

ACCESSIBLE CLIMATE-CONSCIOUS ESSENTIAL SERVICES (A.C.C.E.S.)

POLICY PATHWAYS FOR SUSTAINABLE,
AFFORDABLE, AND ACCESSIBLE
WATER, ENERGY, AND HOUSING
SERVICES ACROSS EUROPE

► POLICY REPORT
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FOREWORD



**VALERIA
RONZITTI**
SGI Europe
General Secretary



At a time when Europe is navigating profound social, environmental, and geopolitical transitions, Services of General Interest (SGIs) have become more than the infrastructure of daily life: they are the foundation of cohesion, inclusion, and resilience in our communities. They are the backbone of a fair, resilient, and climate-conscious Europe. Yet, they face unprecedented stress originating from the adaptation to climate change, an ageing infrastructure, affordability pressures, and the administrative burden slowing their transformation.

As SGI Europe, we are proud to present the final conclusions from our Accessible Climate-Conscious Essential Services (A.C.C.E.S.) project. For the past two years, we have been developing an understanding of the critical challenges and opportunities faced by providers of SGIs across the European Union. This report presents our key findings, and ways forward to ensure the prosperity of our social market economy.

Services such as energy, housing and water are at the heart of what the European Pillar of Social Rights (EPSR) calls for, the access to essential services of good quality, available to all and especially to those in vulnerable situations. The upcoming Action Plan on the implementation of the EPSR must be a turning point: it must better recognize the right to access these services, and also highlight the need to invest meaningfully in their long-term resilience and affordability. Our members are on the frontlines of this effort, ensuring that their services are delivered through practical and local solutions.

This report further reinforces some of SGI Europe's key messages: Services of General Interest are more than a backup solution when the market fails. They are a strategic investment in Europe's future and competitiveness. Their role is crucial to enable people to live, work, and thrive in their communities, directly contributing to the vision recently reaffirmed in the Letta Report, a vision where the *freedom to stay* is as vital as the freedom to move. Without high-quality, affordable and accessible SGIs, that *freedom* becomes a privilege, not a right.

We want to thank all our partners and contributors who shaped this report. It is both a call to action and a tool for dialogue with EU institutions, with Member States, and above all citizens using public services every day. Together, we must build a future in which services of general interest are not only protected but empowered to deliver on Europe's social, environmental, and economic promise.

A stylized, handwritten signature in white ink, appearing to read 'Valeria'.

1. EXECUTIVE SUMMARY



- This report examines the climate-resilience and accessibility of essential services in the water, energy, and housing sectors across Europe. Grounded on contributions from over 40 sectoral organizations across 10 EU Member States, interviews with 30 experts, and three policy workshops, the report identifies critical challenges facing service providers and presents targeted policy recommendations for the European Commission, the Member States and the service providers with proposed measurable criteria and indicators for policy monitoring.

WHY THIS REPORT MATTERS

Europe is confronting a climate reality that is straining the foundations of daily life. More frequent droughts and floods are testing water systems. Energy grids are under pressure from extreme weather and shifting consumption patterns. Meanwhile, housing remains both a driver and victim of climate stress—inefficient buildings worsen emissions, while affordability and renovation gaps widen social divides.

This report finds that the challenges facing **water, energy, and housing providers are deeply interconnected, and require systemic, cross-sectoral solutions**. Four core challenges underpin the current crisis:

➤ **Aging and under-maintained infrastructure:** Many water and wastewater systems are operating beyond their intended lifespan. Energy distribution networks require €400 billion in investment by 2030, including €70–80 billion for adaptation. Housing renovation rates remain well below what is needed to achieve energy efficiency and climate resilience targets.

➤ **Affordability stress and social inequality:** Nearly one in five EU households struggle with energy poverty. Housing costs remain unaffordable for many tenants and young people. In some countries, up to 20% of the population reports being unable to heat their homes adequately. Water affordability has the potential to become an additional stressor due to increasing investment needs and regulatory obligations.

➤ **Fragmented governance and implementation delays:** Essential service providers report difficulties in long-term planning due to fragmented responsibilities, regulatory uncertainty, and a lack of coherent national frameworks.

➤ **Cascading and cross-sectoral risks:** Infrastructure failures do not occur in isolation. Storms, floods, and blackouts often trigger simultaneous breakdowns across water, energy, and housing systems. These compounding effects are expected to increase with climate change.

The report also highlights several **main findings**:

➤ **Investment gaps remain a major bottleneck.** Public and private financing mechanisms are insufficient to meet climate and service delivery targets. The Draghi Report estimates an annual EU investment shortfall of €750–800 billion, much of which concerns essential services.

➤ **Affordability concerns are growing across all sectors,** with low-income and vulnerable households disproportionately affected. There is also a growing overlap in users struggling with multiple services simultaneously.



► **Innovative practices are emerging**, especially in local and municipal contexts (from nature-based urban water adaptation to integrated housing-renovation programs), but these remain fragmented and underfunded.

► **The EU is increasingly recognizing the strategic value of essential services**, with new frameworks such as the Affordable Housing Plan, the revised Drinking Water Directive, and the forthcoming Affordable Energy Action Plan signaling progress. However, water still receives less attention than energy and housing at EU level.

WHAT NEEDS TO CHANGE

The report identifies four strategic priorities:

1. **Invest in infrastructure resilience**, with a focus on climate adaptation and long-term planning.
2. **Close funding gaps** using a mix of EU, national, and private sources, supported by regulatory reforms.
3. **Protect affordability and inclusion**, ensuring that adaptation and modernization do not increase inequality.
4. **Improve coordination across sectors and levels of governance**, enabling joint planning and integrated service delivery.

KEY RECOMMENDATIONS

FOR THE EUROPEAN COMMISSION:

- Establish an integrated EU infrastructure resilience framework coordinating housing, energy, and water sectors;
- Create dedicated climate adaptation funding mechanisms for essential services infrastructure;
- Reform economic governance rules to recognize essential services investments as strategic infrastructure.
- Full implementation of the polluter pays principle in order to alleviate some of the investment burdens created by pollution and protect water resources.

FOR MEMBER STATES:

- Develop national climate adaptation plans with involvement of social partners and service providers;
- Create financial incentives for climate-resilient investments using blended finance mechanisms;
- Implement integrated source control approaches for water contaminants;
- Use grants and low-cost investment support schemes for renovation with a more granular approach by balancing costs with financial possibilities of tenants without displacing them.

FOR SGI PROVIDERS:

- Develop comprehensive asset management systems for proactive infrastructure planning;
- Implement integrated efficiency programs targeting effective energy and water conservation;
- Create transparent communication channels about adaptation plans and investments;
- Form sector-specific preparedness consortia to strengthen service continuity management.

CONCLUSIONS

Europe's essential services are facing a convergence of crises, but also a window of opportunity. Without immediate action to enhance infrastructure resilience to maintain and increase affordability, Europe risks not fully meeting the needs to transition to the climate-conscious and resilient economy while also reaching the social goals of a fairer and just society. Successfully addressing these challenges requires integrated approaches that recognize interconnections between sectors and balance technical solutions with social equity considerations.

The recommendations presented in this report offer a viable pathway toward more resilient, inclusive, and sustainable essential services in Europe, aligning with the European Commission's Competitiveness Compass framework and the latest initiatives to strengthen the safety of critical infrastructure while pursuing the Industrial Clean Deal through targeted investments. These investments will strengthen not only Europe's economic competitiveness but also its social and territorial cohesion, ensuring that high-quality essential services remain accessible to all citizens despite intensifying climate challenge.

2. INTRODUCTION



- In a context where the quality and cost of essential services have a tremendous impact on the overall prosperity and inequality levels, a core interest of society in the EU regarding the measure of the health of the European economy and society is the development of detailed, trustworthy, and accessible data and indicators on the evolution towards improving access to quality essential services.

With this in mind, SGI Europe and its partners Union Sociale pour l'Habitat (USH), Bundesverband der Energie- und Wasserwirtschaft (BDEW) and Union Française de l'Électricité (UFE) have implemented the 'Accessible Climate-Conscious Essential Services' (A.C.C.E.S.) project, funded by the European Commission.

Throughout the two years' project life-span, the project's overall objective was to strengthen service providers capacity to engage in national social dialogue and contribute to national and EU-level policy-making through developing further research and evidence concerning the defining indicators, monitoring and evaluation of progress towards providing adequate access to essential services. Moreover, the project aimed to assess the current state of play concerning climate change adaptation and affordability in the water, energy and housing sectors from the perspective of essential service providers and their stakeholders, as represented through SGI Europe and its partner organizations.

This report provides an overview of key findings and policy recommendations from the Accessible Climate-Conscious Essential Services project.

2.1. DEFINITIONS OF KEY TERMS

► **Services of General Interest (SGIs)** refers to services that public authorities classify as essential to ensure social and territorial cohesion and public well-being. They include both economic and non-economic services, and can range from utilities such as energy, water, transport, and postal services to core social services such as education, healthcare, housing, and social welfare. In line with Treaty provisions (Article 14 TFEU and Protocol 26 on Services of General Interest), public authorities "shall take care that such services operate on the basis of principles and conditions, particularly economic and financial conditions, which enable them to fulfil their missions".

► **Essential services** is a term first introduced in 2017 by the European Pillar of Social Rights and is often used interchangeably with SGIs in this report, referring to the basic services that are fundamental to citizens' daily lives and wellbeing. For this report, we focus specifically on the water, energy, and housing sectors.

► **Social infrastructure** encompasses long-term physical assets in sectors related to education and lifelong learning, health and long-term care, and affordable housing that enable services to be provided. Social infrastructure in the housing sector covers direct assets such as residential buildings, semi-residential buildings, adjacent supporting infrastructure, premises dedicated to community, local services and intangible assets that relate to energy and water sectors as well as energy efficiency, low carbon and housing renovation programs, provision of care and support services for social housing residents.

► **Housing affordability** refers to the relationship between housing costs, the costs of meeting other needs, and households' financial situation in terms of wealth, income and income security. Housing costs include not only mortgage interest and rent, but also utilities, service charges and maintenance costs. Housing affordability problems can manifest as exclusion from housing, housing insecurity, financial strain due to problematic housing costs, or inability to afford adequate housing for one's circumstances.



2.2. POLICY CONTEXT AND EUROPEAN DIMENSION

Services of General Interest (SGIs) play a central role in promoting social, territorial, and economic cohesion in the European Union (EU). Article 14 of the Treaty on the Functioning of the European Union (TFEU) affirms the importance of these services and the responsibility of national, regional, and local authorities in delivering them. It is for this reason that SGI Europe argues that essential services should not be viewed as responses to market failures, but as a structural component of Europe's long-term competitiveness (SGI Europe, 2024).

The importance of essential services is further underscored by Principle 20 of the European Pillar of Social Rights (EPSR), which explicitly states that 'everyone has the right to access essential services of good quality, including water, sanitation, energy, transport, financial services and digital communications. Support for access to such services shall be available for those in need' (DG EMPL, 2023).

This principle, solemnly proclaimed by the European Parliament, the Council and the Commission on December 13, 2017, reaffirms access to essential services as a critical aspect of social inclusion and a vital component of social justice across the European Union, especially for disadvantaged groups. The EPSR recognizes that accessibility, availability, and affordability are essential to ensure equal access for all, particularly for those in more vulnerable situations.

While not directly addressed in the Treaties as such, the essential services described in Principle 20 have been linked to the concept of Services of General Economic Interest (SGEIs), which are already covered by EU law.

Protocol 26 on Services of General Interest (annexed to the Treaty on the Functioning of the European Union) recognizes the essential role of national, regional, and local authorities in providing these services, while highlighting shared values of quality, safety, affordability, equal treatment, universal access, and users' rights.

In this context, SGI providers are not only implementing social rights, but are also on the frontline of delivering infrastructure and services that must adapt to climate change and support the green transition.

SGI Europe, the voice of employers and enterprises delivering Services of General Interest at EU level, calls for a climate 2040 target of a minimum of 80% emissions reduction, which implies keeping the path defined by the EU Green Deal. This ambitious target acknowledges that reducing the EU's gross emissions shall remain the priority, while carbon offsets will be needed in specific cases with a determined framework to ensure their efficient use (SGI Europe, 2023).

SGI Europe has emphasized that European legislation should be technology neutral to enable more industries to contribute to the climate objectives. Without the inclusion of all viable technologies, it is unlikely that the EU will reach its goals.

This report focuses on the needs of providers of SGIs operating in the water (drinking water and wastewater), energy (electric power generation, transmission and distribution, gas supply, heating and cooling systems), and housing sectors across Europe.

Their shared exposure to climate, financial, and social pressures requires urgent policy attention. More so, **the interconnected nature of Services of General Interest also means that vulnerabilities in one sector can easily cascade into others, creating a domino effect with dire and multiple consequences.**

Yet, current approaches often lack cross-sectoral coordination. In addition to climate-induced physical risks, the cost-of-living crisis has added additional pressure with access to affordable energy seeing a strong backslide because of energy price hikes, with the share of the population unable to keep the home adequately warm rising strongly in 2022 (Progress report towards the SDGs, 2024).

This report aligns with the European Commission's commitment to implementing the principles of the European Pillar of Social Rights through its Action Plan, which sets concrete initiatives to turn the Pillar's rights into reality, and with Principle 20 which requires the development of tangible measures and policies to ensure that citizens have actual access to services recognized as essential EU values.

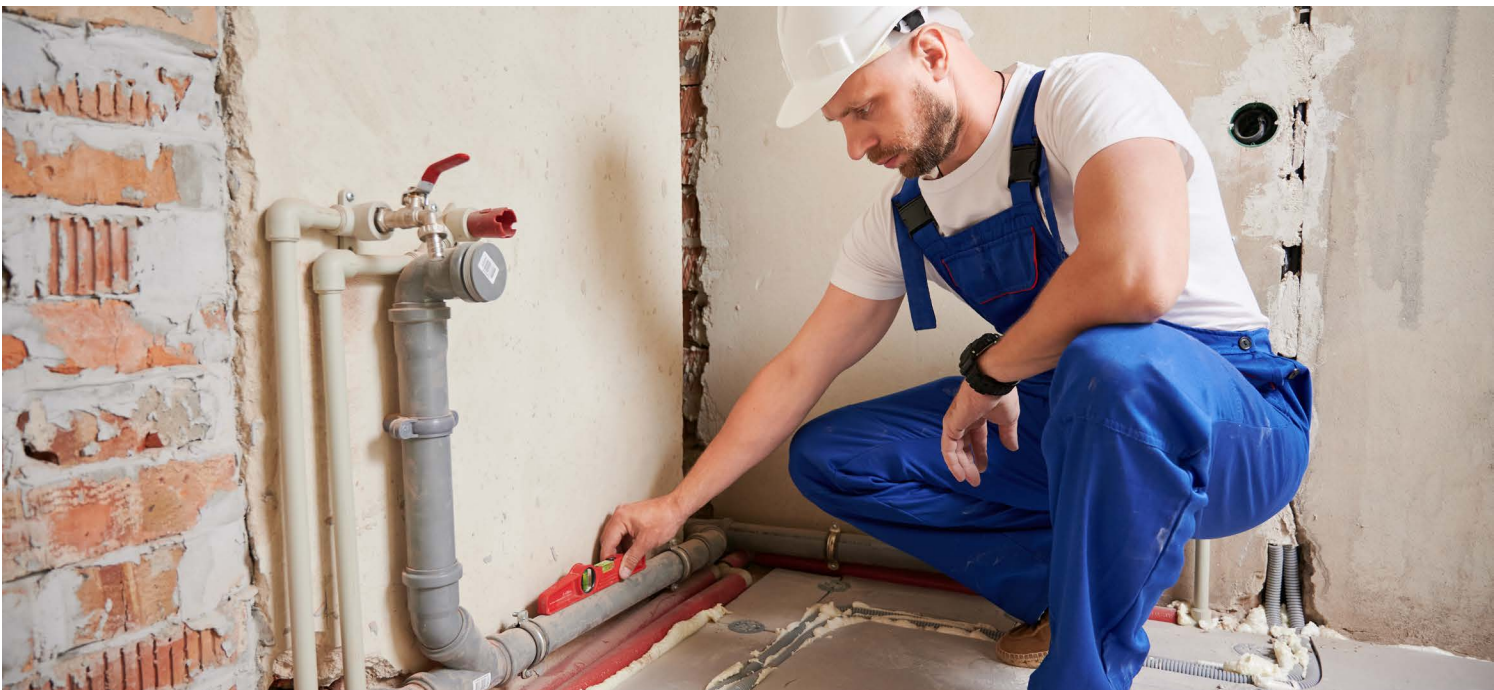
This report is also aligned with the broader European sustainability agenda, and it contributes to several Sustainable Development Goals (SDGs), particularly SDG 6 (Clean water and sanitation), SDG 7 (Affordable and clean energy), SDG 11 (Sustainable cities and communities), and SDG 13 (Climate action). According to Eurostat's 2024 monitoring report on SDGs, the EU has made varying degrees of progress across these areas, with some notable challenges remaining in each sector analyzed in this report (Progress report towards the SDGs, 2024).

