and navigating barriers, to advance design and construction practices.[2]

Since May 2017, all rezoning applications in Vancouver are required to meet near-zero or low-emissions goals. Developers are encouraged to use the Passive House standard, for which the city provides guidance on the ZEBx website. Under Vancouver's Zero Emission Building Catalyst Guidelines the city has the ability to relax planning and zoning policies on a case by case basis to accommodate buildings to comply with local zero-carbon building standards, balancing the building's proposed path to zero carbon with other considerations.

Better Buildings programmes

Cities including Toronto, Sydney and cities in the United Kingdom have started 'Better Buildings' partnership programmes to provide real estate markets with the information, tools, and technical and market support to accelerate improvements in building energy performance. These programmes, which are often low cost and relatively simple to run, set a voluntary building efficiency goal, share best practice toolkits, and encourage competition among participants. Sydney has also created a Better Buildings partnership specifically for the city's tourism industry and its facilities, such as hotels, museums and conference centres, called the Sustainable Destination Partnership.[3]

Provide guidance and training to building owners to assist in the implementation of energy efficiency projects

Cities can set up programmes or dedicated centres to offer guidance and technical assistance to building owners, including local authorities and social landlords, to implement energy efficiency upgrades in existing buildings. These seek to make these projects easier and more convenient for building owners, and may include online training, in-person workshops, expert teams providing end-to-end support, resources such as lists of locally trusted suppliers and more. In some cases they also provide basic equipment. The focus of these programmes should be informed by your market analysis.

Cities should work with local community groups, NGOs, housing associations, faith groups and other grass roots organisations to reach building owners, to set up and run these programmes, and to engage a wide range of communities.

‘Weatherization’ programmes in the United States

Many cities in the United States have ’weatherization’ programmes, which aim to arm owners with the skills and knowledge to protect their buildings from the elements (particularly sunlight, precipitation and wind) while reducing energy consumption. They mainly target low-income households. In Chicago, for example, the Low-Cost Education and Weatherization Program offers residents training opportunities and a toolkit for do-it-yourself low-cost weatherproofing. Participants attend a local weatherization workshop and are provided with a low-cost weatherisation kit, including energy efficient light bulbs, seals for door and window opening and other equipment.

London’s RE:NEW programme

London’s RE:NEW programme offers comprehensive guidance and assistance, from idea to implementation, to local authorities and social landlords on implementing energy efficiency measures in both private and public affordable housing. It includes a RE:NEW Support Team providing expert support, and a procurement framework of suppliers for retrofit services and works. As of January 2017, RE: NEW had helped improve over 127,500 of London’s homes.[4]

Other examples include the NYC Retrofit Accelerator in New York, United States and the Tower Renewal Partnership in Toronto, Canada, which support large-private-building owners, and the Sustainability Unit in Tshwane, South Africa, and the Energy Centre in Stockholm, both of which support municipal building managers.

Use public buildings to test and showcase new technologies and models

Cities can develop partnerships with building-sector stakeholders to test the viability of building energy performance technologies and deployment models in real-world settings, using public buildings. Results should be shared with the wider marketplace. This helps to accelerate skill development and the uptake of energy efficiency options for buildings and appliances.

The Municipal Entrepreneurial Testing System (METS) in New York City allows entrepreneurs to test new green building technologies in municipal buildings before release to the market.[5]

In 2011, Boston issued its first E+ Green Buildings Request for Proposals, challenging the market to submit feasible building projects that will be energy positive. This helped raise awareness and provided a testing ground, and the programme is still running today.[6]

Financing

Facilitate energy performance contracting by stimulating the market and reducing transaction costs

Energy performance contracts (EPCs, or sometimes 'Energy savings performance contracts' (ESPCs)) are a common 'pay-for-performance' financing mechanism, allowing energy efficiency investments to be repaid through realised energy savings over time. EPCs encompass goods, services and financing, and allow energy-inefficient equipment and systems to be replaced with more energy-efficient technologies, with the capital investment, installation and ongoing management paid for by an energy service company (ESCO) or third-party financier.

