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**REVIEW OF IMPLEMENTATION OF THE PROGRAMME OF WORK  
FOR THE PERIOD 2010-2011**

**HOUSING MODERNIZATION AND MANAGEMENT**

**DRAFT ACTION PLAN FOR ENERGY-EFFICIENT HOUSING  
IN THE UNECE REGION**

Note by the secretariat

***Executive summary***

The draft Action Plan for Energy-efficient Housing in the UNECE Region, or Action Plan, provides a framework for the member States of the region to raise energy efficiency in the housing sector and thus enable them to more effectively address environmental and economic challenges and meet social needs. Improved energy efficiency in housing is defined as achieving reduced energy intensities in residential premises without compromising the well-being of the residents and the environment. The Action Plan lists a range of measures aimed at removing barriers to energy efficiency and progressively moving towards a low-energy and ultimately zero-energy and carbon-neutral housing sector. The Action Plan is based on the following guiding principles: comprehensiveness; flexibility; a people-centered approach; and sensitivity to geographical context.

The Action Plan outlines three policy areas for action. Each policy area contains four goals, which are broken down into detailed targets and actions to be taken. Each of the goals is underpinned by an overall vision of what is expected to be achieved in the UNECE region by the year 2020. While the actions suggested can be operationally adapted to local requirements, it is

expected that the member States will ensure an all-round and coherent implementation of the goals and targets. The policy areas and goals are summarized below.

Policy area I: *energy efficiency governance and financial infrastructure*. This policy area outlines measures for the establishment of organizational and financial capacities necessary for the realization of the comprehensive policies on improved housing energy efficiency. Goals include the following: (a) setting up administrative systems for effective policy formulations and implementation; (b) developing financial stimuli; (c) integrating energy efficiency into housing management and maintenance practices; and (d) improving incentives and capacities for efficient end-use management of energy services.

Policy area II: *energy performance standards and technology integration*. This policy area embraces measures to ensure that new and existing residential buildings progressively meet higher technological standards. Goals include the following: (a) strengthening mandatory energy and carbon performance requirements; (b) promoting very low-energy and low-carbon technology; (c) integrating energy efficiency into spatial planning and development practices; and (d) stimulating the development of cost-effective technological solutions and innovations.

Policy area III: *access to energy efficiency and public housing*. This policy area is concerned with a broader reach of the policies in question so that the benefits of energy-efficient housing and knowledge of these benefits are not limited to a few areas or social groups but contribute to wider social and spatial integration, as well as housing affordability. Goals include the following: (a) transforming social or public housing so that it is more energy efficient; (b) ensuring energy affordability; (c) awareness-raising and capacity-building; and (d) balancing geographical development with respect to access to energy-efficient housing.

## Background

1. The housing sector is a priority area that aims to improve energy efficiency in the UNECE region. First, housing is responsible for a substantial share of total energy demand. According to data from the International Energy Agency, 20 per cent of total final consumption of energy in the UNECE region (25 per cent not including the United States of America and Canada, were attributed to the residential sector in 2006. This share represents up to half of total final consumption in individual member States and averages 20 to 30 per cent across all the countries in the region. The corresponding carbon emissions of the sector are also substantial. Second, dwellings are some of the longest-lasting and most expensive human technological infrastructures and have very long maintenance and replacement cycles and a high degree of inertia. Thus, measures taken today, or lack thereof, will leave a substantial legacy for many decades. Third, the housing sector remains characteristically wasteful across the UNECE region. While available technology provides a highly feasible potential to achieve drastically reduced energy demand in housing, the sector generally maintains inefficient practices, leading to even higher levels of energy demand.

2. The UNECE report *Green Homes: Towards Energy-efficient Housing in the United Nations Economic Commission for Europe Region* (ECE/HBP/159) recognizes that enhancing energy efficiency in housing is a prerequisite to fulfilling national and international

commitments aimed at resolving many of today's problems: climate change; energy security; economic development; and poverty. Improved energy efficiency in housing can create the following benefits and opportunities:

(a) Environmental benefits. As most anthropogenic emissions of greenhouse gases are caused by energy generation from fossil fuels, energy efficiency and the use of renewable energy in housing help mitigate global climate change. Energy-efficient housing is also a local climate change adaptation measure that reduces the exposure of households to adverse weather conditions;

(b) Energy availability and energy security. Improved energy efficiency in housing opens up more energy for alternative uses and growing energy demands in the housing sector itself. It also reduces the risks of destabilizing a country by possible energy shortages or price inflation;

(c) Economic benefits. Better efficiency offers savings on running costs for tenants, while service providers suffer less loss in energy services delivery. In macroeconomic terms, investing in energy-efficient homes provides a quicker and more economical effect than boosting the capacities of energy supply. The development of the sector also has positive impacts on research and innovation, employment, investment and the development of small and medium-sized enterprises (SMEs);

(d) Regeneration of the built environment. Retrofitting homes and using proper technologies for homebuilding can significantly improve indoor comfort and imply longer cycles of property repair. Comprehensive programmes also enhance the aesthetics of domestic buildings, as well as of surrounding public areas, making the urban environment more attractive;

(e) Social effects. Energy efficiency interventions in housing improve living conditions and the state of public health, address the issues of energy affordability and, as a result, mitigate social exclusion and inequality, fostering social cohesion.

3. In comparison with other energy end-use sectors, the residential sector offers one of the greatest potentials for energy savings. Most energy savings can be achieved by implementing appropriate technological solutions, from the simple to the more advanced. Plus-energy buildings, for example, produce renewable energy and deliver excesses beyond their own needs to the energy grid, thus using less energy over a year than they produce. However, even less sophisticated and yet cost-effective retrofitting projects in the UNECE region demonstrate up to 40 per cent savings in energy.

4. Despite this potential, investments in energy-efficient housing across the UNECE region are below the levels that may be considered optimal, thus contributing to the energy efficiency gap between the actual use of energy and the optimal use demonstrated by existing cost-effective methods and technology. This situation is due to a number of barriers and challenges to the deployment of energy-efficient technologies. One of the most common challenges is a low priority for energy issues compared with alternative necessities for households and other economic agents. Efficiency products are usually more expensive and not as well known as alternatives.