The EU's competitiveness context adds urgency to these efforts. As noted in the European Commission's Competitiveness Compass, 'Europe faces a world of great power rivalry, competition for technological supremacy, and a scramble for control over resources. In this world, Europe's competitiveness and what Europe stands for are inseparable'. The Draghi Report on the EU Competitiveness, prepared at the request of European Commission President von der Leyen, estimates the combined additional investment needs in Europe at €750-800 billion per year by 2030, meaning that the EU's total investment-to-GDP rate will need to rise by around 5 percentage points of EU GDP annually. A significant portion of these investments must be directed toward climate-resilient essential services infrastructure.

The urgency of addressing essential services challenges is equally pressing. In 2023, more than 10.5% of the European Union population struggled with inadequate home heating, a 3.7 percentage point rise since 2021. Some countries reached rates as high as 20%. At the same time, approximately 3% of EU citizens experience long-term persistent energy poverty, primarily challenged by utility bill arrears and difficulties in heating their homes (JRC, 2024).

Finally, the COVID-19 pandemic exposed deep vulnerabilities in Europe's supply chains and essential services, including energy, food, healthcare, and raw materials. As the EU's foreign and security policy highlights, these systems are increasingly exposed to geopolitical pressure, economic manipulation, and conflict. **Building resilient essential services is now not only a matter of inclusion, but of strategic security.**

3. METHODOLOGY



- The recommendations presented in this report are based on extensive research conducted in 2024-2025 through multiple complementary methods designed to capture comprehensive insights from across Europe's essential services sectors:

Survey Research: The project team conducted surveys capturing views from over 40 sectorial organizations across 10 EU Member States, including national associations, major utility providers, municipalities, and established experts. The surveys collected both quantitative data on climate vulnerabilities, affordability concerns, and adaptation investments, as well as qualitative insights on implementation challenges and successful approaches.

Expert Interviews: To gain deeper understanding of sector-specific challenges, the research included semi-structured interviews with 30 experts (10 per sector). These interviews allowed for detailed exploration of complex issues that could not be fully captured through survey methods. Interview participants were selected to represent geographical diversity across Europe and included both practitioners and policy specialists.

Policy Workshops: Three sector-specific workshops were organized gathering inputs on possible solutions to address the identified challenges. These workshops brought together many stakeholders from across Europe, including service providers, regulatory authorities, consumer representatives, and policy experts. The workshop format enabled collaborative problem-solving and identification of best practices.

Desk Research and Analysis: The project team, with the support of external consultancy, conducted extensive analysis of existing policies, academic literature, and best practices across Europe. This included review of European policy frameworks, national implementation strategies, and case studies of successful adaptation approaches.

The research focused on three essential services sectors:

- › **Water services** (drinking water and wastewater)
- › **Energy services** (electricity, gas, heating and cooling)
- › **Housing**

Throughout the report, quotes from experts who were interviewed during the analysis stage and/or spoke at policy workshops have been included. These quotes have been selected to illustrate key points and capture the perspective of practitioners working directly with the challenges described. They should be interpreted as illustrations of individual expert opinions rather than evidential statements representing official positions. But in the bigger picture they contribute to the analysis and conclusions of this report.

The analysis identified critical challenges facing essential service providers in their efforts to maintain service quality, accessibility and affordability while reducing greenhouse gases emissions and at the same time adapting to intensifying climate change impacts. The findings demonstrate that while each sector faces unique challenges, several transversal issues require coordinated policy responses at European, national and local levels and presents a call to action by recommending very specific areas for policy intervention.

4

CLIMATE CHANGE IMPACTS ON ESSENTIAL SERVICES



- Climate change represents an unprecedented challenge to Europe's essential services infrastructure, creating complex pressures that span the water, energy and housing sectors. These impacts are not merely future concerns but present-day realities requiring immediate and coordinated responses.

4.1. SECTOR-SPECIFIC VULNERABILITIES AND IMPACTS

4.1.1. WATER SECTOR CHALLENGES

Water utilities report both increasing drought frequency and flooding intensity, with Spain recently experiencing severe drought conditions that necessitated water use restrictions, and devastating Valencia floods in late 2024 causing over 230 deaths and significant disruption to water supply infrastructure.

The water sector faces a dual challenge: managing both water scarcity and excess. Drought conditions are becoming more frequent and severe, with longer duration and greater geographical reach. Simultaneously, intense rainfall events are exceeding capacities of drainage systems designed for historical precipitation patterns. These opposing challenges often affect the same regions in different seasons, requiring highly adaptive infrastructure and management practices.

During the COVID-19 pandemic, water services proved to be even more essential, as handwashing became a primary prevention measure. Additionally, many European water service providers developed monitoring systems to track the pandemic through the presence of viral genetic material in wastewater, demonstrating the sector's adaptability and critical public health function beyond conventional water supply and treatment.

4.1.2. ENERGY SECTOR VULNERABILITIES

The energy sector faces multiple climate-related vulnerabilities that threaten both production capacity and distribution systems. Three key impact areas have been identified across Europe:

► The first impact area is energy infrastructure

which faces disruptions to production (hydropower shortages, reduced thermal plant output during heatwaves), grid damage from extreme weather, and system balancing challenges.

► The second impact area is hydropower shortages

due to drought, particularly affecting southern European regions where severe reductions in hydropower generation have resulted from prolonged droughts.

► The third impact area is wind energy vulnerability

, with periods of low wind speeds leading to increased reliance on backup power and gas stations, predominantly affecting central Europe.

The severity of extreme weather impacts on energy systems is increasingly evident across the continent. *“Storm Éowyn, which hit Ireland and the UK in January 2025, was among the most powerful storms to ever hit Ireland and caused catastrophic damage to both energy and telecommunications systems. Over one million people were left without power, with some areas experiencing outages for up to two weeks”* reflected Seamus Hoyne from the Technological University of the Shannon (Ireland) and Secretary General of FEDARENE (European Federation of Agencies and Regions for Energy and the Environment).

These extreme weather events are testing not only physical infrastructures, but also the entire energy system's resilience and emergency response capabilities. As climate models project increasing frequency and intensity of such events, the energy sector must transform its approach to infrastructure design, redundancy planning, and crisis management.



4.1.3. HOUSING SECTOR PRESSURES

Housing providers must address both energy efficiency demands and increasing climate resilience needs, with renovation costs that, in most cases, are simply untenable for public budgets. There are “*difficulties to comply to European climate goals by 2040 because of the large number of housing units that need to be renovated and the lack of funding to complete these works*” highlighted Kevin Opdecam from Brussels Social Housing Authority (SLRB-BGHM - Société du Logement de la Région de Bruxelles-Capitale - De Brusselse Gewestelijke Huisvestingsmaatschappij).

The housing sector faces a complex balancing act between improving energy efficiency, enhancing climate resilience, maintaining affordability, and addressing existing housing shortages. Climate adaptation requirements include protection against overheating, flood resilience measures, and resistance to extreme weather events. These challenges are particularly acute as “Europe is the continent that is heating the fastest. It has experienced devastating natural disasters, from floods to droughts and forest fires, coastal erosion, heat and cold waves and storms. If not addressed by improving the structural capacity of our societies to manage risks, the human, economic and social costs of climate change will only increase in the years to come” (JOIN (2025) 130 final).

Housing providers must increasingly consider not just energy efficiency but also cooling needs, building materials’ resilience to extreme weather, and the location of housing in relation to climate risks such as flooding and heat islands. This multi-dimensional challenge requires integrated approaches that address both climate and social equity concerns simultaneously.

4.2. SYSTEMIC VULNERABILITIES AND CASCADING RISKS

4.2.1. INFRASTRUCTURE VULNERABILITY

Climate change is no longer a future threat but a present reality significantly impacting essential infrastructure and thus the availability of essential services *per se*. The cascading nature of essential service failures becomes even more critical at the infrastructure level, with disruptions in one system rapidly propagating to others, magnifying impacts and complicating recovery efforts. For example, prolonged power outages can disable water pumping stations, leading to water supply disruptions and potential public health emergencies. Similarly, water shortages can impact cooling systems for power plants, potentially leading to energy production constraints during peak demand periods.

4.2.2. SOCIOECONOMIC IMPACTS AND AFFORDABILITY CONCERNS

Essential services are becoming increasingly unaffordable for vulnerable populations as climate adaptation costs and extreme weather impacts drive up prices. The monetary losses from weather- and climate-related disasters have risen sharply in recent years, with these costs often passed through to consumers through higher service rates. Drought impacts have intensified, with the EU area affected by drought increasing strongly since 2017 (Progress report towards the SDGs, 2024).

Recent data shows that energy poverty affects households across all income levels, with some regions witnessing substantial challenges even among those in the middle- and highest-income brackets (JRC, 2024).

Housing affordability particularly impacts young people, low-income earners, and private tenants, who are often excluded from energy-efficient buildings and therefore face higher energy costs.

These developments would undermine the EU's commitment to social cohesion and the principle of "leave no one behind" in the climate transition if left unchecked. Climate adaptation strategies must, therefore, integrate social equity considerations to avoid exacerbating existing inequalities.

4.2.3. IMPLEMENTATION AND GOVERNANCE BARRIERS

While EU ambitions for climate adaptation and service quality are essential, implementation faces significant barriers at national and local levels. Municipal utilities and smaller providers often lack the technical capacity, funding mechanisms, and regulatory certainty needed to implement complex directives. For example, in the water sector, some municipalities struggle to implement technical directives without adequate support and due to the lack of skilled workforce and further resources necessary for technical implementation. These challenges can also be found within the housing and energy sectors.

Policy instability and the lack of genuine planification further complicates long-term investment planning, as infrastructure improvements require funding commitments that extend beyond political cycles. Essential service providers must make decisions with 30-50-year horizons, yet often face regulatory and policy frameworks that change every few years. This temporal mismatch creates significant uncertainty for infrastructure planning and investment.

Governance challenges also extend to coordination between different levels of government and across sectors. The fragmented responsibility for different aspects of essential services across multiple government departments and agencies often leads to siloed approaches that fail to address the interconnected nature of climate impacts. Effective climate adaptation requires integrated governance models that can coordinate responses across water, energy, and housing sectors.

4.3. ADAPTATION STRATEGIES AND POLICY DEVELOPMENTS

In response to growing climate pressures, essential service providers across Europe are developing innovative adaptation strategies.

4.3.1. EUROPEAN POLICY RESPONSE

To address the increasing threats from extreme weather events to European economic security, the European Commission is developing a European Climate Adaptation Plan that will integrate climate resilience in urban planning, deploy nature-based solutions, and develop adaptation strategies across sectors. In parallel, a European Water Resilience Strategy is being prepared to improve water management practices and infrastructures, increase water efficiency and promote sustainable water use across Member States.



The Commission is also preparing its first-ever European Affordable Housing Plan, led by Commissioner for Energy and Housing Dan Jørgensen, to offer technical assistance to cities and Member States and focus on investment and skills needed. This plan aims to support Member States in addressing the root causes of housing supply issues and to unlock public and private investment for affordable and sustainable housing. The plan forms part of a pan-European push that brings together local and national, public and private actors to catalyze finance and urgent action, supported by the EIB Group's Action Plan for Affordable and Sustainable Housing with planned investments of around €10 billion over the next two years.

The European Parliament has established a Special Committee on the Housing Crisis (HOUS) to contribute to the development and future implementation of the European affordable housing plan, with its mandate including mapping housing needs, analyzing current housing policies, assessing the impact of housing speculation, evaluating policies and funding for the eradication of homelessness, and examining the role of non-profit and limited-profit housing solutions.

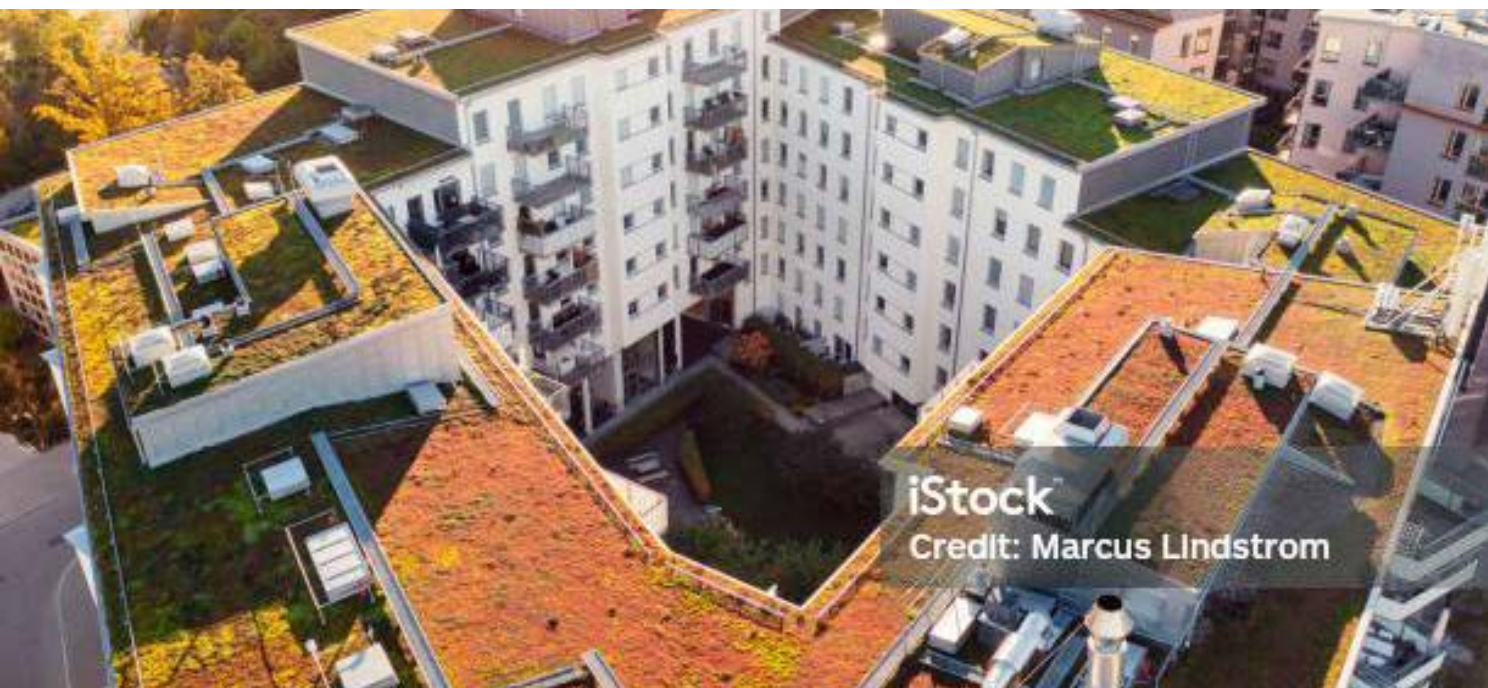
Complementing the housing strategy, the Commission is developing an Affordable Energy Action Plan as outlined in the Competitiveness Compass to ensure households and industrial customers have wider direct access to low-cost energy through improved market integration, expanded guarantees and risk reduction instruments for long-term power purchase agreements, and better-designed network tariffs.

In anticipation of increasing water-related challenges, SGI Europe has called for urgent actions to be taken to avoid a water crisis. The increasing risks stemming from climate change such as droughts, water shortages and extreme heatwaves, require adapting to this 'new normal'. SGI Europe has urged the European Commission to put forward an 'EU Blue Deal' to safeguard this valuable and irreplaceable resource (SGI Europe, 2023). This initiative would complement existing climate policies with a specific focus on water resilience, recognizing the foundational role of water security in Europe's overall climate adaptation strategy.

These initiatives represent important and very timely steps toward a more coordinated European approach to climate adaptation in essential services. However, their success will depend on addressing the implementation barriers and governance challenges identified earlier, as well as ensuring adequate financing mechanisms for the substantial investments required.

4.3.2. CROSS-SECTORAL INTEGRATION FOR RESILIENCE

A key finding from the research conducted during the implementation of the A.C.C.E.S. project is the critical importance of cross-sectoral approaches to climate adaptation. The traditional "siloe approach" to essential services – treating water, energy, and housing as separate domains – is increasingly inadequate in the face of interconnected climate impacts. Successful adaptation requires integrated strategies that recognize and address these interdependencies, as emphasized throughout this report.



For example, energy-efficient housing renovations should incorporate water efficiency measures and climate resilience features simultaneously. Wastewater operators often have the potential to produce their own energy. And energy infrastructure planning should systematically consider both water availability for cooling and the location of critical assets in relation to water availability and flood risks.