The building owner pays the ESCO from the operational energy savings delivered by the building upgrade, over a set period of time, usually up to twenty years. The ESCO takes on the performance risk during installation and through the duration of the contract. Often, ESCOs focus on specific segments of the buildings market – in the United States and Europe, for example, many ESCOs focus on 'MUSH' buildings (municipal, utility, schools and hospitals).[7]

These contracts can be used by cities to finance the retrofit of municipal buildings. They can also be used to support building performance upgrades in residential and commercial buildings. The main barriers to the use of EPCs are the transaction costs, due to their greater complexity relative to the purchase of a product or service, and the lack of ESCOs operating in many areas.

To lower the transaction costs for the use of EPCs, cities can develop:

- Guidance on tendering for EPCs, and standardised EPC contract templates. For example, the Netherlands national government has published Guideline for Tenders for Energy Performance Contracts, while the United Kingdom national government has produced a Guide to Energy Performance Contracting Best Practices.
- Pre-approved lists of EPC providers, ESCOs, project facilitators or consultants. For example, RE:FIT London has published a list of trusted ESCOs, selected for their excellent track record in providing energy reduction and generation measures.
- Standardised measurement and verification protocols for the calculation and verification of energy savings.

To support the growth and maturation the local ESCO market, cities can:

- Use EPCs to tender energy efficiency improvements of municipal buildings, attracting established ESCO providers to the region.
- Help to establish (semi-)public ESCOs. Read *How to finance the retrofit of municipal buildings* for examples of this.

Singapore's Zero Capital Partnership Scheme

Singapore's Zero Capital Partnership Scheme links smaller building owners – without the capital and technical expertise to implement retrofit projects on their own – with accredited ESCO firms, serving as a one-stop solution including energy audits, upfront financing or support with accessing relevant grants and incentive schemes, implementation, and facilitating assessment under Singapore's Green Mark green-building certification scheme if desired.[8]

Enable financing mechanisms with repayments through property taxes and utility bills

Tax lien financing

Energy performance bonds, also known (in the United States) as Property-Assessed Clean Energy bonds, or 'PACE'), are government financing mechanisms that city governments can create for energy efficiency retrofits and building-scale renewable energy projects. Cities offering energy-performance-bond financing allow building owners to borrow money to pay for energy performance improvements. Building owners repay the funds over a set period through an assessment on their property tax bill, in addition to their regular property tax payment (known as tax lien financing). Cities should link the loan to the property, rather than to the owner, such as in Toronto.

The city of Toronto offers building owners access to low-interest loans (at a rate equal to the city's cost of borrowing) for retrofits, with repayment terms up to 20 years, through the Energy Retrofit Loans programme. All buildings are eligible, and it offers 100% financing for energy efficiency projects. The loan is attached to the property, rather than the owner.[9]

On-bill financing

On-bill financing and repayment allows investments to be repaid as part of building owners' utility bill, and is sometimes called 'pay as you save'. Cities can use this repayment mechanism to provide residential- or (small-) commercial-building owners access to low-to-no interest loans for energy efficiency upgrades, with repayments through the utility bill going back to the city. In this model the city is working with utility companies to leverage the utilities' relationship with its customers. The loan for the upfront cost can also be provided by a utility company or other investor. Ideally, an on-bill repayment programme should be structured to be utility-bill-neutral, meaning that utility bill cost savings are sufficient to cover or even exceed the monthly repayments. Many United States cities use on-bill repayment. Los Angeles, for instance, has both PACE and on-bill repayment programmes in place for

specific segments of the market.

Reduce real and perceived investment risks to support access to finance from private investors

Improve private investors' perceptions of risk by tackling the lack of standardisation and reducing transaction costs in building retrofits

The significant variety in the building stock makes it difficult to predict the benefits of implementing energy efficiency measures, particularly in existing buildings. This lack of standardisation, combined with the relatively small size (and associated higher transaction costs) of a building efficiency project, means that many potential investors see energy efficiency projects as risky investments, more so than renewable energy investments.

Read *How to finance the retrofit of municipal buildings* for guidance on how cities can overcome these issues for municipal retrofits.