5. Therefore, owing to the lack of proper regulatory requirements and other incentives, the technological chain involved in the design, production and maintenance of new housing tends to uphold the status quo rather than to embrace best practices. The situation is even more daunting for existing homes, as retrofitting requires high upfront costs and involves varied transaction costs. Even if actors realize that such investments bring them operational savings, they may

consider that the opportunity costs are too high, and the payback period too long, to be worth the effort. Furthermore, split incentives between tenants, homeowners and energy producers rarely work in favour of energy efficiency. Other common obstacles include a lack of sufficient investment capacities for the agents of energy efficiency, uncertainties and the risks of such investments, organizational barriers, technological lock-in and path dependency, and a lack of information and/or awareness. Progress towards energy-efficient housing therefore requires not only technological solutions, but institutional infrastructure for the active deployment of these solutions.

6. The draft Action Plan is designed to prompt and shape the policies in the field of energy-efficient housing in the member States. Although some countries in the UNECE region, such as those belonging to the European Union, have adopted international agreements related to energy efficiency in housing, for many UNECE member States this draft Action Plan is the first document of its kind.

#### **A. Purpose and scope**

7. The present draft Action Plan presupposes that housing in the UNECE region must be purposefully and progressively transformed into an advanced sector that is well equipped to tackle global environmental challenges, meet local everyday needs and achieve its full potential in the national economies. Improved energy efficiency is considered to be an essential element for such a transformation and is the overall agenda of the Action Plan.

8. *Improved energy efficiency in housing is defined as achieving reduced energy intensities in residential services without compromising the well-being of the residents or the environment.* The corollary of this definition is that housing that consumes excessive energy, pollutes the environment and is associated with problems of energy affordability cannot be considered to be efficient. This definition thus recognizes the links between energy efficiency and the three components of sustainable development: the environment, society and the economy.

9. Based on this definition, improved housing energy efficiency contains the following components:

- (a) Retrofitting existing housing to achieve high energy efficiency standards;
- (b) High energy standards for all newly built homes;
- (c) Energy-efficient utility systems providing services to housing;
- (d) Low-energy housing management systems;
- (e) Replacement of inefficient equipment, appliances and lighting systems;
- (f) Good environmental quality in spatial planning;
- (g) Environmentally friendly building practices;
- (h) A minimized carbon footprint for the housing sector;
- (i) Housing energy affordability.

10. The overall aim of this draft Action Plan is to establish the necessary institutional conditions to develop and strengthen these components and thereby achieve a sustainable and progressive transformation towards a low-energy and ultimately zero-energy and carbon-neutral housing sector. Specific objectives include the following:

- (a) Develop administrative, legal, and financial capacities, as well as political leadership allowing the large-scale and holistic implementation of energy efficiency measures in the housing sector;
- (b) Encourage the private and public sectors to invest heavily into housing energy efficiency;
- (c) Ensure that performance standards in the housing sector become increasingly more energy efficient and environmentally friendly and ultimately achieve zero-energy and zero-carbon goals;
- (d) Bring about behavioural change with regard to energy demand practices in housing;
- (e) Make the benefits of energy-efficient housing widely available, socially inclusive and affordable.

11. To these ends, the draft Action Plan provides a policy framework for both the actions of individual member States and international cooperation until 2020.

### **B. Guiding principles**

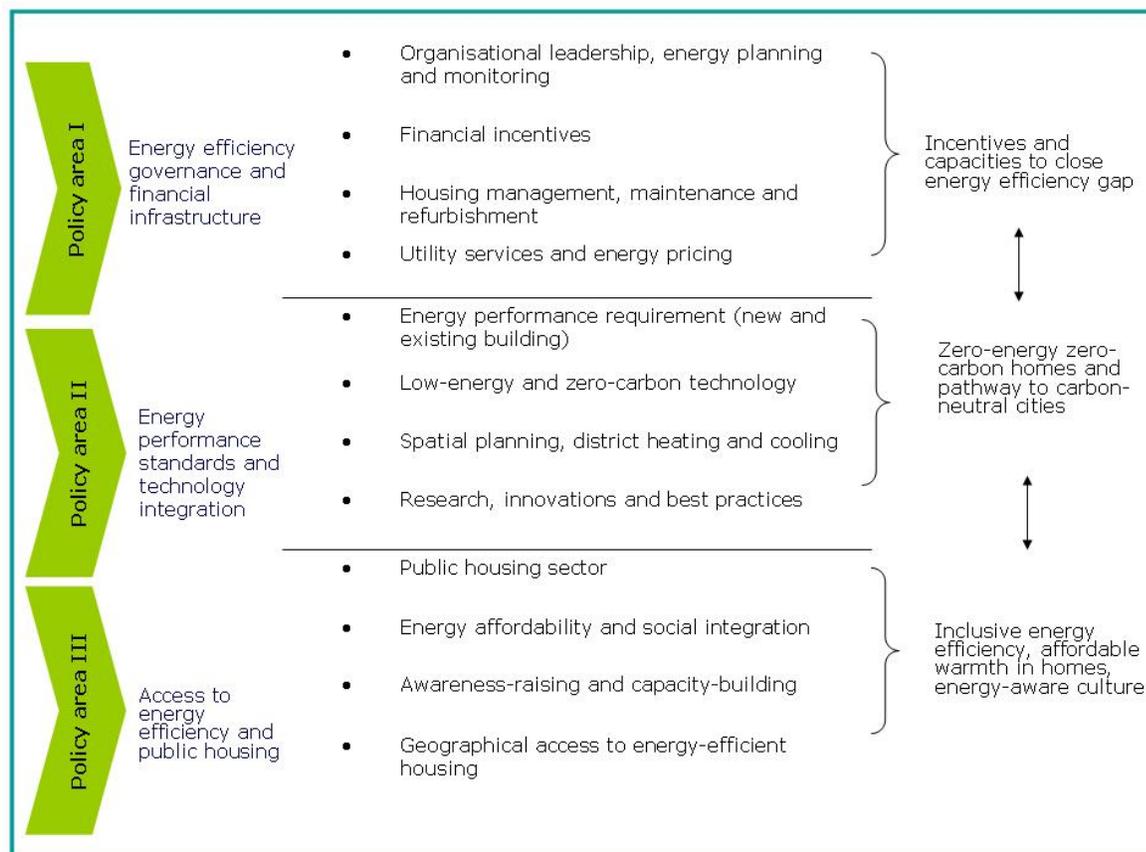
12. The draft Action plan is based on the following guiding principles, which should be considered in combination with the framework:

- (a) *Comprehensiveness.* There is no single measure that can achieve housing energy efficiency. Policies should be comprehensive and integrative of a number of instruments. Simultaneous cross-sectoral approaches are necessary. One-dimensional solutions may lead to undesired or even unexpected results. This draft Action Plan should therefore be considered in its entirety and all goals and targets should be reflected in national policies, even if their operational implementation may differ.
- (b) *Learning and flexibility.* Policies should both encourage and embrace best practices and innovations emerging from research and development (R & D), information exchange, demonstration and pilot projects. Policies should also allow sufficient flexibility in approach and avoid overregulation that, on the one hand, may hamper initiative and lead to a monopolization of the industries in question and, on the other, force actors to flout the formal requirements if necessary capacities are lacking, especially in poorer countries.
- (c) *People-centred approach.* It is vital that energy efficiency be interlinked with social policies and ensure affordable access to energy, promote the well-being of society and help reduce social inequality. To consider energy-efficient housing in narrow technocratic terms is inadequate from both a social and political point of view. Another important consideration to be taken into account is that housing energy efficiency should be combined with housing affordability.
- (d) *Sensitivity to geographical context.* There are large differences across the UNECE region with respect to the levels of economic development, legislative and organizational structures, the history and practice of the residential sector and climatic conditions. The draft Action Plan has a universal relevance to the UNECE region and it is expected that all goals and targets will be properly incorporated into policies at the national and local levels. Further, local socio-economic, institutional and geographical contexts should be taken into account in designing and implementing specific measures.

### C. Structure

13. The draft Action Plan outlines three policy areas, each of which contains four goals. These are divided into more concrete targets and suggested actions to be taken to reach those targets, including timeframes. Each goal is also underpinned by a vision or an overall expected outcome for its implementation by the year 2020.

14. The detailed draft Action Plan is presented in section D. The illustration provides an outline of the draft Action Plan, indicating the three policy areas, twelve goals and overall expected outcomes.



**D. Policies and actions**

**POLICY AREA I**  
**ENERGY EFFICIENCY GOVERNANCE AND FINANCIAL INFRASTRUCTURE**

*Goal 1. Organizational leadership and energy planning: Designate administrative bodies responsible for improving energy efficiency in housing: develop energy planning, management and monitoring capacities.*

Rationale: Enhancing energy efficiency in housing requires a dedicated process of decision-making, planning, coordination, implementation and control; therefore, specific organizational units in Governments must be established. They must ensure that the housing sector is highly visible on the energy policy agenda. Further, regional and local energy planning, of which housing must be an integral part, should facilitate interdepartmental coordination, including coordination between the housing and energy sectors. Energy planning and governance systems must, in turn, be supported by reliable data to adequately assess the current situation and monitor policy impacts.

*Targets*

1.1. Introduce framework laws supporting institutional changes with respect to energy efficiency

1.2. Establish national and local government structures responsible for energy practices and energy efficiency in housing

*Actions*

1.1.1. A framework law for energy-efficient transformations containing provisions for the domestic building sector should be introduced.

1.1.2. Links should be set up between energy efficiency in housing and climate change policies.

1.1.3. Changes should be made to national and local legislation as necessary to support the policies outlined in the draft Action Plan.

1.2.1. An ad hoc national organizational unit should be entrusted with the responsibility of coordinating, monitoring, enforcing and evaluating energy efficiency measures in housing (this may be a key body within existing housing departments or a newly formed structure).

1.2.2. The unit should be given concrete functions and powers over other relevant national departments and regional or local governments, such as drafting policies and initiating legislation.

1.2.3. If necessary in the national context, a multi-level structure of the unit should be established at the regional and local levels.

1.2.4. The unit should establish strong coordination mechanisms between housing, energy and other authorities and stakeholders.

1.2.5. Each local administration should be required to have its own body dealing with housing energy efficiency.

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| 1.3. Design and implement action plans for energy efficiency in housing at the national and local levels | 1.3.1. National governments, in collaboration with relevant international and national stakeholders, should devise national plans and strategies for energy-efficient housing.<br>1.3.2. National action plans should be written into a subsidiary programme of work that guides local governments.   |
| 1.4. Build statistical indicators and databases for energy monitoring in the residential sector          | 1.4.1. National statistical indicators and monitoring capacities based on cooperation between departments responsible for housing, energy and statistics should be developed.<br>1.4.2. Information database systems should be set up at the regional and local levels to support decision-making with respect to energy efficiency.<br>1.4.3. International databases of best practices should be set up.<br>1.4.4. A complete energy performance database for all homes should be created in the long term. |
| 1.5. Develop a coordinated system of regional and local planning of energy resources                     | 1.5.1. An energy resources planning system should be established.<br>1.5.2. Legal and administrative responsibilities throughout the energy-planning system should be designated.<br>1.5.3. Informational support for the system should be deployed.  |

*Goal 1 – Vision 2020:* Dedicated and effective government leadership to steer the transformation of the housing sector towards increasingly lower levels of energy demand and carbon emissions.

*Goal 2: Financial incentives: Develop financial mechanisms that will stimulate owners, tenants, the construction industry, technology providers and other stakeholders to invest in energy-efficient housing.*

Rationale: A sound financial framework is necessary for stakeholders to raise capital for retrofitting and investing in efficiency technology, and for new technologies to establish market niches. This should include a transparent system of subsidies, grants, loans, public investment programmes, leasing and self-financing funding sources.