This integrated approach extends beyond technical coordination to financing mechanisms, governance structures, and policy frameworks. The European Water Resilience Strategy and Climate Adaptation Plan mentioned earlier must therefore develop mechanisms for cross-sectoral coordination and promote integrated approaches to essential services adaptation.

The urgency of this integrated approach is underscored by recent extreme weather events that have demonstrated the cascading nature of essential service failures on multiple occasions and in different regions. When critical thresholds are exceeded, failures in one system rapidly propagate to others, magnifying impacts and complicating recovery efforts. Building resilience therefore requires understanding and strengthening these system interdependencies rather than focusing solely on individual sector vulnerabilities.

5. TRANSVERSAL CHALLENGES AND FINDINGS



5.1. INFRASTRUCTURE VULNERABILITY AND CLIMATE RESILIENCE

Climate change impacts are further accelerating across all three sectors, creating new vulnerabilities and stretching existing infrastructure beyond design parameters. As Dr. Jörg Rehberg from the German Association of Energy and Water Industries BDEW (Bundesverband der Energie- und Wasserwirtschaft) emphasized that “*we cannot so much prevent climate change as we can adapt to it – we must prepare for the new realities it will bring. This includes protecting our physical infrastructure from increasing risks, such as flooding and other related impacts*”.

Rising temperatures, changing precipitation patterns, and more frequent extreme weather events are testing the resilience of essential service providers. The severity and frequency of these impacts are intensifying rapidly. According to the Eurostat's 2024 monitoring report, Europe is experiencing warming at a rate more than twice the global average, with climate-related economic losses in the EU averaging €14.6 billion annually over the past decade. For essential service providers, these impacts manifest in multiple ways: water utilities face both drought conditions reducing supply and flooding damaging treatment facilities; energy providers contend with reduced hydropower capacity, transmission line damage from storms, and cooling challenges during heatwaves; while housing providers must address both overheating in summer and increased energy demands in winter.

SGI Europe has emphasized that European legislation should be technology neutral to enable more industries to contribute to the climate objectives. Without the inclusion of all viable technologies, it is unlikely that the EU will reach its goals. Technology neutrality also ensures a level playing field among EU industry, which contributes to industrial strength and innovation (SGI Europe, 2023). This principle is particularly important for essential service providers who must balance multiple objectives including affordability, accessibility, and sustainability.

Additional level of complexity is added by the recent realization that critical infrastructures are exposed not only to climate hazards, but also to major security risks, including cyberattacks targeting operational technology systems, physical sabotage of critical installations, and geopolitical threats that can disrupt supply chains and service delivery. These compounding challenges further increase infrastructure vulnerability.

The European Commission's 2025 Joint Communication on Strengthening EU Preparedness and Security notes that "critical infrastructure sectors must strengthen their resilience by integrating security, cyber and physical protection considerations in all investments". Critical infrastructure vulnerability is increasingly recognized as not only a climate challenge, but also as a security imperative. As noted in EU preparedness strategies, these compounding challenges further increase infrastructure vulnerability requiring coordinated responses that address both dimensions simultaneously (JOIN (2025) 130 final). This dual challenge is exemplified by the increasing frequency of cyberattacks targeting essential services infrastructure across Europe, with ENISA reporting a 300% increase in cyberattacks targeting operational technology systems in essential services between 2021 and 2024.

5.2. SCALE AND STATE OF CRITICAL INFRASTRUCTURE

5.2.1. WATER INFRASTRUCTURE

In Europe, there are over 4 million km of drinking water networks supplying 23 billion cubic meters of clean, safe water to homes each year. There is over 3 million km of sewerage network in operation transporting wastewater to more than 21,000 urban wastewater treatment plants. The aging state of water infrastructure is particularly concerning. According to the VEWA study, much of Europe's water infrastructure has typical lifespans of 60-100 years which are approaching their physical limits.

As Belén Ramos Alcalde of AEAS (Spain) notes: *“Around 26% of our drinking water network is over 30 or evens 40 years old. This gives you an idea of the leakage problems that we have: we have a limited water supply, and we’re losing a significant amount due to underinvestment in the infrastructure”.*

Water loss statistics demonstrate significant infrastructure vulnerabilities – while, for example, Germany and the Netherlands have the lowest levels of water loss at 7% and 9% respectively, France and Poland lose between 20-24% of water before it reaches consumers. In absolute terms, these losses amount to 1.1 billion m³ in France annually, representing both financial losses and wasted resources during increasing water stress.

The situation is even more concerning in some southern and eastern European countries, where water losses can exceed 40% in aging distribution networks. With Europe already experiencing water stress affecting 20% of its territory and 30% of its population, according to the European Environment Agency, these infrastructure deficiencies represent a critical vulnerability that climate change will only exacerbate.

5.2.2. ENERGY INFRASTRUCTURE

The scale of vulnerable energy infrastructure is immense. Distribution grids alone comprise more than ten million kilometers of electricity networks and host four million electricity substations (the network elements closest to final consumers). These assets are central not just to Europe’s decarbonization efforts but also to its security and resilience in the face of both climate and geopolitical challenges (Joint Statement on Distribution Grids, 2024).

The energy infrastructure challenge extends beyond electricity to include gas networks, district heating systems, and hydrogen-ready infrastructure being developed for the transition. According to the European Network of Transmission System Operators for Electricity (ENTSO-E), approximately 35% of Europe’s high-voltage transmission infrastructure is over 40 years old, approaching the end of its design life. At the distribution level, the situation varies significantly by country, with some Member States having grids where over 50% of components exceed their original design lifespans.

European cumulative power grid investment needs by 2030 are estimated between €402 and €650 billion (Bruegel, 2025), which gives an idea of the huge amount of financial resources to be injected into both renovating and expanding the infrastructure.

5.2.3. HOUSING INFRASTRUCTURE

The minimum infrastructure gap in social infrastructure investment in the EU is estimated at €100-150 billion per annum, representing a total gap of over €1.5 trillion for the period 2018-2030. This chronic lack of investment predates the 2007-2009 financial crisis and has been exacerbated since then. Net public investment in the Eurozone periphery, with its critical need to catch up in infrastructure, has decreased from 2% of GDP to a negative -0.6%. This means the net public capital stock is actually shrinking, to the detriment of younger generations (High-Level Task Force on Investing in Social Infrastructure in Europe, 2018).

Housing infrastructure faces particular challenges related to energy efficiency. The Buildings Performance Institute Europe estimates that 97% of the EU’s building stock requires renovation to meet 2050 decarbonization goals.

Approximately 75% of buildings in the EU are energy inefficient according to current standards, with 85-95% of today's buildings expected to still be standing in 2050. The scale of this renovation challenge is compounded by the fact that current renovation rates across the EU average only 1% per year, far below the 3% minimum needed to meet climate goals.

5.3. REGIONAL AND SECTORAL VULNERABILITIES

The research and consultation findings show that infrastructure vulnerability varies across Europe, but affects all regions. Northern European countries, like Sweden and the Netherlands, face increasing flooding risks, with, for example, Gothenburg developing adaptation plans costing an estimated €5.500 per person. Southern European regions like Spain face severe drought, leading to water restrictions and necessitating alternative supply sources like desalination (now providing 10% of Spain's water supply through more than 700 plants).

These regional differences create distinct adaptation challenges. Nordic countries report increasing challenges with freeze-thaw cycles damaging water and heating infrastructure, while Mediterranean regions struggle with water scarcity and peak electricity demand during heatwaves. Central European regions face increasing flash flood risks, with, for example, the 2021 floods in Germany, Belgium, and the Netherlands which caused over €30 billion in damage to infrastructure including water treatment plants, electricity substations, and residential buildings.

Large-scale infrastructure failures demonstrate systemic vulnerabilities. In April 2025, Spain and Portugal experienced one of the worst blackouts in European history, affecting approximately 55 million people for more than half a day. This event demonstrated how infrastructure failures can cascade across multiple systems - hospitals suspended routine operations, public transport halted, banking services were disrupted, and telecommunications were severely impacted with internet traffic dropping 80-90% compared to previous-week levels. The Spanish government declared a national emergency and deployed 30,000 police to maintain order, illustrating the wide-ranging societal impacts of critical infrastructure failures (Reuters, 2025).

This event provided a stark illustration of cross-sectoral dependencies: water distribution systems failed without electricity for pumping stations; residential buildings with electric pumps lost water supply even in upper floors; digital payment systems collapsed without telecommunications; and heating systems in hospitals failed without power for control systems. The estimated economic impact exceeded €2.2 billion for just the initial 14-hour outage period, with recovery costs continuing for weeks afterward.

Essential service providers across Europe are developing innovative technologies to enhance climate resilience. For example, Italian utility A2A uses its renewable energy plants to test Energy Dome's CO₂ battery technology, which addresses intermittency challenges in renewable energy production. Similarly, French waste management company Semardel pioneered the capture of biogas from landfills, converting it into heat for on-site use and electricity for the public grid, producing 40,000 megawatts/hour annually—equivalent to powering a town of 30,000 inhabitants (SGI Europe, 2024).

Water utilities are implementing predictive modeling systems that integrate weather forecasting, consumption patterns, and infrastructure monitoring to anticipate and prevent service disruptions. Dutch water authorities have developed integrated water management systems that combine flood protection with nature-based solutions, creating multifunctional infrastructure that provides both climate resilience and recreational opportunities.

Climate vulnerability varies significantly based on water supply sources. The VEWA study found that Germany, France, the Netherlands and Poland abstract primarily from groundwater (approximately two-thirds of supply), while other countries rely predominantly on surface water, making it potentially more vulnerable to drought conditions. Water consumption patterns also vary significantly - average consumption in France exceeds 150 liters per person daily, while in Germany consumption is just 122 liters and in Poland only 98 liters per person daily. Lower consumption, while environmentally beneficial, can increase per-unit costs as fixed infrastructure costs are spread over smaller volumes.

The resilience challenges are compounded by the aging state of housing infrastructure across Europe. As Kevin Opdecam from SLRB-BGHM (Belgium) explains: *“Most housing units were built in the 20th century – many in the 1970s and 1980s, and some of these are even over hundred years old. As a result, their condition is often far from ideal. Renovation is essential, not only to improve the comfort and the sustainability of those buildings, but also to reach our climate objectives”*.

Large-scale housing renovation programs are essential to meeting the goals of the Paris Agreement and related SDGs. Such efforts also benefit the creation of new jobs and increase the comfort and health levels in living and working spaces. However, renovation ambitions can have adverse effects if they do not take into account the socioeconomic situation, especially of the most vulnerable households (UNICE, 2021).

5.4. FINANCIAL CHALLENGES AND INVESTMENT GAPS

Financial sustainability is a growing concern across all essential services. Providers must urgently invest to upgrade ageing infrastructure and respond to climate impacts – but face serious constraints due to affordability pressures, regulatory limits, and underfunded public budgets.

In the water sector, reinvestment rates remain below sustainability thresholds across many countries. For example, drinking water networks in Germany, Poland, and England and Wales show consistently low reinvestment levels – in some cases under 1% of asset value (BDEW, 2021). Infrastructure replacement costs represent one of Europe's largest infrastructure investments, ranging from €11 billion (Netherlands) to €145 billion (France) for drinking water, and up to €400 billion for wastewater systems. At the same time, these investments must be viewed in the context of increasing treatment requirements driven by both climate impacts and stricter water quality standards. New contaminants of concern, including pharmaceutical residues, microplastics, and per- and polyfluoroalkyl substances (PFAS), require advanced treatment technologies that significantly increase both capital and operational costs.

Implementing fourth-stage treatment for pharmaceutical removal across Europe would require significant capital investments and annual operational costs.

Similar investment gaps exist in the energy sector. According to Eurelectric, distribution system operators across Europe need an estimated €400 billion by 2030 just to maintain current infrastructure and support electrification goals, with an additional €70–80 billion specifically for climate adaptation measures. Transmission system operators face similar challenges, with France's RTE planning €20 billion in adaptation investments by 2040 to adapt 80% of its grid to climate impacts.

The housing sector faces equally challenging financial pressures, with energy efficiency facing one of the largest investment gaps, estimated at €165 billion each year (BUILD UP, 2024). Meeting the 2030 target requires a €149 billion annual investment gap to be bridged, according to recent Bruegel analysis (Bruegel, 2024). 75% of the EU's building stock has a poor energy performance, requiring comprehensive renovation to meet climate targets (DG Energy, 2024). The scale of this challenge is compounded by the fact that public, cooperative, and social housing providers plan to invest at least €35 billion annually in new buildings, and €23 billion in renovation and maintenance (Housing Europe, 2024). However, housing providers face unique constraints as renovation costs often exceed affordable rent levels—for example, Brussels reports rent levels of €360/month against actual costs of €2800/month needed, requiring substantial public subsidies to bridge the gap (Bruegel, 2024).

The time gap between high upfront costs and long-term payback from renovation works deter consumers from investing in energy renovation, while housing providers must

balance climate objectives with maintaining affordable accommodation for vulnerable populations.

The financial challenge is further complicated by the tension between investment needs and affordability concerns. As public budgets face constraints and private investments seek returns, essential service providers must balance significant infrastructure investments with maintaining affordable services for vulnerable populations. This balancing act is particularly challenging as climate impacts increase operational costs while simultaneously reducing infrastructure lifespans, creating a compounding financial pressure.

5.5. CROSS-SECTORAL IMPACTS AND SECURITY CONCERNS

The surveyed stakeholders in the project implementation phase highlighted the need for increased cross-sectoral planning. For instance, the impacts of recent natural calamities across Europe demonstrate how vulnerabilities in one infrastructure system quickly affect others, creating cascading failures across multiple essential services simultaneously. These cross-sectoral impacts highlight the growing interdependence between essential services. Energy is required for water treatment and distribution, telecommunications depend on energy, and housing habitability relies on all these services functioning properly. Traditional sector-specific planning approaches fail to capture these interconnections, potentially creating blind spots in resilience strategies.



The European Commission's 2025 Joint Communication on Strengthening EU Preparedness and Security recognizes this challenge, noting that "the interconnected nature of our critical infrastructure means failures can cascade across multiple sectors, magnifying impacts and complicating response efforts". The communication calls for integrated resilience planning that considers both climate and security dimensions, acknowledging that "preparedness for climate extremes and preparedness for security threats must be approached as complementary rather than competing priorities."

These cross-sectoral dependencies are particularly evident in urban environments, where dense infrastructure networks create complex interaction patterns. Research from the Stockholm Resilience Centre identifies six critical "nexus points" where water, energy, and housing systems interact most intensively:

1. heating and cooling systems;
2. water pumping and distribution;
3. wastewater treatment;
4. building automation systems;
5. emergency response capabilities; and
6. community resilience resources.

Vulnerabilities at these nexus points can trigger cascading failures that affect multiple essential services simultaneously.

The threat of land degradation compounds these problems, with soil sealing from impervious materials continuously increasing since 2006, reducing natural water absorption capacity and increasing flash flooding risks in urban environments (Progress report towards the SDGs, 2024, p. 16).

This environmental degradation interacts with infrastructure vulnerabilities to create compound risks, particularly in densely populated areas where natural buffer capacity has been reduced by development patterns. Infrastructure vulnerability is further exacerbated by territorial disparities, with rural areas and remote regions often having access to fewer transport services and lower quality broadband connectivity. Physical accessibility issues particularly affect persons with disabilities and older people. Research shows overlap in difficulties accessing different essential services, with approximately 11.3% of the EU population estimated to be unable to afford at least one essential service. Among these, 83% are unable to access one service only, 15% cannot afford two services, and 2% cannot afford access to three essential services. Being at risk of poverty and living in rural areas significantly impact the possibility of accessing essential services (SWD, 2023).

The European Commission's Competitiveness Compass has recognized that critical infrastructure faces intensifying security risks. Essential services providers must factor in risks to infrastructure security, whether digital or physical, at all stages – from construction and technology choice to operations and recovery capabilities. The forthcoming European Grids Package will address the significant investment needs for modernizing and expanding Europe's network of energy transmission and distribution infrastructure.

Security concerns have further intensified following documented incidents of sabotage targeting critical infrastructure. Since 2022, European authorities have recorded over 70 suspicious incidents at electricity substations, water treatment facilities, and telecommunications nodes, with evidence suggesting coordinated efforts to test system vulnerabilities.

The European Union Agency for Cybersecurity (ENISA) reports a 300% increase in cyberattacks targeting operational technology systems in essential services between 2021 and 2024, with water and energy infrastructure being particularly targeted. These evolving threats require essential service providers to implement robust security measures while maintaining operational efficiency and service accessibility.

5.6. AFFORDABILITY AND ACCESSIBILITY CONCERNS

Maintaining affordable and accessible essential services while investing in climate adaptation presents a significant challenge across all sectors. Evidence from the research shows that affordability concerns exist throughout Europe, though with regional variations.