Cities can help break down these barriers for commercial and residential buildings by supporting building owners to package or bundle a number of similar but smaller building efficiency projects, and by standardising the approach to reduce transaction costs. Frameworks such as that developed by the Investor Confidence Project (ICP),[10] which standardise how energy efficiency projects are developed and documented and how energy savings are calculated and measured, can be useful tools. The ICP framework is geared toward the United States and Europe, but can also guide cities outside of these regions. Cities can use these frameworks and templates to support the retrofit of high-priority segments of the existing building stock.[11]

Establish risk-sharing or risk-mitigation mechanisms

Risk-sharing or risk-mitigation mechanisms provide local investors with partial risk coverage when extending loans for building energy efficiency or building-scale renewable energy projects.

The main way for cities to share risk with investors is to sign a guarantee facility agreement, also known as loan-loss reserve facilities. By signing a guarantee facility agreement, cities commit to covering a portion of investors' potential losses by providing a partial guarantee in case of loan default. The actual amount or percentage of loss covered varies, but is often a 50–50 split between the private investor and the public agency. Sometimes, agreements include a 'first-loss' facility that absorbs a high percentage of initial losses, up to a specified amount, placing more risk with the government agency and encouraging more private investment.

These facilities should be accompanied by guidance and training programmes as described earlier to ensure the building industry stakeholders taking these loans have the necessary skills and support to implement energy efficiency projects. This increases the uptake of loans, and helps to ensure that the

energy savings are realised to support loan repayment. Chicago, for instance, has established loan-loss reserves with federal money for the upgrade of multi-family affordable housing.

Reduce risks for ESCOs

Many ESCO start-ups have limited performance track records, which can make it challenging for them to attract sufficient capital to purchase equipment. To help boost the local ESCO market, cities can provide indirect risk-mitigation support by establishing mechanisms such as energy-savings warranties or other insurance products that protect the investment partner against the possible poor performance of an EPC project.

Incentives

Use incentives to accelerate uptake beyond mandatory measures

Financial incentives

There are two main financial incentives that cities can introduce locally to encourage uptake of energy efficiency measures, beyond those required by codes and standards:

- **Grants or rebates.** Upfront grants or cash rebates for installing energy efficient measures or fixtures. These are usually made available for a set period or time, or until a target level of uptake has been achieved. For example, in the United States, Chicago's Retrofit Chicago Residential Partnership provides homeowners with free energy-efficient fixtures as well as rebates on larger appliances.[12]
- **Tax incentives.** Cities can offer building owners a reduction on their property taxes for a number of years if they install certain energy-efficient measures, or may be able to offer reduced tax rates on the components or labour of a retrofit. For instance, an efficient cooling system may have a lower tax rate than the standard value-added tax. Cities can also ensure that property taxes remain static even if the upgrades have increased the value of the property. In Tokyo, Japan, tax incentives are available to small- to medium-sized enterprises for energy efficiency upgrades and renewable energy installations. In Rio de Janeiro, Brazil, developers can receive a reduction on three building-related taxes if they incorporate specified energy or water efficiency measures into a new building.

These financial incentives are usually tied to targeted energy-efficient measures or fixtures, to the achievement of certain levels in an energy performance certificate or rating scheme, and/or to targeted segments of the building stock. Any new programme should be informed by analysis of the existing building stock and an understanding of any financing incentives already offered at state or national level, and needs to have a sufficiently long timeframe to foster market confidence (usually at least 5–10 years).

China's three-star green-building rating programme

Beijing, China, requires new buildings to meet the minimum level (one star) of China's three-star green-building rating programme, and provides subsidies per square metre of floor area for buildings that meet the more ambitious two- or three-star performance levels.

Austin's free energy performance improvements

Austin, United States, provides free energy performance improvements, such as attic insulation and minor duct repair and sealing, to qualifying homes with low to moderate incomes under the Weatherization Assistance Program. In addition, the city provides $25 rebates to households installing approved Wi-Fi-connected thermostats, and a $85 incentive for enrolling in the voluntary smart-energy-savings programme. The thermostats form part of the Power Partner Thermostat smart-energy-savings events programme, which allows the local utility company, Austin Energy, to vary indoor temperatures by between 2 and 4 degrees during the hottest days of the year, when energy demand is highest, to ensure there is no city-wide power outage. The city also provides $2,500 rebates for residents taking Austin's Energy Solar Education Course and installing an onsite solar energy system.