#### *Targets*

- 2.1. Develop a system of subsidies for improved energy efficiency in housing

#### *Actions*

- 2.1.1. More funds (e.g. tax-based funds and revolving funds) should be provided in public budgetary systems to allow subsidies for energy efficiency.  
2.1.2. Grants or rebates and subsidies to homeowners and tenants for the purchase and installation of energy-efficient equipment such as microgeneration equipment and for retrofitting homes with higher energy efficiency should be increased.  
2.1.3. The above-mentioned subsidies should be granted

solely for solutions that have a high energy-efficiency impact, and to existing homes which lack such solutions.

- 2.1.4. In the longer term, only holistic, comprehensive renovations meeting requisite energy and environmental criteria should be subsidized.
- 2.1.5. A publicly sponsored system of interest-free and low-interest loans for energy efficiency retrofit and improvements should be available.
- 2.1.6. Grants to low-income households and affordable housing providers should allow them to improve energy efficiency.
- 2.2. Improve tax incentives (tax credits, reductions, exemptions)
  - 2.2.1. Tax instruments such as tax credits and tax deductions on investments in energy efficiency should be reviewed and strengthened.
  - 2.2.2. Exemptions from property taxes for new homes built to much higher efficiency standards than present building codes should be introduced (limited to a certain property value and a certain number of years).
  - 2.2.3. Property tax exemptions should be introduced for all high-energy demand residential buildings converted to meet performance standards in accordance with the codes for new homes (subject to audit and certification).
  - 2.2.4. Tax incentives for certain newly commercialized technologies should be introduced. Such incentives include tax reductions or value-added tax removal for efficient boilers, heat pumps, solar collectors and thermal insulation.
- 2.3. Introduce tax on inefficiency
  - 2.3.1. An energy inefficiency property tax should be introduced based on energy performance certification and depending on both energy performance and the size of property; lack of certification should lead to maximum taxation for a given size.
  - 2.3.2. Low-income homeowners should be exempted.
- 2.4. Introduce systematized information portals on financial incentives
  - 2.4.1. Nationwide information about available financial resources that is accessible from a single user-friendly portal should be systematized.
  - 2.4.2. Model investment schemes should be developed and made available.
- 2.5. Stimulate development of energy efficiency practices within financial institutions
  - 2.5.1. Legal provisions should be made for collateral, guarantees and insurance that banks can use to create credit facilities for energy-efficient projects.
  - 2.5.2. A system of public guarantees for loans to cover investments in improved energy efficiency in housing should be developed.
  - 2.5.3. Financial institutions should be required to prove their expertise in the appraisal and risk assessment of

energy-efficient projects in order to participate in public and private partnership energy efficiency programmes.

- 2.5.4. Detailed instructions for financial institutions should be provided so that they can incorporate energy efficiency in their business models.

*Goal 2 – Vision 2020:* The financial system raises stakeholders' incentives and investment capabilities to the levels necessary to close the energy efficiency gap in the housing sector.

*Goal 3. Housing management, maintenance and refurbishment: Develop the institutional capacities of housing management that lead to energy efficiency improvements and establish programmes for retrofitting of housing.*

Rationale: The residential sector requires continuous maintenance and renovation in order to meet modern requirements of quality, comfort and energy efficiency. There must be a system of clearly defined responsibilities in place for housing management and maintenance that integrates energy efficiency into its operational practices. Furthermore, the problem of split incentives between landlords and tenants hinders investment in energy efficiency and needs to be resolved.

#### *Targets*

3.1. Develop institutional capacities for housing management

#### *Actions*

3.1.1. Legislation should be provided for the establishment and operation of homeowners associations in apartment buildings on which legal obligations for housing maintenance are imposed.

3.1.2. Responsibilities for the maintenance of common areas should be defined.

3.1.3. The decision-making process for collective homeownership should be set out.

3.1.4. Maintenance funds set up by collective homeowners associations should also be used to finance energy efficiency projects as part of maintenance activities.

3.1.5. Homeowners associations can borrow additional capital for maintenance activities, including those related to achieving energy efficiency.

3.1.6. Homeowners associations should be given powers of enforcement over apartment owners who are not willing to take part in maintenance schemes or who are unable to fulfil their obligations.

3.1.7. Non-owning tenants' rights and responsibilities should be secured (i.e. security of tenure).

3.2. Professionalize housing management

3.2.1. A transparent market for housing management companies should be established (involving SMEs).

3.2.2. Training programmes and other capacity-building initiatives in housing management should be widely

available at the local level (with the participation of educational institutions and interested NGOs).

- 3.2.3. Special mechanisms should be created that provide low-cost technical assistance to homeowners in the field of energy-efficient renovation.
- 3.2.4. Portfolios of model of energy efficiency investment schemes should be available.
- 3.3. Develop publicly sponsored programmes for retrofitting of housing
  - 3.3.1. Energy efficiency retrofit should be incorporated into all government housing regeneration strategies and programmes.
  - 3.3.2. Special programmes should be provided for energy efficiency improvements in the most problematic parts of dwellings, for example, glazed areas.
  - 3.3.3. Separate programmes should be developed for comprehensive retrofitting of existing low-quality and low-energy-efficient homes.

*Goal 3 – Vision 2020:* The housing management system operates within a strong framework of capacities and incentives to deliver higher energy efficiency.

*Goal 4. Utility services and energy pricing: Develop mechanisms for sustainable end-use management of energy in housing, making utilities more efficient, adjusting energy pricing systems and providing incentives for energy suppliers.*

Rationale: User fees for delivered energy are important for stimulating energy-efficient behaviour. Therefore, a suitable energy-pricing scheme should be in place. However, households must have full control over their own energy demand and make informed decisions regarding use, while utility companies and energy producers should be required to improve end-use energy efficiency.