5.6.1. ENERGY AFFORDABILITY

Data presented by the Joint Research Centre shows significant variations in energy poverty across EU regions, with 17.4% of households experiencing energy poverty at least once during 2020-2023. As Giorgos Koukoulakis from JRC explains: *"At least once in the past four years, 17.4% of the households experienced energy poverty. This is significant because, once someone finds themselves in a precarious situation, they do not easily forget it. Struggling for a year to keep your home warm or to pay your bills, leaves a lasting impression – the fear of falling back into poverty and/or energy poverty remains."* While income is the primary determinant of energy poverty, housing quality and energy efficiency play crucial roles, highlighting the interconnections between sectors that must be addressed holistically.

Data from the JRC shows that energy poverty disproportionately affects those with lower income, but in some regions, particularly in Greece, even the highest income quintiles show elevated levels of energy poverty. In 2022, the proportion of individuals with arrears on utility bills within the total population living in households where the highest education level was basic schooling was almost three times higher than in households with tertiary education (11% versus 4%), highlighting the socioeconomic dimension of energy poverty (JRC, 2024).

Analysis of regional data reveals significant variations in energy poverty across EU territories, with the highest share of individuals unable to heat their homes adequately observed in Bulgaria (21-24%), Greece (up to 20%), Spain (up to 26%), and Portugal (up to 26%). These regional disparities highlight the uneven impact of climate change and the different levels of infrastructure resilience across Europe (JRC, 2024).

Recent findings suggest potential health implications of energy poverty. The JRC examined the potential correlation between energy price fluctuations and health outcomes, finding a weak positive correlation between energy price changes and excess death rates during the 2022-2023 winter months. While this relationship requires further investigation to establish causality, it suggests that energy affordability may have implications beyond comfort, potentially affecting public health outcomes.

5.6.2. HOUSING AFFORDABILITY

Housing cost burden data shows significant variations across tenures in the EU. The economic challenge of providing affordable housing is starkly illustrated by data from Brussels, where according to SLRB-BGHM, *“Rent levels are very low compared to costs (e.g. €360/month vs €2800/month needed), requiring significant subsidies.”* The demand far outstrips supply, with SLRB-BGHM reporting *“very long waiting lists (10 years) due to high demand and half the Brussels population qualifying for social housing.”*

The housing affordability crisis is further complicated by climate policy requirements. Özgür Öner from the German housing federation GDW (GdW Bundesverband deutscher Wohnungs- und Immobilienunternehmen) has noted that *“the obligation to renovate buildings to meet energy efficiency standards under the European Green Deal puts an additional financial burden on housing providers, limiting their ability to invest in new construction or other areas”*. This illustrates that the main challenges in the sector also interact but remain parallel.

The social housing model demonstrates potential for addressing both affordability and climate objectives. Vienna’s cost-rental model shows significantly lower housing cost burdens compared to the private rental sector (20% vs. nearly 50% of income for median earners), demonstrating how social housing can provide better protection for vulnerable groups while still enabling climate-adaptive investments. The Netherlands (28% of all dwellings), Austria (23%), Denmark (20%), and France (17%) maintain robust social housing systems that provide both affordability and increasing climate resilience, offering models for other Member States to consider.

5.6.3. WATER AFFORDABILITY AND ACCESSIBILITY

The scale of water affordability is still being assessed. The data from the impact assessment conducted during the drafting of the Drinking Water Directive indicates that water costs represent roughly 1 to 2% of household income.

This figure should be interpreted with caution, as the percentage varies among Member States, with some experiencing higher costs and others lower, though the average falls within this range. However, investment needs to comply with new regulatory measures as well as to mitigate climate change impacts have the potential to significantly increase costs for drinking water and wastewater.

Current access statistics paint a generally positive picture with remaining challenges. According to WHO data, 99.7% of the population in the EU lived in homes connected to the water supply system as of 2015. However, the European Commission estimates that around 23 million people in Europe lack a connection to the public water supply network. For sanitation, Eurostat reported that the percentage of the population living in households without basic sanitary facilities decreased from 2.5% in 2013 to 1.9% in 2018. These overall positive figures mask significant regional disparities, with Romania reporting 21.2% of the population living without basic sanitary facilities, while Bulgaria, Latvia, and Lithuania reported values between 6.4% and 7.0%. These figures are significantly higher for populations at risk of poverty (5.1% at EU level, reaching 56.6% in Romania), highlighting the strong link between reduced access to basic facilities and poverty.

5.6.4. INTEGRATED APPROACHES TO AFFORDABILITY

As recognized in the European Commission's Competitiveness Compass, energy prices in Europe are much higher than in competitor regions and vary significantly across the EU. To address this challenge, the Commission is developing an Affordable Energy Action Plan to ensure households and industrial customers have wider direct access to low-cost energy through improved market integration, expanded guarantees and risk reduction instruments for long-term power purchase agreements, and better-designed network tariffs.

Similarly, the forthcoming EU Affordable Housing Plan aims to address the growing housing affordability crisis through a comprehensive approach that combines increased investment, regulatory measures, and social protection. This plan recognizes the interconnected nature of housing affordability with energy efficiency objectives and aims to prevent climate policies from exacerbating housing inequalities.

Water affordability receives less attention at the EU level but is increasingly recognized as a critical dimension of service accessibility. The revised Drinking Water Directive and Wastewater Treatment Directive include provisions aimed at improving access to water and sanitation for all citizens, particularly vulnerable and marginalized groups.

The European Pillar of Social Rights and the associated Action Plan provide an overarching framework for addressing affordability concerns across all essential services.

Principle 20 specifically addresses access to essential services, stating that “everyone has the right to access essential services of good quality, including water, sanitation, energy, transport, financial services and digital communications.” Implementing this principle requires coordinated action across all three sectors examined in this report, with particular attention to the most vulnerable populations.

5.7. POLICY IMPLEMENTATION CHALLENGES

5.7.1. STRATEGIC CONTEXT AND IMPLEMENTATION BARRIERS

While the European Union has established ambitious policy frameworks for climate adaptation and essential services quality, SGI Europe has identified significant implementation barriers at national and local levels.

These barriers include critical knowledge gaps in climate adaptation, with limited capacity for systemic risk assessments and difficulties in translating climate risk information into actionable solutions. Governance-related challenges persist across many countries, including coordination difficulties due to limitations in financial, technical and human capacities (EEA, 2024). Although EU and national climate policies emphasize the need for equitable adaptation solutions, the practical implementation of such solutions remains scarce, requiring a focus on equity at all stages of adaptation planning, implementation and monitoring. Furthermore, the EU adaptation strategy lacks concrete and measurable targets, legally binding measures and deadlines, while providing no additional funding for adaptation efforts.

Despite the European Commission presenting many transformative policies aimed at delivering on sustainability since 2019 (Progress report towards the SDGs, 2024), implementation challenges remain at national and local levels, particularly for essential services providers. These challenges are exacerbated by the scale of the problem. As noted in the Draghi Report, Europe needs additional investments of €750-800 billion per year by 2030, representing approximately 5 percentage points of EU GDP annually, with a significant portion directed toward climate-resilient essential services infrastructure.

Climate-neutral construction and renovation must become the new norm. Yet, policy actions have not sufficiently focused on lowering CO₂ emissions in the residential sector, despite buildings and construction accounting for 36% of final energy use and 38% of total global energy-related CO₂ emissions (UNICE, 2021). There is growing recognition of the need to accelerate and widen policy efforts, expanding their narrow focus from just the building to a more systemic approach that encompasses energy production systems, neighborhood planning, and the circular and resource-efficient use of building materials and services.

The implementation gap is particularly pronounced in critical areas such as water infrastructure management. As Belén Ramos Alcalde from the Spanish Association of Urban Water Management Companies (AEAS) notes: “We have over 8,000 municipalities and, on average, more than 2,000 water management systems. While 95% of these municipalities have less than 20,000 inhabitants, the population is increasingly concentrated – with 69% of people now living in large cities”. This fragmentation can create significant barriers to implementing EU directives consistently and effectively.



5.7.2. POLICY STABILITY AND COORDINATION CHALLENGES

Policy instability complicates long-term investment planning. Infrastructure investments typically span decades, but policy frameworks and funding mechanisms often change with political cycles. France's National Climate Change Adaptation Plan based on a 4°C warming trajectory provides an example of longer-term planning, with transmission system operator RTE planning €20 billion in adaptation investments by 2040. Such stability in planning horizons is essential but rare.

Local utilities face particularly severe planning challenges. This gap between adaptation needs and financial resources exists across all three sectors and throughout Europe.

Coordination gaps between policy domains (water, energy, housing) remain significant. Participants to the sector-specific project workshops consistently identified the need for better alignment between EU climate

objectives and practical implementation at national and local levels, as well as improved coordination between different policy domains. Currently, separate Directorate-Generals manage distinct agendas for water, energy, housing, and environment—often without sufficient integration. As a result, cross-sector synergies are missed, and interdependencies are overlooked in both planning and funding processes.

This fragmentation is particularly evident in the water sector. Several EU directives directly affect the water supply chain, including the Urban Wastewater Treatment Directive, the Drinking Water Directive, and regulations on nitrates and pesticides, which impact water source quality. There is a realization reported by the stakeholders that these directives must be better coordinated to ensure that measures, such as those addressing pesticide use, align with the objectives of the Drinking Water Directive. This coordination represents a key focus for improving water management policies.



5.7.3. EUROPEAN COMMISSION'S RESPONSE AND SIMPLIFICATION EFFORTS

The European Commission has committed to unprecedented simplification efforts, with targets for reducing administrative burden by at least 25% for all companies and at least 35% for SMEs. This represents approximately €37.5 billion of recurring costs reduction by the end of the Commission's mandate through a series of Simplification Omnibus packages. A new Competitiveness Coordination Tool is also being developed to align industrial and research policies at EU and national levels, which will help deliver major cross-border projects with European added value, including essential services infrastructure.

The Commission is developing several targeted initiatives to address these implementation challenges. The European Climate Adaptation Plan will integrate climate resilience in urban planning, deploy nature-based solutions, and develop adaptation strategies across sectors. In parallel, a European Water Resilience Strategy is being prepared to improve water management practices and infrastructures, increase water efficiency, and promote sustainable water use across Member States.

Additionally, the forthcoming European Grids Package will address the significant investment needs for modernizing and expanding Europe's network of energy transmission and distribution infrastructure.

The Commission is also preparing an Affordable Housing Plan to address challenges faced by vulnerable groups, particularly young people, low-income earners, and private tenants, who often have limited access to energy-efficient buildings.

The Commission has also recognized the critical need for a coordinated approach to resilience and preparedness. As noted in recent EU communications, 'preparedness is a collective responsibility. Public authorities, media, education, training and cultural institutions, youth and civil society organizations, social partners, businesses, local networks and communities, and citizens, from an early age, all play a vital role' (JOIN (2025) 130 final).

5.8. PUBLIC ENGAGEMENT AND AWARENESS

5.8.1. THE AWARENESS GAP

The successful implementation of climate adaptation measures critically depends on public understanding and support. Yet, technical complexities and communication gaps often hinder meaningful engagement and lead to misconception about climate mitigation policies. According to recent Eurobarometer surveys, "almost half of Europeans (49%) did not feel well-informed about disaster risks that could affect them and 65% of them need more information to be able to prepare for disasters or emergencies" (JOIN (2025) 130 final). Without addressing this awareness gap, even well-designed adaptation strategies may face implementation barriers or public resistance, undermining their effectiveness.

5.8.2. CHALLENGES AND SOLUTIONS FOR PUBLIC ENGAGEMENT

Even when adaptation measures are implemented, knowledge gaps can diminish their impact. Experience from the housing sector demonstrates that actual energy consumption frequently does not align with theoretical performance after renovations. For instance, Brussels housing authority reported that theoretical energy performance often does not match actual results post-renovation, highlighting the need for resident education and monitoring of real consumption patterns (JRC, 2024). This phenomenon illustrates how user behavior can significantly undermine technical improvements without proper engagement and education programs.

The challenges of translating technical solutions into real-world benefits are further complicated by affordability concerns. Although electrification could reduce energy bills by 35–40% by 2050, according to Eurelectric projections, many vulnerable households face prohibitive upfront costs.

In parallel, public awareness is also crucial for responding to immediate infrastructure crisis. The blackout of April 2025 in Spain and Portugal underscored societal vulnerability to service disruptions, illustrating how inadequate public preparedness can quickly escalate localized outages into widespread economic and social challenges.

To overcome public awareness and implementation challenges, several promising approaches are emerging across Europe, including the introduction of transparency systems in making the monitoring data publicly available and participatory approaches.

Transparency systems have proven effective in bridging knowledge gaps and building public trust. For example, Italy's national benchmarking system for water utilities exemplifies this approach: with specific indicators for drought resilience and flood impact, these systems support informed dialogue and decision-making about essential service investments and their impacts, allowing citizens to understand the rationale behind adaptation measures.

Participatory approaches also show considerable promise in fostering engagement and ownership. Zaragoza's housing authority has developed comprehensive indicators that go beyond technical performance to include social impact, tenant satisfaction, and community benefits. By involving citizens in both planning and evaluation processes, these approaches foster a sense of ownership and ensure that adaptation measures reflect community priorities.

These examples demonstrate that when people are well-informed and actively involved, climate adaptation becomes more effective and socially accepted.



SECTOR-SPECIFIC CHALLENGES AND FINDINGS



6.1. HOUSING SECTOR: KEY CHALLENGES

6.1.1. INFRASTRUCTURE VULNERABILITY AND CLIMATE IMPACTS

Housing infrastructure across Europe faces dual challenges of aging stock and increasing climate vulnerability. The aging infrastructure significantly impacts energy efficiency and climate resilience, with buildings accounting for 36% of final energy use and contributing approximately 38% of total global energy-related CO₂ emissions when including construction industry emissions (UNICE, 2021).

Vulnerability to energy poverty is closely tied to housing type and building conditions. According to JRC data (2024), in 2022, apartments or flats in buildings with fewer than 10 dwelling units had the highest energy poverty rates (13.5% EU average), with substantially higher figures in Lithuania (23%), Cyprus, Spain, Slovakia, Greece, and Bulgaria. These findings highlight the need for targeted retrofitting strategies for different building types and demonstrate how structural housing features can amplify climate vulnerability.

6.1.2. FINANCIAL BARRIERS TO CLIMATE ADAPTATION

The scale of renovation investment needs is staggering and represents one of Europe's most significant climate adaptation challenges. Across the EU, the minimum infrastructure gap in social infrastructure investment is estimated at €100-150 billion per annum, representing a total gap of over €1.5 trillion for 2018-2030 (High-Level Task Force on Investing in Social Infrastructure in Europe, 2018). France alone reports housing renovation costs estimated at €9 billion annually, while simultaneously needing an additional €60 billion for new construction to address housing shortages. These investment needs far exceed available resources, particularly for social housing providers with limited revenue-generating capacity. The financial challenge extends beyond renovation to include ensuring housing quality and affordability during climate transition. Net public investment in the Eurozone periphery, with its critical need to catch up in infrastructure, has decreased from 2% of GDP to a negative -0.6% since the financial crisis. This means that the net public capital stock is actually shrinking to the detriment of younger generations and climate resilience efforts (High-Level Task Force on Investing in Social Infrastructure in Europe, 2018).

This underinvestment not only hampers climate resilience but also risks exacerbating generational inequality. Housing federations across Europe stress that the financial burden of meeting EU renovation targets far exceeds what housing companies and governments can currently afford. This tension between climate objectives and financial resources represents perhaps the most significant barrier to housing adaptation.

6.1.3. HOUSING INEQUALITY AND ACCESS CHALLENGES

Access to adequate housing remains highly unequal across Europe, with vulnerable groups particularly affected. Even in countries with substantial social housing stocks, waiting lists have reached unprecedented levels. In Brussels, waiting lists extend up to 10 years, with nearly half the population qualifying for social housing. The situation is similarly dire across multiple Member States. In the Netherlands, at least 90 of its 344 municipalities require registration for over 7 years to obtain social housing, with waiting times exceeding 17 years in 5 municipalities. In Stockholm, the average waiting time for an apartment increased from 5.1 years in 1997 to 12.7 years in 2017, with maximum waiting times reaching 22 years for apartments in the city center (Eurofound, 2023).

Housing cost burden data shows significant disparities across tenure types in the EU. Homeowners spent 16% of their income on housing in 2019, down from 18% in 2010. In contrast, tenants faced an increase in an already higher rate, from 28% to 31% during the same period. In all Member States, tenants spend higher proportions of their income on housing than owners, with this gap widening between 2010 and 2019 in 22 Member States, and by more than 5 percentage points in Luxembourg, Germany, Greece, Denmark, and the Netherlands (Eurofound, 2023).