Non-financial incentives

Non-financial incentives are often more valuable to developers than financial incentives, and can target residents too. The main types of non-financial incentives that cities provide are:

- **An allowance for extra height or floor area for buildings that meet certain energy performance criteria.** This is typically of great appeal to developers in high-density cities, and is on offer in Hong Kong, Singapore and Tokyo.
- **Expedited building permits** through priority processing. Acquiring permits and planning approval for new buildings and building performance upgrades can account for a significant portion of the costs and risks involved in their deployment. Cities can simplify this process so that developers can receive approval quickly and cheaply. This is offered by cities such as Seattle, San Francisco and Chicago.
- **Offering free and/or convenient building energy performance services** to make energy efficiency improvements as easy and hassle-free as possible. In South Korea, the cities of Seoul and Busan have 'cool roof' programmes offering to paint roofs white for free, with the use volunteers. The programmes target vulnerable citizens in Busan, and citizens living in 'rooftop slums' in Seoul.
- **Implementing bulk purchasing programmes to lower consumer costs.** Cities can take advantage of their purchasing and aggregating power to host bulk purchasing programmes, particularly for municipal building retrofits but also to support private building owners. For private buildings, bulk purchasing programmes are better suited to supporting the installation of building-scale renewable energy than energy efficiency upgrades, given the wider variety in retrofit measures that may be

needed. However, the city can negotiate a lower price with vendors of common energy-efficient measures, helping to reduce the cost and inconvenience involved for building owners in selecting a supplier and technologies.

Many of these financial and non-financial incentives can also be used to encourage building owners to install building-scale clean energy.

Run competitions or 'better buildings challenges' to raise ambition

Cities can run building-related energy challenges to set ambitious but voluntary energy-reduction targets and recognise participants that successfully meet them. Challenge programmes usually target commercial or multi-family residential buildings. Sometimes, participating partners self-organise in technical working groups to support each other in overcoming common barriers, but cities often provide training and guidance. Cities running these competitions often establish a dedicated team to offer technical resources, provide matchmaking support for participants, and identify appropriate technical and market solutions.

Atlanta's Better Buildings Challenge

Atlanta runs the Better Buildings Challenge, which engages a wide range of commercial and non-commercial property managers, building owners and office tenants in a voluntary competition, and recognises outstanding achievements. Over 650 properties now take part, aiming to reduce energy and water consumption by 20% by 2020.[13]

Use green leases to overcome split incentives

Split incentives, where a building owner is financially responsible for making energy performance improvements but it is the tenant who benefits from lower utility bills, are a common barrier to upgrading existing buildings to zero carbon. Green leases offer an approach to overcoming this.[14] These leases include provisions to enable building owners to pass on the cost of building improvements to tenants if the tenants benefit from energy savings. Cities can help to promote the use of green leases by producing local guidance, or a toolkit, for building owners and tenants.

Singapore's Green Lease Toolkit

Singapore's Green Lease Toolkit includes examples of a green lease agreement, a list of standard clauses that can be included, provisions for monitoring energy performance, and guidance on how utility bill savings can be attributed. Sydney, Australia, set up the Better Buildings Partnership with the commercial real estate sector, and together they developed a Green Lease Guide.

The Green Lease Library and the Green Lease Leaders Resources offer further guidance about how to use green leases. These sources include reference guides for landlords and tenants, and case studies on how to use the lease to drive the deployment of building-scale clean energy, to make buildings more efficient and to drive better landlord–tenant engagement on energy efficiency. The sites are United States oriented, but the Green Lease Library includes international examples, such as the United Kingdom Green Lease Toolkit.

Further resources:

More information on many of the policies discussed in this article be found in the World Resources Institute's report *Accelerating Building Efficiency: Eight Actions for Urban Leaders* (chapters 8 to 12).

C40's *Urban Efficiency: A Global Survey of Building Energy Efficiency Policies in Cities* and *Urban Efficiency II - Seven Innovative City Programmes for Existing Building Energy Efficiency* provide case studies of cities applying the measures outlined in this article.

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