#### *Targets*

4.1. Develop technological capacities for sustainable energy management in the housing sector

#### *Actions*

- 4.1.1. Dwelling-level energy metering and adjustable controlling systems should be fully provided for electricity, gas, heating and hot water.
- 4.1.2. Targets should be set for replacement of traditional meters with smart meters that feature real-time information, including price information.
- 4.1.3. New homes should be required to be equipped with intelligent integrated controls system for energy and indoor climate (temperature, humidity, ventilation).
- 4.1.4. Energy utility distribution networks should be maintained and updated to high technological standards.
- 4.1.5. End-users should be able to choose from a range of suppliers, including those of renewable generation systems.

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| 4.2. Establish an adequate and responsible energy-pricing system for the housing sector            | <ul style="list-style-type: none"> <li>4.2.1. Fixed-cost payment systems for energy services should be eliminated; users should pay for energy used.</li> <li>4.2.2. Progressive tariff systems designed to charge domestic end-users more per unit of energy above certain thresholds should be introduced.</li> <li>4.2.3. Differentiated energy tariffs taking into account the time of day and the season should be introduced. These are based on smart metering, which provides two-way communication.</li> </ul>  |
| 4.3. Provide incentives for and optimize energy suppliers and utilities                            | <ul style="list-style-type: none"> <li>4.3.1. Utilities should be required to send informative energy bills and advise customs on everyday energy-saving measures, possible efficiency investments and available financial incentives.</li> <li>4.3.2. Energy suppliers should be required to spend extra income received from the higher energy tariff bands for energy efficiency.</li> <li>4.3.3. Provisions should be made to reward utilities for end-users' energy savings to which they contribute and for low-carbon energy supplied.</li> <li>4.3.4. A system of tradable energy-saving certificates, for example, white certificates, should be devised.</li> <li>4.3.5. Institutional conditions necessary for energy performance contracting and for energy services companies should be established.</li> </ul> |
| 4.4. Develop technological capacities and incentives for microgeneration in the residential sector | <ul style="list-style-type: none"> <li>4.4.1. Capabilities should be provided for bi-directional electricity flows, allowing on-site generation from renewable sources to be transmitted to the grid.</li> <li>4.4.2. Households should be paid for energy microgeneration at preferential tariffs irrespective of whether they use it on site or feed into the grid, where and as long as deemed necessary for this technology to develop.</li> <li>4.4.3. Electricity suppliers should be required to source a certain proportion of electricity from renewable microgeneration.</li> </ul>  |

*Goal 4 – Vision 2020:* The housing sector is connected to intelligent energy grids based on digital technology and user-friendly control systems; utilities deliver renewable energy to households and efficiently redistribute energy generated by homes.

**POLICY AREA II**  
**ENERGY PERFORMANCE STANDARDS AND TECHNOLOGY INTEGRATION**

*Goal 5: Energy performance requirements for homebuilding and existing housing:  
Strengthen energy and carbon performance requirements for both new and existing homes.*

Rationale: The system of mandatory standards for energy performance of buildings, as per their design and system for heating, hot water, ventilation, cooling, lighting and related control, is among the most effective means of increasing energy efficiency of new buildings and must be promoted. It is also important to develop mechanisms for energy performance of existing buildings, as they will constitute the bulk of the housing stock for many decades.

<i>Targets</i>	<i>Actions</i>
5.1. Improve the dynamics and mandatory system of energy and carbon performance standards for new domestic buildings	<p>5.1.1. Building codes should be made mandatory throughout the entire country.</p> <p>5.1.2. Energy standards should be raised regularly to higher levels; future targets should be set in advance to give the industry time to adjust.</p> <p>5.1.3. Differentiated energy requirements should be introduced according to climatic zones, for example, stricter u-value requirements for cold regions.</p> <p>5.1.4. Differentiated energy efficiency requirements should be introduced depending on the size of the project and status of the developer. Larger developments and public-sector projects are required to meet more challenging standards faster.</p> <p>5.1.5. In the medium term, standards should include energy and carbon performance during the full life cycle of the building, taking into account energy used in the manufacturing of construction materials and during the construction phase.</p> <p>5.1.6. In the medium term, energy performance standards should be set requiring all new buildings to be built to comply with passive house standards, and in the longer term, with net zero-energy standards (see target 6.1).</p>
5.2. Introduce mandatory energy certification for all residential buildings	<p>5.2.1. A universally regulated system of energy audit and certification should be introduced at the national level.</p> <p>5.2.2. Certification should be based on a system of integrated environmental assessment of buildings that includes both energy and carbon indicators.</p> <p>5.2.3. All new homes should be required to obtain energy performance certificates.</p> <p>5.2.4. Existing homes are required to obtain energy performance certificates if they are being sold or if the owner applies for tax reductions or subsidies (see target 2.1).</p>

- 5.2.5. Certification should be added to housing energy efficiency databases (see target 1.4).
- 5.2.6. Mass energy assessment of all residential buildings should be conducted once the certification and audit system is well established.
- 5.3. Develop energy performance standards for existing housing
  - 5.3.1. Certain levels of energy efficiency should be required before issuing building permits for extensive renovation and reconstruction.
  - 5.3.2. Energy efficiency standards should be established for existing homes that take into account, for example, year of construction and heritage value; initially may be used in a pilot phase (e.g. for subsidies or renovation priorities).
  - 5.3.3. After a transition period, energy standards should be made mandatory for existing housing, so that homes must be retrofitted - and if not in compliance with the requirements, they should be considered unsuitable for occupation.
  - 5.3.4. Dates should be provided to indicate when energy standards call for the renovation of certain categories of existing buildings in order to meet passive-house and zero-energy standards (see target 6.1).
- 5.4. Ensure the enforcement of mandatory standards
  - 5.4.1. Mechanisms to control and enforce the implementation of mandatory codes, including heavy penalties for non-compliance, should be strengthened.
- 5.5. Make energy efficiency a prerequisite for subsidized housing projects
  - 5.5.1. High levels of energy efficiency should be required for government investments in housing; public procurement and subsidies for projects with low energy efficiency should be phased out.
  - 5.5.2. Energy efficiency should be made a selection criterion in the allocation of public subsidies to residential construction projects.