6.1.4. GENERATIONAL HOUSING DIVIDE

Young adults face particularly severe housing challenges, leading to delayed household formation across Europe. JRC research confirms that housing problems disproportionately affect young people, low-income earners, and private tenants. The age at which at least 50% of people in the EU were living outside their parental home increased from 26 in 2007 to 28 in 2019.

Between 2010 and 2019, Spain, Croatia, Italy, Cyprus, Belgium, Greece, and Ireland faced the largest increases in people aged 25–34 living with their parents. In some countries, the proportion of 25- to 34-year-olds living with their parents grew by 6 percentage points or more during this period. National-level surveys confirm that financial constraints are the primary barrier, with nearly half of 18- to 29-year-olds in Finland stating they could not afford to live independently, an increase of 12 percentage points since 2014 (Eurofound, 2023).

This generational housing divide is further exacerbated by the unequal distribution of energy-efficient housing. Those in the lowest income quintile are nearly twice as likely to struggle with heating compared to those in the highest quintile (odds ratio of 1.86), while households with foreign-born adults (odds ratio of 1.24) and lower educational levels (odds ratio of 1.32 for low education) face significantly higher risks of energy poverty (JRC, 2024).

6.1.5. COMPOUNDING VULNERABILITY FACTORS

Beyond income and age, multiple factors compound housing vulnerability. In many post-communist and southern European countries with high rates of ownership without a mortgage (ranging from 38% in Portugal

to 95% in Romania), between 10% and 24% of these homeowners are at risk of poverty. Many have difficulties making ends meet (at least 70% in Greece, Croatia, Romania, and Bulgaria) and are unable to keep their homes adequately heated due to poor energy efficiency and limited financial resources (at least 15% in Bulgaria, Lithuania, Portugal, Cyprus, and Greece) (Eurofound, 2023).

The multivariate analysis conducted by the JRC confirms that socioeconomic factors like low income, reliance on social benefits, low work intensity, and lower educational attainment significantly increase susceptibility to energy poverty across all EU Member States (JRC, 2024). The correlation between housing quality and vulnerability is particularly concerning in the context of increasing climate impacts.

Research shows that poor energy efficiency of dwellings affects 26% of the EU's population, with households with children, those on low incomes, large families, and those renting social or private housing being more likely to experience this problem. Many people also face problems with lack of space (16%), noise from neighbors (15%), poor internet connection (14%), and lack of access to outdoor spaces (13%). These issues are reported more frequently by tenants than homeowners, and most are more problematic for private tenants than for social housing tenants.

6.1.6. RENOVATION COMPLEXITY AND IMPLEMENTATION CHALLENGES

Renovating Europe's housing stock involves more than securing funding: it also requires overcoming significant technical and implementation challenges. One recurring issue is the so-called "performance gap," where the energy savings predicted during design and renovation phases do not match actual results.

As reported by Brussels housing authorities, many renovated buildings continue to consume more energy than expected, underlining the importance of educating residents and monitoring real consumption patterns.

The renovation wave faces additional implementation hurdles, including coordination challenges between national and local authorities, shortage of skilled workers, and limited industrial capacity. As Özgür Öner from the German housing federation GDW notes, *“The obligation to renovate buildings to meet energy efficiency standards under the European Green Deal puts an additional financial burden on housing providers, limiting their ability to invest in new construction or other areas.”* These constraints force difficult trade-offs between expanding housing supply and improving existing stock.

The COVID-19 pandemic has heightened the importance people place on housing quality, with 37% reporting increased importance of having outdoor space and 38% placing greater importance on good internet connections (Eurofound, 2023). These changing expectations create both challenges and opportunities for climate adaptation measures in the housing sector.

6.1.7. ENERGY POVERTY AND UTILITY COSTS

Recent utility price increases have only been partly mitigated by government support measures, creating additional affordability pressures. In 2022, rising energy prices meant that households in the lowest income decile faced estimated average cost increases of 20% of total household expenditure, compared to 13% for those in the highest income decile.

The burden of these costs varies based on dwelling energy efficiency, energy sources used, and household composition. Unemployed individuals, who spend more

time at home, tend to have greater energy needs and are therefore disproportionately affected. Private rental market tenants are particularly vulnerable, with 46% feeling at risk of needing to leave their accommodation within three months because they could no longer afford it (Eurofound, 2023).

This concern about inequity is validated by data showing that in 2022, the lowest income quintile accounted for 41.7% of energy-poor households (using the high share of energy expenditure indicator), while only 2.3% of households in the highest income quintile were classified as energy poor—a stark illustration of the social equity challenges facing essential services (JRC, 2024).

6.1.8. SUCCESSFUL MODELS AND INNOVATIVE APPROACHES

Despite these challenges, several European countries offer promising models for combining climate objectives with housing affordability. Vienna’s cost-rental model demonstrates significantly lower housing cost burdens compared to the private rental sector (20% vs. nearly 50% of income for median earners), showing how social housing can provide better protection for vulnerable groups while enabling climate-adaptive investments.

Targeted climate adaptation funding programs are proving effective in several Member States. Lithuania renovated 2,631 multi-apartment buildings between 2013 and 2020, covering 100% of costs for recipients of heating allowance (Eurofound, 2023). Investments amounted to around €750 million, with funding from multiple sources including the national Climate Change Programme and European Structural Funds. In 2020 alone, €35.9 million in support was paid to property owners implementing renovation projects.



Such programs demonstrate how dedicated funding mechanisms can effectively address both climate adaptation needs and social equity concerns simultaneously.

The affordable housing model successfully implemented in the Netherlands, Denmark, and Austria provides valuable lessons in balancing climate goals with affordability concerns. Özgür Öner from GDW states: *“What we’re basically advocating for now is changing the European state aid legislation, specifically the SGEI decision on social housing, because we need to be able to do more for middle-income housing”*.

Housing First approaches for people facing extreme housing vulnerability are showing promise. About three-quarters of EU Member States are already experimenting with or have implemented initiatives inspired by the Housing First approach, which provides housing as a starting point rather than an end goal for supporting homeless people. Most evaluated programs show housing stability rates of 90% or higher, with evaluations quantifying benefits including reduced healthcare costs (46% decrease in Belgium), reduced social service usage, and improved health outcomes (Eurofound, 2023).

6.1.9. POLICY DEVELOPMENTS AND INTEGRATION

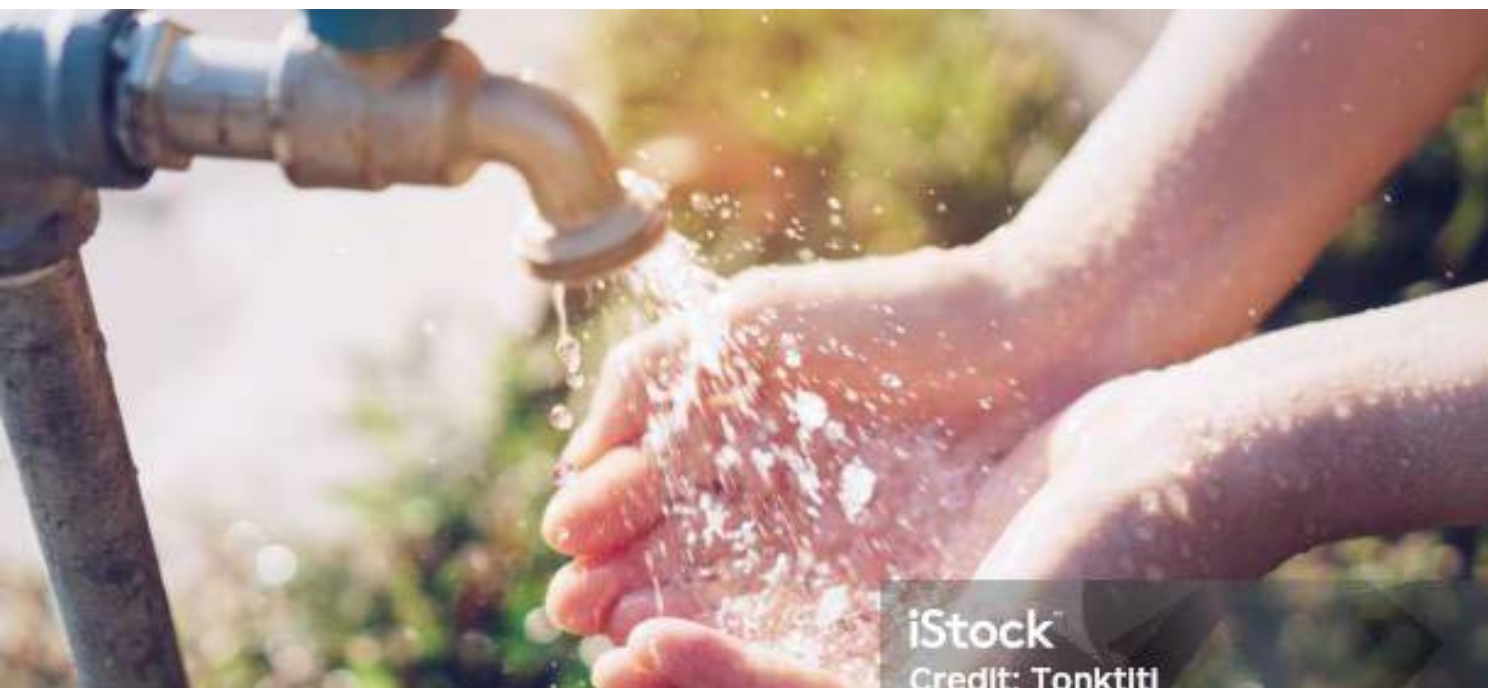
The European Commission is preparing an Affordable Housing Plan to address challenges faced by vulnerable groups, particularly young people, low-income earners, and private tenants, who often have limited access to energy-efficient and affordable housing. This comprehensive initiative aims to address Europe’s housing crisis through investment, construction, and consultation, recognizing the critical housing shortage, rising costs, and increasing homelessness affecting cities and communities across Europe. Moreover,

the plan aims to ensure access to affordable, sustainable, and inclusive housing for all citizens, including vulnerable groups such as people with disabilities.

A dedicated committee in the European Parliament has been established to map housing needs and analyze existing policies, contributing to the plan’s implementation. This initiative represents an unprecedented effort by the EU to tackle structural weaknesses in housing markets while fostering collaboration among Member States, cities, financial institutions, and stakeholders. However, its success will depend on balancing public interests with private sector involvement.

A key ambition of the plan is to make climate-neutral construction and renovation the new norm. Yet, policy actions have not sufficiently focused on lowering CO₂ emissions in the residential sector. There is growing recognition of the need to accelerate and widen policy efforts, expanding their narrow focus from just the building to a more systemic approach. This would encompass the energy production system, neighborhood planning, and the circular and resource-efficient use of building materials and services (UNICE, 2021).

Large-scale housing renovation programs are essential to meeting the goals of the Paris Agreement and related Sustainable Development Goals (SDGs). Such efforts also benefit job creation and increase comfort and health levels in living spaces. However, renovation ambitions can have adverse effects if they do not take into account the socioeconomic situation, especially of the most vulnerable households (UNICE, 2021). Ultimately, the integration of housing, climate, and social policies represents perhaps the EU’s most significant opportunity to address the intersecting challenges, ensuring housing affordability, quality, and climate resilience.



6.2. WATER SECTOR: KEY CHALLENGES

Water is a limited resource and an increasingly contested resource, essential to people, economies, and ecosystems. While water services account for approximately 9.6% of total annual water use in Europe, they operate within a much broader landscape of competing demand where agriculture, forestry and fishing consume around 60% of total water, energy production accounts for approximately 20%, and mining and manufacturing for 10%. Understanding this distribution is crucial for developing integrated water management policies that recognize competing demands.

At the same time, access to safe water and sanitation is more than a technical issue: it is a human right. Recognized by the United Nations to be essential for living a life in dignity and the realization of all human rights, water supply and sanitation services require both adequate infrastructure and robust governance frameworks to ensure universal access and social equity.

The water services sector is also a significant driver of economic activity and a substantial economic force, investing approximately €41 billion annually in infrastructure. The total gross value added of the water industry reached €43.84 billion, or 0.35% of the total EU28 value added. At the EU level, water services directly employ 475,000 full-time equivalent positions, in addition to numerous indirect jobs in companies supplying water services providers.

Yet, the economic importance of water resilience extends far beyond the water sector itself. According to the European Central Bank, almost 75% of bank loans to companies in the Euro area are granted to companies that are highly dependent on at least one ecosystem service, notably water (JOIN (2025) 130 final). This underscores how water security fundamentally underpins the entire European economy and financial system, making water resilience a macroeconomic priority.



6.2.1. CLIMATE CHANGE AND INFRASTRUCTURE VULNERABILITY

Climate change effects are intensifying throughout the water sector, creating unprecedented challenges for infrastructure designed for historical climate patterns and for the planning of municipalities. Belén Ramos Alcalde from AEAS (Spain) explained that Europe is *“experiencing more frequent and intense droughts affecting larger areas, along with rising temperatures that are severely disrupting the water cycle.”* Therefore, infrastructure and the whole planning of municipalities need to react to this changed water cycle.

Beyond climate risks, water infrastructure faces a growing range of security challenges including cyber-attacks targeting operational technology systems, physical sabotage of critical installations, and geopolitical threats that can disrupt supply chains and service delivery. This convergence of climate and security vulnerabilities requires a comprehensive approach to infrastructure protection.

6.2.2. INFRASTRUCTURE INVESTMENT AND FINANCING CHALLENGES

Delivering resilient and climate-adapted water services across Europe requires massive and sustained investment—but financing gaps and structural constraints threaten the sector’s ability to deliver on this ambition. This challenge manifests across multiple interconnected dimensions that together create a complex web of barriers to adequate infrastructure development.

► The Scale of the Investment Challenge

At the most fundamental level, infrastructure investment needs are substantial, particularly for aging networks requiring renewal. German

data illustrates how investments are failing to keep pace with rising construction costs, effectively reducing real investment levels despite nominal increases. This troubling trend of declining infrastructure investment in real terms has been confirmed through broader sectoral studies, highlighting the growing gap between infrastructure needs and available resources.

Moreover, recent BDEW studies reveal that addressing this investment gap requires more than simply increasing funding for traditional approaches. Relying solely on technical end-of-pipe solutions like advanced treatment stages proves insufficient and cost-inefficient for addressing the full spectrum of water quality challenges. While such treatments can provide temporary relief, they address symptoms rather than root causes. This reality points toward the need for an integrated approach that combines infrastructure investments with source control measures through multi-stakeholder coordination—a more complex but ultimately more effective strategy for protecting water resources while managing costs.

► Financial Capacity and Structural Constraints

Even when the most efficient approaches are identified, the magnitude of required investments often exceeds the financial capacity of water utilities, particularly in regions already facing climate stress. As Michele Falcone from Gruppo Cap candidly explains that *“total investment needed to address climate change is simply beyond what we can manage on our own. CAP Holding is one of the strongest water companies in Italy, yet even we face difficulties. If we consider the situation in southern Italy, where drought is more severe and resources are more limited, it becomes*

clear that tackling climate change without new funding instruments—or relying solely on existing tariffs—is simply not feasible“.

This capacity constraint is exacerbated by a fundamental contradiction within the sector’s economic model. The water sector operates with predominantly fixed costs—infrastructure, maintenance, and personnel—while relying heavily on variable revenues through volume-based charges. This mismatch creates persistent tension between revenue security and conservation incentives, while simultaneously limiting utilities’ ability to generate the stable funding streams necessary for long-term infrastructure investments. Attempts to resolve this through tariff increases face the additional challenge of affordability impacts on consumers.

► **Implementation and Governance Barriers**

These financial constraints intersect with broader implementation challenges that further complicate the investment landscape. While EU ambitions for climate adaptation and service quality provide essential direction, translating these goals into action faces significant obstacles at national and local levels. Municipal utilities and smaller providers frequently lack the technical capacity, funding mechanisms, and regulatory certainty needed to execute complex directives effectively. This implementation challenge becomes particularly acute in countries with highly fragmented water governance structures, where coordination across multiple actors compounds the complexity.

Policy instability complicates long-term investment planning, as infrastructure improvements require funding commitments that extend well beyond political cycles.

The political sensitivity of water pricing often interferes with sustainable financing models, creating a dynamic where, as one stakeholder observed: “ministers do not like to increase the price of water especially when there are elections. So, it’s not obvious that you can increase the price of water which means that we are maybe going to a too low investment.”

This political sensitivity around pricing reflects deeper structural issues in how water is valued and governed. Some sectors with high water demand pay nothing for the resource itself, while transparency around water abstraction in these areas remains lacking. As Belén Ramos Alcalde emphasizes, addressing these challenges requires elevating water’s political profile: *“We need to prioritize water as a social, economic and political issue because nowadays water is not at the same level as energy and we have no good governance to make the decisions. They are quite political but not in the political agenda”.*

6.2.3. WATER QUALITY AND POLLUTION CHALLENGES

► **Growing Pollution Concerns:** Quality deterioration and pollution prevention represent increasingly complex challenges for water service providers. The water services sector faces significant difficulties managing persistent pollutants. EurEau’s 2023 report notes that ‘the removal of pollutants such as nitrate, pesticides or PFAS significantly increases the carbon footprint, resource use and energy consumption of water service providers while generating difficult-to-treat waste and limiting circular economy options. This reinforces why source control is preferable to end-of-pipe solutions’.

► **Prevention-Focused Policy Need:** Prevention of pollution at source represents the most sustainable approach to addressing water quality challenges. EurEau emphasizes that ‘preventing the release of contaminants to drinking water resources and wastewater is the most effective way to ensure the sustainability of water services’ (2023). Prevention-focused policies would align environmental protection with climate goals while reducing treatment costs and energy consumption.

► **Pharmaceutical Contamination:** Studies from Germany highlight an additional challenge: pharmaceutical residues in water systems. Projections indicate that pharmaceutical consumption could increase by up to 70% by 2045, primarily due to aging populations, with over 150 pharmaceutical compounds already detected in German water bodies. Conventional treatment technologies cannot completely remove these compounds, creating a growing challenge for water utilities alongside climate impacts. This represents another example where source control is more effective than end-of-pipe treatment solutions.

► **Persistent Pollutants Challenge:** New threats from persistent pollutants, primarily per- and polyfluoroalkyl substances (PFAS) - widely used, long-lasting chemicals with components that do not break down over time - require stricter source control rather than relying on treatment technologies. Wolfgang Deinlein from the ERM Coalition of European Drinking Water Suppliers explains the limitations of treatment-based approaches: *“There are restrictions for reverse osmosis: we have 30% extra water demand and the residual water is the concentrate of pollutants where no one knows where to put it. So it could be that we would need reverse*

osmosis, it’s the only treatment that would work, but we cannot use it and it wouldn’t be available”.

► **Scale of PFAS Challenge:** The extent of the PFAS contamination issue is substantial across Europe. Wolfgang Deinlein notes: *“If we look at Germany there would be 29% of German water works that would need extra treatment if the new drinking water PFAS limit value would be the one used in Denmark”*, underscoring the potential regulatory and infrastructure impact if stricter standards are adopted EU-wide. Already we see increasing water prices caused by further treatment for PFAS. In Rastatt, in the south of Germany, the drinking water tariff has doubled since PFAS was found in the raw water resources of Stadtwerke Rastatt (BDEW, 2024).

6.2.4. WATER SCARCITY AND RESOURCE STRESS

Water scarcity and stress affect increasing portions of Europe, extending beyond traditionally drought-prone regions. Spain has experienced particularly severe drought conditions that necessitated water use restrictions in late 2023.

► **Multiple Stressors on Water Resources:** Water scarcity emerges from a combination of climate change impacts and increasing demand pressures. As Belén Ramos Alcalde elaborates: *“Water is a scarce resource in Spain with decreasing quality due to less rain, pollution and increasing demand. Spain is particularly vulnerable to climate change effects: less rainfall, higher temperatures and more extreme events such as floods; simultaneously, water demand even increases in some sectors as agriculture”*. Climate projections indicate these challenges will intensify and expand geographically, requiring diversified adaptation strategies.

► **Downstream Vulnerability:** The position within river basins significantly affects vulnerability to water stress. Dr. Jörg Rehberg from BDEW (Germany) emphasizes that *“Climate change impacts water availability, especially in downstream regions of rivers which, in turn, increase costs and investments needed to adapt to climate change and meet stricter quality standards, putting pressure on affordability.”* This highlights how geographical location within watersheds creates uneven vulnerability profiles.

► **Adaptation Through Reuse:** Water reuse represents one promising adaptation pathway that several Member States are developing. Spain has been progressively implementing water reuse technologies by starting adapting the national wastewater treatment plants for creating reclaimed water. As of recent data, Spain reuses approximately 343 hm³ (hectometers cubed or million cubic meters) per year of treated wastewater. This places Spain as the **second-highest water reuser in the EU**, accounting for nearly half of Europe’s total reclaimed water volume (IDRA, 2021).

► **Mixed Trends in Water Quality:** Recent data shows inconsistent progress in water quality indicators across Europe. While biochemical oxygen demand in rivers and nitrate concentrations in European groundwater bodies have decreased since 2016, phosphate concentrations in rivers have risen strongly. Additionally, the share of inland bathing sites with excellent water quality has been falling in the EU since 2017, and the EU’s water exploitation index shows a slightly increasing trend in recent years (Progress report towards the SDGs, 2024). These mixed trends indicate the complex interplay between climate impacts, pollution pressures, and infrastructure capacity.

► **Strategic Planning Imperative:** A comprehensive water strategy is essential for balancing competing demands and ensuring resilience. The Water Resilience Strategy announced in the Competitiveness Compass aims to address growing water scarcity challenges by improving water management practices and infrastructures, increasing efficiency and promoting sustainable use, with implementation planned from 4th June 2025.

6.2.5. ACCESS, AFFORDABILITY AND SOCIAL EQUITY

Access to safe water and sanitation is more than a technical issue: it is a human right. Recognized by the United Nations to be essential for living a life in dignity and the realization of all human rights, water supply and sanitation services require both adequate infrastructure and robust governance frameworks to ensure universal access and social equity.

► **Sanitation Access Disparities:** Almost every household in the EU had basic sanitary facilities in 2020, with on average only 1.5% of the population reporting they were living in households without a bath, shower or flushing toilet. However, significant disparities exist between Member States. In Romania, this proportion reaches 21.2%, while Bulgaria, Latvia and Lithuania reported values between 6.4% and 7.0%. These figures are significantly higher for the population at risk of poverty (5.1% at EU level, reaching 56.6% in Romania), highlighting the strong link between reduced access to basic facilities and poverty (SWD, 2023).

► **Affordability Considerations:** The median share of water and sanitation expenditure in households' incomes in the EU is relatively low overall – reaching 1.7% in 2015 – but it is on average significantly higher (2.9%) among households that are at risk of poverty or social exclusion (SWD, 2023).

► **Low Tariffs vs. Infrastructure Needs:** In some Member States, politically-determined low tariffs create challenges for sustainable infrastructure financing. In Spain water tariffs, decided at the political level not by operators, are one of the lowest in the European Union (0.9% household budget for an average family), leading to low-cost recovery and investment rates. This highlights the fundamental tension between keeping water affordable for all citizens while ensuring sufficient investment in infrastructure resilience and quality. It also underscores that in some member states it is not possible for water operators to simply increase their tariffs according to their need to accommodate for the full upcoming investment costs.

the Euro area are granted to companies that are highly dependent on at least one ecosystem service, notably water (JOIN (2025) 130 final). This underscores how water security fundamentally underpins the entire European economy and financial system, making water resilience a macroeconomic priority.

► **Circular Economy Leadership:** Water services are increasingly recognized as key players in implementing circular economy principles. Urban wastewater treatment plants are evolving into bio-factories, producing energy from biomass, recovering nutrients, producing reclaimed water for reuse and reducing their carbon footprint. This transformation represents both an opportunity and a challenge for the sector. The water services sector has articulated ambitious goals to play a front-running role in Europe's transition to a climate-neutral, circular society (EurEau, 2023). This transformation requires significant investment and regulatory support to succeed at scale.

6.2.6. ECONOMIC IMPORTANCE AND ROLE FOR CIRCULAR ECONOMY

► **Economic Importance:** The water services sector is a significant driver of economic activity and a substantial economic force, investing approximately €41 billion annually in infrastructure. The total gross value added of the water industry reached €43.84 billion, or 0.35% of the total EU28 value added. At the EU level, water services directly employ 475,000 full-time equivalent positions, in addition to numerous indirect jobs in companies supplying water services providers. Yet, the economic importance of water resilience extends far beyond the water sector itself. According to the European Central Bank, almost 75% of bank loans to companies in

6.2.7. WORKFORCE AND GOVERNANCE CHALLENGES

► **Skills Shortage:** The water sector faces particular challenges in public visibility and workforce attraction. According to EurEau (2023), “water service providers across Europe face serious and growing shortages of qualified people ranging from blue-collar workers to IT experts to engineers.” This skills shortage threatens the sector's ability to implement innovative solutions for climate adaptation and infrastructure modernization. As Dr. Jörg Rehberg (BDEW) notes: “A lack of specialized workforce and decreasing number of students entering the water sector poses challenges for maintenance, innovation, and long-term sustainability”.



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Credit: Marcus Lindstrom

6.3. ENERGY SECTOR: KEY CHALLENGES

6.3.1. ENERGY AND EUROPE'S SOVEREIGNTY AND COMPETITIVENESS

The multiple crises that have subsequently hit the EU have increased the need for European action to have an impact on the EU's energy sector, industry and competitiveness. Despite this, we are still largely dependent on fossil fuels for our energy needs. Decarbonizing our uses, among other by accelerating electrification, must therefore become a central objective of European policy. In this context Europe faces a very complex challenge, forcing our continent to invest into a strong energy transition simultaneously combining the meeting of environmental, energy independence, security of supply, and affordability / competitiveness objectives. However different the situations of the different member states can be, it is vital that these challenges be tackled in a more wide-scale approach building on complementarity rather than competition between member states.

Recent crisis has also reminded European citizens that energy is not to be taken for granted and that it requires some renewed approach and long-term vision.

6.3.2. INFRASTRUCTURE VULNERABILITY AND CLIMATE IMPACTS

Located at the core of the energy system, grid resilience and adaptation require substantial investments. France's transmission system operator plans to invest €20 billion by 2040 to adapt 80% of the transmission grid to climate change, while the distribution system operator plans €25 billion in the same period. As Youenn Rougetet from Union Française de l'Electricité (UFE) explains, *"37% of overhead power lines are already exposed to the risk of heat in 2025 and 18% of substations are subject to flooding."* Distribution system operators across Europe need an estimated €70-80 billion specifically for climate adaptation measures by 2030, as part of total grid investment needs of €400 billion by 2030.

Energy security concerns have increased, with the EU's energy import dependency rising strongly in 2022, especially for natural gas, mainly due to Russia's war in Ukraine and the refilling of stocks that were particularly low at the end of 2021. While the share of renewables in the EU's energy consumption has grown since 2017, stronger progress will be required to meet the respective 2030 targets (Progress report towards the SDGs, 2024).

Balancing electrification with system resilience presents challenges. Local utilities face particular implementation challenges, as explained by the calculations from utilities in Germany showing a significant gap between climate neutrality targets (2045) and realistic implementation timelines. This demonstrates an urgent need for creating adjustment mechanisms that balance ambition with practical implementation capabilities.

Climate impacts on energy infrastructure vary significantly by region. Southern Europe faces increasing cooling demands and reduced hydropower capacity due to drought, while Northern regions experience more extreme weather events disrupting transmission infrastructure. A 2024 study by the Joint Research Centre found that 42% of European power plants are vulnerable to at least one climate hazard, with projections suggesting this could increase to 65% by 2050 without adaptation measures.

Digitalization is accelerating the energy transition while creating new vulnerabilities and security challenges. Smart meters, grid automation, and digital platforms enable more efficient energy management but also increase cyber-security risks.

According to the European Union Agency for Cybersecurity (ENISA), reported cyber incidents in the energy sector increased by 36% between 2022 and 2024, with 68% targeting operational technology systems rather than information technology infrastructure. This suggests the need for integrated approaches to physical and digital resilience in energy systems.

6.3.3. MARKET STRUCTURE AND INDUSTRY TRANSFORMATION

The transition toward decentralized energy systems is creating new market dynamics. Distributed energy resources such as rooftop solar, battery storage, and demand response capabilities are transforming consumers into “prosumers” who both consume and produce electricity. This shift challenges the conventional utility model and calls for new market designs, regulatory frameworks, and business strategies. Rather than relying solely on selling electricity by volume, energy providers are increasingly moving toward service-oriented approaches –offering integrated energy management, efficiency solutions, and tailored customer services. Those able to adapt to this evolving landscape will be better positioned to ensure long-term sustainability and competitiveness in the energy transition.

Regional disparities in energy market development remain significant. Nordic countries have achieved high levels of market integration and benefit from efficient cross-border electricity trading, which has supported the uptake of renewable energy. In contrast, other regions still face technical, regulatory, or infrastructural that limit market flexibility. These differences affect countries' ability to integrate higher shares of renewables while maintaining grid stability and affordability.

6.3.4. WORKFORCE AND SKILLS CHALLENGES

Industry concentration in the electricity sector creates unique governance challenges. As of 2018/2019, more than half of the European workforce in electricity was employed by just 14 multinational companies operating across 23 Member States. This concentration affects how climate adaptation policies are implemented and suggests the need for coordinated approaches that balance large-scale efficiency with local responsiveness.

The electricity sector is undergoing significant workforce transformation while addressing climate challenges. Data from 2011-2024 shows substantial growth in high-skilled positions, with increases of 187% in business/administration professionals, 126% in ICT professionals, and 45% in science/engineering professionals (SGI Europe Workshop on Energy, 2025). This shift toward higher cognitive tasks demands targeted training programs and suggests the sector is positioning itself for innovation but requires focused workforce development policies to support this transition.

Major electricity providers are already responding to energy transition demands with significant workforce expansion. In 2024 alone, companies like ENGIE (more than 5000 workers), EDF (more than 4000 workers), Enel (ca. 1200 workers), and Smart Solar (around 800 workers) announced business expansions specifically linked to decarbonization initiatives. These examples demonstrate the sector's capacity for adaptation but also highlight the scale of transformation required across Europe.

But, as Jean-Michel ROMANN, from UFE explains, *"companies of the energy sector have been facing some critical skills shortages and recruitment difficulties (especially in technical jobs) due to some drastic changes in working methods and, at the same time, a steep decrease of industrial jobs attractiveness among young generations"*.

This calls for call for giving a particular attention to education and training. Existing actions at European level, such as the "Industry Academies" under the NZIA or the "Erasmus+" program, actions in the field of education/ training under the Knowledge & Innovation Communities (KICs), etc. Are good examples of positive actions in that field.

6.3.5. ENERGY POVERTY AND AFFORDABILITY CHALLENGES

Affordability during transition requires careful policy design. While Eurelectric projections suggest long-term savings from electrification (35-40% decreased energy bills by 2050), the transition requires addressing high upfront costs, particularly for vulnerable customers.

Housing costs significantly exacerbate income inequality and energy poverty. As Georgios Koukoulakis (JRC) notes, *"younger age groups tend to struggle more to keep up with paying bills while older generations are usually more secure"*. This generational disparity adds another dimension to energy affordability challenges.

JRC analysis reveals that individuals residing in dwellings with reduced rent exhibited the highest proportion of arrears on utility bills (14% EU average), followed by those in free accommodation (10%).



Regional analysis shows that energy poverty varies significantly across regions, with the highest rates of inadequate heating in Bulgaria, Greece, Lithuania and Spain. In Bulgaria, 25% of the population was persistently unable to adequately heat their homes from 2018 to 2021, compared to minimal rates in Luxembourg, Finland, Sweden, Estonia and Slovenia (JRC, 2024).

An EU-wide definition of energy poverty has been agreed between co-legislators in the regulation establishing the Social Climate Fund: 'energy poverty' means a household's lack of access to essential energy services that underpin a decent standard of living and health, including adequate warmth, cooling, lighting, and energy to power appliances, in the relevant national context, existing social policy and other relevant policies (SWD, 2023). The median expenditure on residential energy in the EU in 2015 amounted to 5.9% of households' disposable income, ranging from between 2% and 3% in some countries to 10% or more in Bulgaria, Croatia, Hungary, Romania and Slovakia. This expenditure is on average significantly higher (9.7%) in households that are at risk of poverty or social exclusion than in those that are not (5.1%), with the gap ranging up to 9.9 percentage points in some countries (SWD, 2023).

In 2022, people who were at risk of poverty experienced significantly higher levels of arrears on utility bills (heating, electricity, gas, water, etc.) than the overall population (15.6% compared with 6.9%). The rate varies greatly between Member States, ranging from 1.5% of total population in the Netherlands to 34.1% in Greece (SWD, 2023). Energy inefficiency – caused by low efficiency of housing stock and infrastructures – represents another important driver of energy poverty. This challenge is further aggravated when low-income households do not own their

dwellings, since this often prevents them from implementing solutions that might otherwise increase energy efficiency (SWD, 2023).