*Goal 5 – Vision 2020:* Low-efficiency residential buildings have been retrofitted to high levels of energy efficiency or demolished in a sustainable way; all new homes and retrofits are made to comply with zero-energy and zero-carbon standards.

*Goal 6. Low energy and low-carbon technology: Promote innovative solutions in new and existing residential buildings such as passive houses, zero-energy and zero-carbon homes, and enable conditions for microgeneration of energy.*

**Rationale:** Improved energy efficiency in housing is based to a large degree on the availability and application of technological solutions. Their dissemination must therefore be facilitated. Appropriate national targets and measures should favour very-low-energy, zero-energy and zero-carbon technology, as it is will most likely become a requirement in the residential sector as soon as necessary capacities develop. Renewable energy, as well as switching to less carbon-intensive fuels, should be promoted.

*Targets*

6.1. Promote passive-house, zero-energy and carbon-neutral buildings solutions

6.2. Develop on-site renewable energy generation capacities (see target 4.4.)

6.3. Promote off-site renewable and low-carbon energy supply to households (see targets 4.4. and 7.4.)

6.4. Promote low-energy lighting and appliance standards

*Actions*

6.1.1. National targets should be set for a step-by-step transformation towards passive-house, zero-carbon, zero-energy and plus-energy buildings technology; these targets should take into account the differences between regional climatic zones.

6.1.2. Universal definitions and design standards should be developed for zero-energy or positive energy buildings that integrate energy and other environmental and health requirements, such as for indoor air quality.

6.1.3. In the medium term, new buildings should be required to meet passive buildings standards.

6.1.4. In the longer term, building codes should be established that require new homes be built to comply with net zero-energy or positive energy standards.

6.1.5. In the long term, building codes should require existing homes to be renovated to meet net zero-energy standards.

6.1.6. The highest energy efficiency standards should be required for all new equipment in new and existing homes, especially with regard to ventilators, pumps, pressure losses in ventilation systems, heat distribution and heat storage.

6.1.7. Policies should be developed that ensure the incorporation of these standards into energy performance standards (0) and their coordination with financial stimuli (see goal 2).

6.2.1. National action plans should consider measures and dissemination of on-site generation technologies for renewable energy.

6.2.2. Bi-directional flow and net-metering should be enabled.

6.2.3. In the longer term, solar collectors should be required in all new and renovated houses (subject to climatic considerations).

6.3.1. Incentives should be offered so that utilities can provide renewable energy for households.

6.3.2. Carbon intensities of energy supplied to the residential sector, for example, by switching from oil to gas and to biomass pellets or developing on-demand district heating and cooling, should be continuously reduced.

6.4.1. National action plans should consider measures to improve the performance of household appliances and lighting.

6.4.2. Minimum energy performance standards for the design of household appliances and lighting should be established and gradually reviewed.

- 6.4.3. Local producers of low-energy appliances should receive support.
- 6.4.4. Programmes should be introduced to phase out low-performing appliances and equipment and incandescent bulbs.
- 6.4.5. Technologies allowing reduced use of energy for lighting and appliances should be incorporated into building management.

*Goal 6 – Vision 2020:* At least 10 per cent of the population in the UNECE region live in zero-energy zero-carbon homes; microgeneration in the sector of domestic buildings is a significant contributor to primary energy production.

*Goal 7. Spatial planning, development control and district heating and cooling systems: Include energy efficiency in spatial strategies, urban planning and development practices; develop district heating and cooling systems.*

Rationale: The technological attributes of buildings alone do not help reduce energy demand; their overall design, spatial orientation, relationship with the surrounding area and the spatial organization of neighbourhoods and communities at large are contributing factors as well. Certain levels of residential density, mixed-used developments, good public transit and integrated district heat-cooling-electricity systems are important considerations in efforts to achieve energy efficiency and reduce greenhouse gas emissions. Spatial planning and the organization of municipal space and municipal services are therefore among the principal means of reaching improved residential energy efficiency.

*Target*

*Action*

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| 7.1. Include residential energy efficiency considerations in the planning process    | <ul style="list-style-type: none"> <li>7.1.1. Urban plans should take into account measures aimed at reducing the energy demand of residential areas and carbon footprints.</li> <li>7.1.2. Urban plans should consider energy resources planning.</li> <li>7.1.3. Definitions of, and planning support for, eco-towns, or sustainable residential areas, should be established.</li> <li>7.1.4. Energy efficiency considerations should be an integrated part of all activities involving comprehensive regeneration of neighbourhoods.</li> </ul>                                      |
| 7.2. Incorporate residential energy efficiency considerations in development control | <ul style="list-style-type: none"> <li>7.2.1. Legal provisions should be made so that building permits are only issued for residential projects that are optimized spatially to reduce energy demands; these include density and transport considerations, best advantage of natural heating, cooling, lighting and shading potentials.</li> <li>7.2.2. Residential projects with certain levels of energy efficiency should be ensured fast-track planning for permit applications.</li> <li>7.2.3. Fast-track planning applications should be provided for microgeneration.</li> </ul> |

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| 7.3. Apply holistic approaches to the assessment of energy efficiency and environmental standards in residential projects | 7.3.1. The integrated design of entire buildings should be considered for the assessment of their energy efficiency.<br>7.3.2. The life cycles of buildings – all stages, from the manufacturing of construction materials to demolition and recycling of same – should be optimized to reduce overall carbon footprints.           |
| 7.4. Develop district and cooling systems   | 7.4.1. Demand-driven district heating systems should be developed (each building takes heat and hot water from the system as needed).<br>7.4.2. In the longer term, integrated district heating and cooling systems should be developed.<br>7.4.3. Standards for energy efficiency of distribution pipelines should be established. |

*Goal 7 – Vision 2020:* Cities and other built-up areas consume less energy and are on their way to becoming carbon neutral.

*Goal 8. Research, innovations and best practices: Stimulate the development of innovations and new techniques in the domestic buildings sector.*

Rationale: Best practices and innovations that emerge from R & D, demonstration or pilot projects must be translated into real-life applications and stimulate a continuous transformation of the building sector towards new technological frontiers. However, energy-efficient solutions and innovations need not be expensive or used exclusively on high technology; affordable solutions should be prioritized.