The risk of creating a two-tier Europe is significant, as Shaemus Hoyne (FEDERENE) recalled, the severe impacts of recent climate-related blackouts in Ireland demanded a humanitarian-level response. In the aftermath of severe blackouts, public authorities had to mobilise emergency support measures—setting up community hubs in local centres and hotels, and coordinating efforts with organisations such as the Red Cross. These experiences have reinforced the growing recognition among local stakeholders that climate preparedness must go beyond infrastructure resilience: it must also include coordinated social support systems capable of responding rapidly to community needs during climate emergencies

It is important to understand that energy services in this context encompasses the full spectrum of energy-related utilities and functions including electricity generation, transmission and distribution, gas supply, heating and cooling systems, and related consumer services – not limited to electricity alone. This broad definition highlights the complexity of ensuring resilience across the entire energy value chain.

At the same time, the social cost of the energy transition is not evenly distributed across population segments. According to analysis from the European Commission's Joint Research Centre, low-income households spend up to three times more of their income on energy compared to high-income households –a disparity particularly pronounced in Central and Eastern Europe. Stakeholder input from the Energy Poverty Observatory confirms that a combination of inefficient housing stock, rising energy prices,

and low disposable income creates high vulnerability among affected households. Without targeted interventions, the energy transition risks deepening social inequalities and excluding the very populations most in need of support.

Successful interventions against energy poverty require multi-dimensional approaches. Member States have implemented various policy instruments, from energy price subsidies to renovation support schemes. The most effective programs combine immediate relief with structural improvements. For example, Ireland's Warmer Homes Scheme provides free energy efficiency upgrades to homes where the occupants receive certain welfare payments, addressing both immediate affordability and long-term efficiency needs. Similar integrated approaches in France and Portugal have demonstrated positive outcomes according to recent evaluations by the Social Climate Fund oversight committee.

6.3.6. NECESSARY FUTURE POLICY DIRECTIONS AND LONG-TERM VISION

The European Commission's Clean Industrial Deal will aim at securing the EU as an attractive location for manufacturing, including for energy-intensive industries, while promoting clean tech and new circular business models. The Electrification Action Plan and European Grids Package, planned for early 2026, will address significant investment needs for modernizing and expanding Europe's network of energy transmission and distribution infrastructure, which is critical for integrating renewable energy sources and leveraging the benefits of Europe's Single Energy Market.

As Federica Bruni from GEODE, the association representing local energy distributors across Europe, argues, *"we really need a forward-looking regulatory framework that allows grid operators to invest and operate in a foreseeable context, otherwise the sector will struggle to meet climate goals while maintaining service quality and affordability"*.

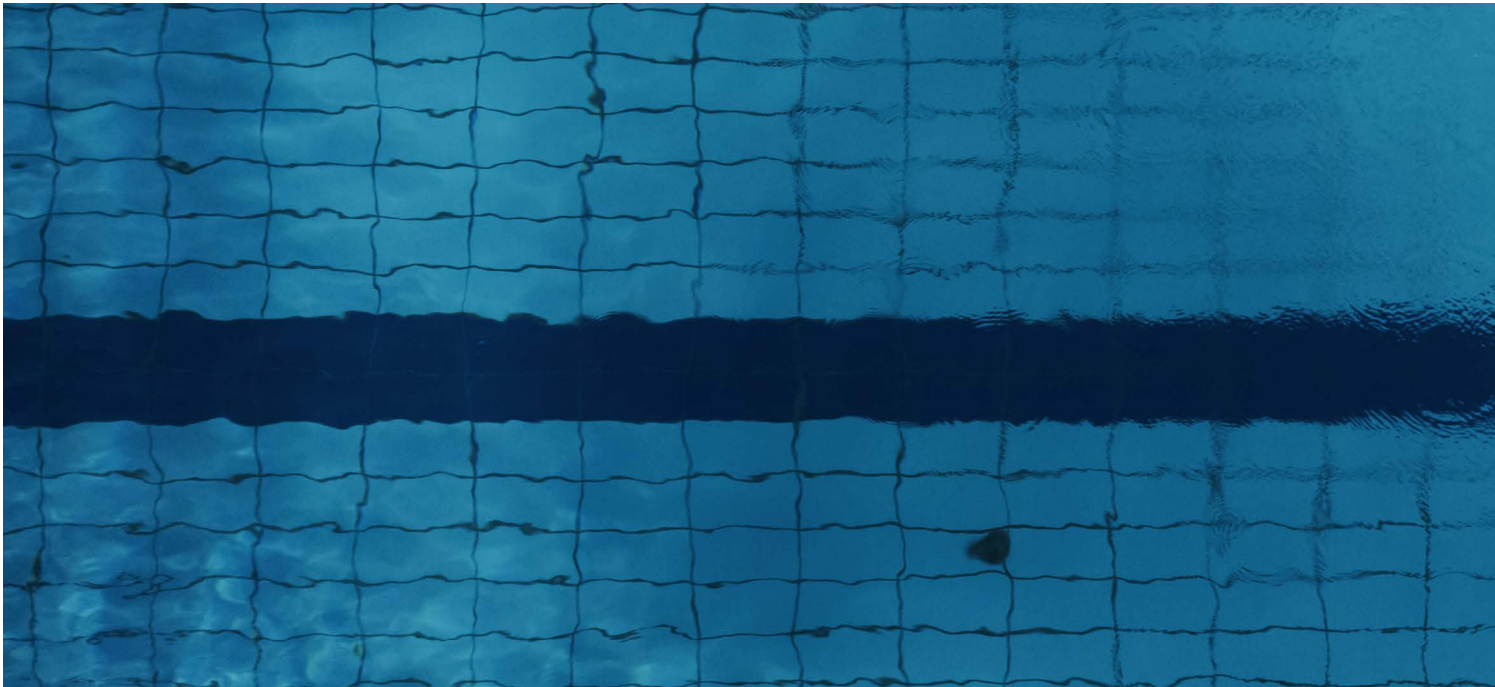
The REPowerEU initiative, launched in response to energy market disruptions, has accelerated renewable energy deployment but created implementation challenges for local utilities. According to the European Federation of Local Energy Companies, permitting processes remain overly complex despite simplification efforts. A 2024 survey found that 72% of local utilities reported difficulties navigating renewable energy zones designation processes, while 65% struggled with finding qualified personnel to implement new projects.

Long-term duration energy storage is increasingly recognised as a critical element of system resilience in the context of high renewable energy penetration. Beyond lithium-ion batteries, technologies such as pumped hydro, compressed air, and thermal storage are gaining attention. The European Commission's Strategic Energy Technology Plan has identified the need for 200-300 GWh of long-duration storage by 2040 to maintain grid stability with high renewable penetration. Despite this, current policy frameworks often overlook the strategic value of storage infrastructure – particularly for long-duration assets that fall outside short-term market mechanisms, but also intermittent or variable renewable energy sources during peak hours. Without a stronger policy focus and targeted investment, Europe risks undermining its decarbonisation goals by failing to secure the storage capacity needed to balance a renewable-dominated energy system.

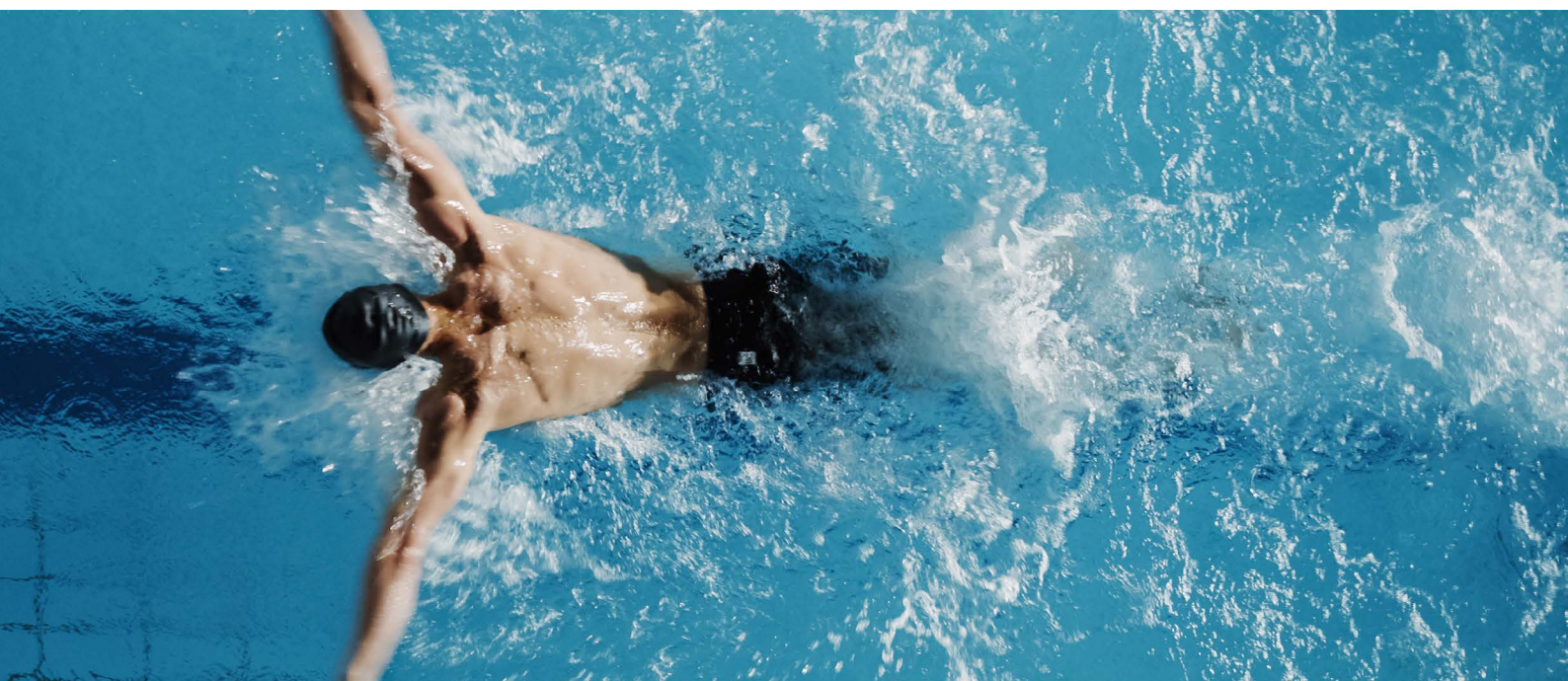


Member States are beginning to adopt coordinated cross-border approaches to grid resilience. The Pentalateral Energy Forum (Belgium, Netherlands, Luxembourg, France, Germany, Austria, and Switzerland) has developed joint crisis response mechanisms and shared resilience standards that could serve as models for wider European coordination. Their 2024 resilience roadmap includes mutual assistance provisions, standardized emergency procedures, and coordinated critical infrastructure investment priorities.

The energy-water nexus requires greater policy attention, especially as both sectors intensifying climate pressures. Energy production relies heavily on water resources, while water treatment and distribution require significant energy inputs. Climate adaptation in either sector affects the other, yet policies often remain siloed.



7. POLICY RECOMMENDATIONS



- Based on the research findings, this report presents targeted recommendations to address both transversal and sector-specific challenges. These recommendations are organized by target audience to facilitate implementation.

7.1. TO THE EUROPEAN COMMISSION

The European Commission plays a central role in shaping the financial, legislative and governance frameworks that determine how Member States and providers of Services of General Interest respond to climate, affordability, and infrastructure challenges.

The following recommendations are designed to reinforce the goals of the EPSR Action Plan, and the Competitiveness Agenda. The European Green Deal, adopted in December 2019, provides an overarching framework for many of our recommendations as it aims to transform the Union into a climate-neutral society while leaving no one behind by creating a modern, resource-efficient, competitive and fair economy where there are no net emissions of greenhouse gases by 2050 and where economic growth is decoupled from resource use.

7.1.1. STRENGTHEN CLIMATE RESILIENCE AND INFRASTRUCTURE ADAPTATION

- ▶ *Establish an integrated EU infrastructure resilience framework* that coordinates housing, energy, and water sectors to ensure synchronized climate adaptation planning and implementation. This framework should recognize the interconnected nature of essential services and address cascading vulnerabilities between systems and contribute towards building resilience that would serve both climate and the ever-growing security challenges.
- ▶ *Establish a European Critical Infrastructure Protection Agency* to coordinate cybersecurity and physical security measures across essential services sectors. This agency should facilitate real-time threat intelligence sharing between Member States and service providers, develop standardized security protocols for operational technology systems, and coordinate rapid response to incidents targeting electricity substations, water treatment facilities, and telecommunications infrastructure.

7.1.2. DRIVE ENERGY SYSTEM TRANSFORMATION

- ▶ *Invest in grid stabilization technologies specifically designed for renewable-heavy power systems*, including battery storage, super-capacitors, and flywheels that can substitute for traditional forms of inertia by providing capacity during sudden frequency changes. These technologies are essential for maintaining grid stability as Europe transitions to higher renewable energy penetration.
- ▶ *Establish a dedicated European Grids Facility* under the EU Competitiveness Fund to accelerate distribution grid investments. This would ensure easier access to ear-marked funding for distribution system operator projects and support regional funding for distribution grid projects at national and local levels. The need is urgent as distribution system operators across Europe require an estimated as high as €650 billion by 2030 for grid modernization, expansion and climate adaptation.
- ▶ *Implement a grid mainstreaming approach* to ensure that distribution system operators' needs are considered in every new and revised regulation, and that grid expansion does not lag behind decarbonization objectives. This should include early and continued involvement of DSOs in infrastructure planning processes, addressing the concern raised by stakeholders that "We really need a forward-looking regulatory framework that allows them to see the investments" (Federica Bruni, GEODE).

- ▶ *Launch a European Grid Academy* within the framework of EU's Net-Zero Academies to build and develop specialized skills in the grid value chain. This would address labor market shortages and support the distribution grid's central role in enabling both climate adaptation and the energy transition. This recommendation is supported by evidence showing the electricity sector's transition toward higher-skilled positions.
- ▶ *Develop EU-wide incentive frameworks* for technologies that enhance end-user autonomy and efficiency, such as heat pumps combined with on-site generation and storage, addressing the current 'highly uneven progress' in adoption rates across Member States.

7.1.3. ENHANCE WATER MANAGEMENT AND QUALITY

- ▶ *Develop a comprehensive EU water contaminant strategy* that addresses both climate-related and non-climate-related water quality challenges, focusing on source control alongside advanced treatment. This strategy should follow the polluter-pays principle and involve coordination between healthcare, pharmaceutical, agricultural, and water sectors to comprehensively address emerging water quality challenges.
- ▶ *Recognize the dual role of water services in public health protection and environmental sustainability* when allocating funds for infrastructure development. This dual mandate creates unique challenges for water utilities that other sectors do not face to the same degree.

7.1.4. FOSTER CIRCULAR ECONOMY AND RESOURCE RECOVERY

- ▶ *Foster a circular economy through recycled content criteria for key products*, potentially in the form of tradeable quotas. This would create markets for secondary materials recovered by essential service providers, including phosphorus from wastewater. Without such market incentives, circular solutions will remain underdeveloped despite their potential to reduce import dependencies and support the EU's transition to greater resource independence.
- ▶ *Support the creation of Important Projects of Common European Interest (IPCEIs)* covering essential service infrastructures and entire value chains. These should include energy, digital, transport, and wastewater infrastructures as core components of integrated value chains for Net-Zero technologies. Such IPCEIs would ensure that all Member States benefit from investments in climate-resilient infrastructure, addressing the uneven distribution of adaptation capacity across Europe.

7.1.5. MODERNIZE FINANCING AND INVESTMENT FRAMEWORKS

- ▶ *Create dedicated climate adaptation funding mechanisms specifically for essential services infrastructure*, separate from existing cohesion and regional development funds. These mechanisms should address the significant investment gaps identified across sectors and provide particular support for regions most vulnerable to climate impacts. This recommendation is supported by JRC evidence showing that targeted interventions are needed for households facing multiple vulnerabilities.
- ▶ *Reform economic governance rules to recognize essential services investments as strategic infrastructure* deserving different fiscal treatment. This would provide greater flexibility for necessary adaptation investments, particularly for social housing and municipal utilities facing significant constraints.



- ▶ *Develop financing frameworks based on the polluter pays principle for infrastructure improvements* addressing emerging contaminants. Research indicates that alternative financing models, such as through the extended producer responsibility (EPR), would distribute costs more equitably across value chains while creating incentives to reduce pollution at its source rather than relying solely on end-of-pipe solutions.
- ▶ *Optimize the use of European Structural and Investment Funds (ESIF) for social infrastructure investments.* These funds, particularly the European Regional Development Fund (ERDF) which lists 'health and social infrastructure' among its investment priorities, and the European Social Fund (ESF), represent substantial resources (over €443 billion for 2014-2020) that could be better directed toward social infrastructure needs. The Commission should ensure these funds are deployed through blending mechanisms that combine grants with loans, guarantees, and equity instruments to maximize impact and attract private investment in social infrastructure.