#### *Targets*

8.1. Support R & D capacities

#### *Actions*

- 8.1.1. A national competitive framework to select promising projects for public support such as energy efficiency trusts should be established.
- 8.1.2. Special public funds should be set up to help the R & D sector devise new low-energy and energy exchanger technologies and techniques for the residential sector: heating, ventilation, and air conditioning systems, heat pumps, solar collectors, cogeneration, efficient construction materials, prefabricated methods and appliances.
- 8.1.3. Support and assistance for pilot projects in innovative areas should be provided.
- 8.1.4. Holistic post-occupancy evaluations of pilot projects for feedback information, for example energy monitoring, comfort analysis and cost analysis, should be provided.

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| 8.2. Stimulate the development of affordable solutions, especially those using local materials | 8.2.1. Public research grants should be provided to develop technologies suitable for particular geographical conditions.                                       |
|  | 8.2.2. Public grants should be provided to develop affordable technology for low-energy, low-carbon and passive buildings, especially using local materials.    |
|  | 8.2.3. Special funds to assist high-risk yet promising innovative R & D should be set up.   |
| 8.3. Support the transition of energy efficiency products from R & D to commercialization      | 8.3.1. Communications between R & D and commercial sectors should be improved.  |
|  | 8.3.2. Special publicly supported agencies should be set up to work as intermediaries for better dissemination of technologies and information to stakeholders. |
|  | 8.3.3. Grants should be provided to help promising technologies develop their market niche.   |
|  | 8.3.4. Locally available construction materials should be promoted.   |
|  | 8.3.5. Innovative design tools should be available.   |
|  | 8.3.6. New technologies should be incorporated into product lines.  |
|  | 8.3.7. SMEs should play an active role in the commercialization of new technologies.  |

*Goal 8 – Vision 2020:* Next-generation technologies for the energy efficiency transformation of the domestic buildings sector are available and being actively deployed.

### **POLICY AREA III**

#### **ACCESS TO ENERGY EFFICIENCY AND PUBLIC HOUSING**

*Goal 9. Public housing sector: Ensure the transformation of the social or public housing stock towards greater energy efficiency.*

Rationale: Specific policies should target the public or social housing sector, which offers particular opportunities from an institutional point of view. Public or social housing in some countries already delivers better standards of energy efficiency than average private homes, which, inter alia, helps tackle fuel poverty. Special programmes for investing in retrofitting of the existing public stock and stricter requirements for better energy efficiency performance of new homes are needed. As the organization of public or social housing varies considerably across the UNECE region, different combinations of financial and legal measures should be provided according to local contexts.

#### *Target*

- 9.1. Develop special energy efficiency policies for the public or social housing sector

#### *Actions*

- 9.1.1. Action plans for the energy-efficient transformation of the public or social housing sector should be drawn up.
- 9.1.2. Energy efficiency considerations should be included in all related documents and procurement contracts.

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| 9.2. Develop comprehensive retrofitting programmes for public or social housing  | 9.1.3. Combinations of financial and legal measures should be provided for the public or social housing sector according to national contexts.   |
| 9.3. Enable the conditions for new public or social housing to adhere to stricter requirements for energy efficiency performance than other housing definitions (see target 5.1) | 9.2.1. Comprehensive retrofitting programmes for public or social housing, starting with the most problematic areas and gradually extending to the whole public or social housing stock, should be introduced. |
|  | 9.3.1. New public or social housing should be required to meet stricter energy codes more quickly than other homes.  |
|  | 9.3.2. Existing public or social housing should be required to be retrofitted to high standards of energy efficiency and to use the best available technologies and solutions.                                 |
|  | 9.3.3. New public or social housing should be required to incorporate renewable energy microgeneration.  |
|  | 9.3.4. In the longer term, all new public or social housing and retrofits should be made to comply with zero-energy (carbon-neutral) standards.  |

*Goal 9 – Vision 2020:* All public homes have initiated action to become carbon neutral; public or social housing is at the forefront of the energy efficiency revolution and sets an example for the rest of the housing sector.

*Goal 10. Energy affordability and social integration: Ensure affordable access to energy efficiency and eradicate energy poverty.*

Rationale: Even in most developed UNECE countries, a considerable portion of the population lives in energy poverty, that is, people spend more than 10 per cent of household income on energy in order to heat their homes to a minimum standard of warmth. Since the same groups are unable to afford energy efficiency, the vicious cycles of energy poverty can worsen. Furthermore, technologies and measures that may be considered affordable in some areas are not necessary affordable if implemented in less affluent regions.

<i>Targets</i>	<i>Actions</i>
10.1. Develop interdepartmental social policy framework for energy affordability	10.1.1. Energy affordability considerations should be integrated with social policies and safety net provisions.
	10.1.2. A special organizational body that is responsible for energy affordability issues and interdepartmental cooperation in the field should be set up.
	10.1.3. Criteria should be developed as to what percentage of the household income should be spent on energy before targeted subsidies are provided.
10.2. Eradicate energy poverty	10.2.1. A complex set of financial measures to tackle energy poverty, including assistance with energy bills, should be introduced.

- 10.2.2. Subsidies and grants to low-income residents should be allocated to improve energy efficiency performances of their dwellings, inter alia, for retrofitting purposes.
- 10.2.3. In the longer term, energy subsidies should be replaced with more generous assistance to improve energy efficiency so that less energy is consumed for acceptable levels of comfort.
- 10.2.4. Low-income households should receive grants and subsidies to purchase new energy-efficient major appliances.
- 10.2.5. Information about energy efficiency assistance should be readily available and application procedures for vulnerable groups should be simplified.
- 10.3. Ensure that low-income groups are not negatively affected by higher building efficiency standards
  - 10.3.1. Dynamic building codes should be coordinated with a dynamic system of public subsidies for low-income and other vulnerable groups.
  - 10.3.2. Local affordable energy efficiency construction materials should be promoted and made available (see target 8.2).

*Goal 10 – Vision 2020:* Energy poverty is eradicated; energy efficiency solutions are affordable for the majority of the population.

*Goal 11. Awareness-raising and capacity-building: Provide capacity-building and education programmes to nurture an energy-aware culture and develop requisite skills.*

Rationale: Much can be achieved through increased public awareness, as a major constituent of energy efficiency depends on informed choice by individuals. Effective communication has a positive impact on energy efficiency by promoting informed choices and contributing to behavioural change. Relevant policies receive public support and commitment particularly in those societies that are well aware of energy efficiency and environmental concerns.

#### *Targets*

11.1. Make energy efficiency more visible for consumers

#### *Actions*

- 11.1.1. Mandatory energy rating for residential buildings should be established (see target 5.2).
- 11.1.2. Energy ratings for residential buildings should be informative and clear.
- 11.1.3. Independent energy ratings and labelling of construction materials, windows and appliances should be compulsory.
- 11.1.4. Energy bills should include detailed information about energy use and options for improving existing energy efficiency potential (see target 4.3).

- 11.1.5. Domestic users should be able to access with desired frequency information on their energy use and renewable energy gains by means such as smart meters, online access, e-mail and phone messaging.
- 11.2. Support the establishment of multiparty partnerships/ associations for energy efficiency in the residential sector
- 11.2.1. Multi-stakeholders associations should be established at national and local levels to ensure coordination between business development and public initiatives; in the residential sector, initiatives and capacities should be pooled, and energy efficiency promoted.
- 11.2.2. Public financial incentives should be offered for voluntary energy standards and labelling.
- 11.2.3. Contests should be organized between neighbourhoods or cities to win government prizes for excellence in energy efficiency and grants; this also improves local cooperation between the public and private sectors.
- 11.3. Strengthen public awareness campaigns
- 11.3.1. Information campaigns should use a variety of multimedia to emphasize the importance and benefits of energy-efficient homes and suggest energy efficiency measures.
- 11.3.2. Targeted campaigns for specific groups of stakeholders should be launched.
- 11.3.3. Relevant public policies should be disseminated widely and in a transparent manner, primarily through the national and local mass media.
- 11.3.4. Organizational and information assistance should be provided for campaigns, and information days organized by interested NGOs and other stakeholders.
- 11.3.5. Information handbooks on good practices should be available.
- 11.3.6. Energy efficiency calculators featuring user-friendly, attractive ergonomics should be widely available.
- 11.4. Support the establishment of local energy centres and demonstration projects
- 11.4.1. Publicly funded local energy centres should be set up to provide advice for homeowners and other stakeholders.
- 11.4.2. Demonstration projects, for example technical, commercial and integrated projects, should be available and supported.
- 11.5. Develop educational programmes in energy efficiency
- 11.5.1. Energy-awareness courses should be introduced in primary and secondary schools.
- 11.5.2. Degree and non-degree training programmes should be developed for different stakeholder groups, such as continuing education for professionals and policy experts.

- 11.5.3. Proficiency in energy efficiency should be an essential requirement for qualification as an architect or town planner.

*Goal 11 – Vision 2020:* Housing energy efficiency is part of everyday practice and business relationships, and has achieved entrenched understanding and culture.

*Goal 12. Geographical access to energy-efficient housing: Carry out additional measures in regions and areas with lower level of developments in the area and in those with more challenging climatic conditions.*

Rationale: Many countries in the UNECE region are not aware of state-of-the-art developments in energy efficiency in housing. Moreover, the status of energy efficiency development may vary significantly between different areas within national boundaries. Such biographical asymmetries result in vicious circles of energy inefficiency traps and pose barriers to gaining common benefits from reducing climate change risks across countries. Furthermore, climatic conditions vary widely in the UNECE region. Larger capital investments and stricter performance requirements may be necessary to achieve zero-energy and other building sustainability targets in the coldest and hottest climates and areas most exposed to adverse effects of climate change. Necessary policy measures should compensate for geographical differences.

<i>Targets</i>	<i>Actions</i>
12.1 Adjust policies to specific climatic conditions	12.1.1 Specific local requirements should be assessed for energy efficiency in housing in different climatic zones. 12.1.2. Special funds should be provided to facilitate energy efficiency transformation in areas that require greater capital investments for future compliance with zero-energy standards, for example in cold climatic areas.
12.2. Anticipate the effects of climate change and adjust policies	12.2.1. Regional climate change adaptation strategies should be drafted and incorporated into energy efficiency measures in the housing sector. 12.2.2. Specific adaptation policies should be devised for the areas that are most exposed to the negative effects of climatic changes.
12.3. Ensure a better dissemination of energy-efficient technologies and techniques across subnational areas	12.3.1. National organizational support and financial assistance programmes to less affluent areas and regions should be developed. 12.3.2. Special funds should be set up to assist lagging areas. 12.3.3. Subnational governments should be required to improve energy performance in their areas in order to receive housing grants.

- 12.4. Participate in international activities that improve access to energy-efficient housing across countries
  - 12.4.1. International research should assess the contextual requirements of lagging countries and good practices should be exchanged at the international level, bearing in mind the local context.
  - 12.4.2. International funds should be set up to provide support for national energy efficiency improvement programmes in the housing sector.
  - 12.4.3. Lagging countries should receive targeted international support, including technological support and training.
- 12.5. Maximize synergies generated by international cooperation
  - 12.5.1. International organizations should share knowledge and experience with regard to residential energy efficiency.
  - 12.5.2. International organizations should facilitate the mutual recognition of relevant energy efficiency standards and qualification
  - 12.5.3. International organizations should advocate a principal role for the housing sector in climate change mitigation and adaptation strategies.
  - 12.5.4. Member States of UNECE should cooperate closely with the Committee on Housing and Land Management to ensure the implementation of this draft Action Plan.

*Goal 12 – Vision 2020:* Balanced geographical development of housing energy efficiency is achieved and advancements in the field are evenly accessible across the UNECE region.

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