7.1.6. IMPROVE AFFORDABILITY AND INCLUSION IN ENERGY AND HOUSING

- ▶ *Improving energy efficiency to contribute to alleviating energy poverty and overcome some of the potential negative distributional impacts of pricing measures,* but the most vulnerable often face barriers to accessing renovation schemes, including split incentives between owners and tenants, administrative barriers, large upfront costs, and problems accessing credit. The recast energy efficiency directive should be leveraged to strengthen the obligation for Member States to implement and finance energy efficiency improvement measures as a priority among vulnerable customers and people affected by energy poverty. JRC research confirms that housing problems disproportionately affect young people, low-income earners, and private tenants, with those in the lowest income quintile nearly twice as likely to struggle with heating compared to those in the highest quintile.
- ▶ *Enhance coordination of spatial and mobility planning to promote energy-efficient homes, neighborhoods, cities, and regions in green, socially inclusive, and walkable neighborhoods* thus minimizing dependence on car use and reducing emissions. This more holistic approach recognizes that building-level efficiency measures alone are insufficient without corresponding urban planning improvements.

7.1.7. BUILD SKILLS AND CAPACITY BUILDING

- ▶ *Establish a European alliance for climate-conscious essential services,* bringing together policy, industrial, R&D, and training dimensions. This would integrate technical and transversal skills development needed for the adaptation of essential services, following the model of successful green skills alliances. This alliance should consider the interconnected nature of sustainability challenges, recognizing that the EU's climate-related targets, such as the 55% GHG emissions reduction by 2030, will require coordinated action across the water, energy and housing sectors.
- ▶ *Enhance the technical assistance offered to Member States for implementing complex directives related to essential services.* This should address the implementation gaps identified and support knowledge transfer between regions with different adaptation experiences.

7.1.8. ADMINISTRATIVE SIMPLIFICATION AND STRATEGIC PLANNING

- ▶ *Implement the ambitious simplification agenda as outlined in the Competitiveness Compass, targeting a 25% reduction in administrative burdens for all companies and a 35% reduction for SMEs, with special attention to permitting and reporting requirements for essential services providers. This represents approximately €37.5 billion of recurring costs reduction through a series of Simplification Omnibus packages.*
- ▶ *Deploy the proposed Competitiveness Coordination Tool to align industrial and research policies and investments at EU and national levels in the essential services sectors, ensuring coordinated approaches to infrastructure adaptation and modernization. This tool will help deliver major cross-border projects with European added value.*

7.2 TO MEMBER STATES

7.2.1. CLIMATE ADAPTATION AND RESILIENCE

- ▶ *Develop national climate adaptation plans for essential services with the involvement of social partners and service providers. These plans should serve as a reference for bottom-up approaches developed at the local level while aligning with European frameworks.*
- ▶ *Promote and adopt successful coordination examples. The recommendation to strengthen coordination mechanisms can be supported by examples like France's National Climate Change Adaptation Plan, which successfully aligns national authorities, regulatory bodies, and local service providers in planning for climate resilience.*

7.2.2. FINANCING AND INVESTMENT MECHANISMS

- ▶ *Create financial incentives for climate-resilient investments in essential services, including blended finance mechanisms combining public grants, low-interest loans, and investments. These approaches have proven successful for essential infrastructure, and special provisions should target areas most vulnerable to climate impacts.*
- ▶ *Encourage the development and issuance of social bonds aligned with the Social Bond Principles to finance social infrastructure projects. Social bonds are debt instruments whose proceeds are used exclusively to finance or refinance eligible social projects, including social infrastructure. Member States should create favorable regulatory conditions and consider issuing sovereign social bonds or supporting their national promotional banks in issuing such bonds. These instruments can attract socially responsible investors seeking both financial returns and positive social impact, thereby expanding the investor base for social infrastructure.*
- ▶ *Harmonize regulations for secondary materials across Member States to create unified markets for recovered resources. This includes establishing consistent rules for products such as phosphorous from sewage sludge, which can be used as fertilizer but is currently lacking market access.*



7.2.3. AFFORDABILITY AND SOCIAL DIMENSION

- ▶ *Implement affordable and accessible essential services monitoring frameworks* that track both climate resilience and social impacts across sectors. These should include standardized affordability metrics such as service costs as percentage of income for different household types, especially given that in 2022 individuals whose housing costs exceeded 40% of disposable income were 10 percentage points more likely to struggle with heating compared to those with lower housing costs.

7.2.4. WORKFORCE AND SKILLS DEVELOPMENT

- ▶ *Involve social partners in developing national green skills plans and ensure they have an active role in ensuring a just transition.* Social partners are essential to initiate and lead communication and awareness campaigns that increase the visibility of occupations in sectors with low attractiveness for young people, particularly those critical to the climate transition.
- ▶ *Build synergies between industrial and training policies* through investments and development plans which consider the design of training paths aimed at building skills that enable climate adaptation innovation in essential services.

- ▶ *Support knowledge transfer networks between experienced and emerging professionals in essential services sectors,* addressing the workforce development needs identified in all three sectors. *Implement targeted programs to develop workforce capabilities aligned with the electricity sector's transformation,* addressing the documented growth in professional, ICT, and engineering positions while supporting workers in declining occupational categories.

7.2.5. STRATEGIC COORDINATION AND GOVERNANCE

- ▶ *Actively participate in the Competitiveness Coordination Tool framework to ensure alignment of national and EU-level investments in essential services infrastructure,* particularly for cross-border projects with European added value.

7.2.6. SECTOR-SPECIFIC MEASURES

• **Water**

Implement integrated source control approaches to reduce contaminants entering water systems rather than relying exclusively on end-of-pipe technical solutions.

Implement full cost recovery mechanisms for water services, including through rigorous application of the polluter-pays principle. Full cost recovery, including for the maintenance and renewal of the existing infrastructure, research and innovation, investment and the development of new business areas must be ensured.

• **Energy**

Contribute to the implementation of the Affordable Energy Action Plan through measures to ensure wider direct access to low-cost energy for essential services providers, including better designed network tariffs and taxation.

- **Housing**

Promote efficient social housing approaches as good practices from the Member States as a powerful tool for addressing affordability concerns when properly funded. Member States should evaluate their social housing systems against the good practice examples, considering both quantity and accessibility, particularly as social housing waiting lists remain a challenge even in countries with large social housing stocks.

- ▶ *Ensure costs of renovation processes do not displace residents or place an excessive cost burden by using grants, long-term low-cost investment and/or assistance to tenants, while supporting the development and implementation of building standards, technologies, processes and supply-chains to promote climate-neutral living environments.*

7.3. TO SGI PROVIDERS

7.3.1. INFRASTRUCTURE AND ASSET MANAGEMENT

- ▶ *Develop comprehensive asset management systems for proactive infrastructure planning and climate adaptation.* These systems should identify and address vulnerabilities before service disruptions occur, particularly focusing on aging infrastructure.
- ▶ *Develop strategies that enhance the role of water infrastructure in transitioning to a circular economy, including energy production from biomass, nutrient recovery, and water reuse systems.*
- ▶ *Implement integrated cybersecurity and physical security frameworks* that protect operational technology systems while maintaining service accessibility. This should include regular vulnerability assessments, incident response protocols, and staff training programs to address the documented increase in coordinated attacks on critical infrastructure. Providers should establish secure communication channels with national authorities and peer organizations to enable rapid threat intelligence sharing and coordinated response to security incidents.
- ▶ *Position the electricity sector not merely as background infrastructure but as an active partner in European energy independence,* recognizing that the sector no longer can position itself as an infrastructure in the background; it has to shape a narrative in helping society to understand the importance of European energy independence.

7.3.2. RESOURCE EFFICIENCY AND CLIMATE ADAPTATION

- ▶ *Combine investment in renovation with economic support programmes to ensure that energy improvements do not lead to excessive costs for tenants,* while promoting capacity building in energy efficiency among building owners, managers and end-users on topics such as environmental impact and cost ratios, tenant engagement possibilities, and life cycle costs.
- ▶ *Implement cross-sectoral coordination mechanisms for water quality protection that engage stakeholders beyond water utilities.* German research demonstrates that addressing complex water quality challenges effectively requires coordination between utilities, product manufacturers, service providers, and consumers to reduce contaminants at their source rather than relying solely on treatment solutions.



7.3.3. COMMUNICATION, EDUCATION AND SKILLS

- ▶ *Develop communication strategies that effectively explain the value and complexity of water services to citizens*, as water services are largely invisible to citizens and their complexity is often poorly understood. This communication is essential to build public support for necessary investments and attract qualified personnel to the sector.
- ▶ *Create transparent communication channels regarding adaptation plans, expected benefits, potential disruptions, and investments*. Transparency builds public support for necessary rate adjustments to fund climate adaptation.
- ▶ *Establish education programs for consumers on resource-efficient practices to address the rebound effect where improved building efficiency does not immediately translate to expected savings*. The communication should explain and elucidate that actual energy consumption often does not match theoretical performance after renovations, demonstrating the importance of monitoring real consumption patterns and the need for educating residents.
- ▶ *Adopt holistic approaches when designing employee training*, recognizing that the segregation between occupations has decreased within sectors, requiring employees to broaden their expertise in problem-solving, digital skills, communication, and creative thinking.

7.3.4. FINANCIAL AND DIGITAL READINESS

- ▶ *Leverage the distinctive financial features of social infrastructure investments to attract investments*.

Social infrastructure projects offer several attractive characteristics for investors, including:

- Low volatility of returns (especially when based on availability payments from the public sector);
 - Low correlation to other assets, reducing portfolio risk;
 - Good opportunities for portfolio diversification due to the typically smaller project sizes
- o Relatively low default rates compared to other investments by structuring projects to emphasize these features and potentially bundling similar projects to overcome the small average size bottlenecks, SGI providers can make their projects more appealing to institutional investors seeking steady, inflation-linked returns (High-Level Task Force on Investing in Social Infrastructure in Europe, 2018).

- ▶ *Leverage digitalization and advanced IT systems to reduce reporting burdens and streamline administrative processes*, using tools such as e-invoicing, e-signature, and digital product passports to simplify compliance with regulatory requirements, in line with the EU's digitalization agenda.

7.3.5. SOCIAL INCLUSION AND HOUSING STABILITY

- ▶ *Implement Housing First approaches for people facing extreme housing vulnerability.* The programmes should increase housing stability rates and create quantifying benefits including reduced healthcare costs, reduced social service usage, and improved health outcomes. SGI providers should explore partnerships to implement or expand such programs.

7.3.6. COLLABORATION AND MULTI-STAKEHOLDER PARTNERSHIPS

- ▶ *Participate in knowledge exchange platforms between utilities, authorities, and consumers to promote understanding of challenges and solutions.* This addresses the identified need for improved coordination and shared learning.
- ▶ *Facilitate the formation of sector-specific preparedness consortia* bringing together key stakeholders from public authorities, industry, business, financial services, the scientific community, social partners and civil society.

8. CONCLUSIONS



THE CRITICAL JUNCTURE FOR ESSENTIAL SERVICES IN EUROPE

The growing burdens on energy, housing, and water sectors –driven by climate impacts, rising inequality, and aging infrastructure– threaten to undermine the Union’s economic and social foundations. It is clear that Europe stands at a critical juncture where strategic investment and policy coordination can either strengthen resilience and inclusion or allow widening inequalities in access to climate-adapted services.

This report has shown that these challenges are deeply interconnected: failures and vulnerabilities in one essential service sector frequently cascade into others, with disproportionate impacts on vulnerable populations.

Local utilities, housing providers, and energy networks are already struggling to deliver affordable, secure, and climate-adapted services—especially in areas with limited investment capacity or demographic pressures.

At the heart of the problem lies a growing divide: without cross-sectoral planning and decisive action, Europe risks becoming a two-tier Union, where access to essential services and the ability to adapt to climate change depend on geography, income, or status. The worsening housing affordability crisis, persistent energy poverty, and mounting infrastructure gaps illustrate the urgency of a coordinated, cross-sectoral response. Yet, the findings also provide a roadmap for progress as the study identifies several exemplary approaches that successfully balance climate adaptation with social equity.

Across Europe, successful models exist where cost-rental housing protects low-income families, where water utilities evolve into circular bio-factories, and where innovation bridges environmental goals with social needs. These examples demonstrate that it is possible to achieve both climate resilience and social inclusion in essential services with appropriate policy frameworks, funding mechanisms, and stakeholder engagement.

WORKFORCE AND SKILLS DEVELOPMENT FOR ESSENTIAL SERVICES TRANSFORMATION

The transformation of essential services requires significant workforce development and skills enhancement, and successful adaptation requires coordination between European, national, and local policies. This must be supported by appropriate funding mechanisms, knowledge exchange networks, and targeted training programs to develop the specialized skills needed for climate-resilient essential services.

The European Commission's recent policy initiatives, including the Clean Industrial Deal and the Affordable Housing Plan, demonstrate recognition of these interconnected challenges. These initiatives represent important steps toward a more coordinated European approach to climate adaptation in essential services. However, their success will depend on addressing the implementation barriers and governance challenges identified throughout this report, as well as ensuring adequate financing mechanisms for the substantial investments required. The proposed financing frameworks, including the EU Competitiveness Fund and expanded European Investment Bank role, offer promising pathways to bridge the investment gaps documented across all three sectors.



To seize this opportunity, European institutions must now move from ambition to implementation. This means:

- ▶ Recognizing essential services infrastructure as strategic and prioritizing it in the European Union funding and economic governance;
- ▶ Embedding climate resilience and social equity into all relevant policy instruments, from grid planning to housing investment;
- ▶ Supporting local actors with the technical, financial, and regulatory tools needed to deliver integrated solutions;
- ▶ Closing the skills gap and enabling the workforce transformation that the shift to sustainable infrastructure demands.

Above all, it requires embracing a coordinated European approach that treats climate adaptation not as an environmental cost, but as a social and economic investment. In conclusion, the evidence presented in this report makes clear that Europe faces a pivotal moment in securing the resilience and inclusivity of its essential services. Failure to act decisively will result in widening disparities in access to climate-resilient infrastructure, diminished economic competitiveness, and increased vulnerability to both climate and security threats.

Conversely, strategic investment in climate-adapted essential services infrastructure will strengthen Europe's economic foundation, enhance social cohesion, create high-quality jobs, and position the EU as a global leader in sustainable development. By embracing a coordinated approach that recognizes the interconnected nature of water, energy, and housing services, Europe can ensure that all citizens benefit from resilient, accessible, and affordable essential services in the face of accelerating climate change.

The time for incremental approaches has passed. The scale of the challenge demands bold, integrated action at European, national, and local levels to secure the foundation of Europe's prosperity and wellbeing for generations to come.

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ANNEX: PROPOSED INDICATORS FOR IMPLEMENTING SGI EUROPE'S POLICY RECOMMENDATIONS

1. ESSENTIAL SERVICES AFFORDABILITY INDEX (ESAI)

Definition:

A composite indicator measuring the combined financial burden of essential services (water, energy, housing) on households, with particular focus on vulnerable populations.

Measurement methodology:

- Calculate percentage of disposable income spent on water, energy, and housing costs by household income quintile
- Track distribution across geographic regions and demographic groups
- Establish vulnerability thresholds (e.g., spending >40% on combined essential services)
- Measure gap between highest and lowest income quintiles

Data sources:

- Eurostat household budget surveys
- National statistical offices
- JRC research on energy poverty
- Housing cost burden data

Implementation rationale:

The report has clearly demonstrated interconnected affordability challenges across all three sectors. The studies on the housing affordability show that individuals in the lowest income quintile are nearly twice as likely to struggle with heating compared to those in the highest quintile. The stakeholders from the energy sector endorsed the assumption that income is the primary determinant of energy poverty, with the lowest two income quintiles reporting the highest rates. The proposed indicator directly supports recommendations on energy poverty, affordable housing, water accessibility, and ensuring no vulnerable groups are left behind in the transition to climate-resilient services.

2. CLIMATE INFRASTRUCTURE ADAPTATION INVESTMENT GAP (CIAIG)

Definition:

A sectoral and cross-sectoral measure of the difference between current investment levels and required investment for climate adaptation of essential services infrastructure.

Measurement methodology:

- Track annual investments in climate adaptation for water, energy, and housing infrastructure
- Compare against established investment needs (e.g., €9 billion annually for housing renovations, €67 billion by 2050 for energy distribution grids)
- Calculate percentage of required investment being delivered
- Identify geographic and sectoral investment disparities

Data sources:

- European Investment Bank data
- National infrastructure investment reporting
- EU funds allocation monitoring
- Service providers' capital expenditure reporting

Implementation rationale:

All stakeholders from the housing, water and energy who participated in the policy workshops sectors have alerted to significant investment gaps. Thus, there is a need to create an indicator that would help to monitor the investment gap at the municipal, regional and Member State level. This indicator directly supports recommendations to create dedicated climate adaptation funding mechanisms and reform economic governance rules to recognize essential services investments as strategic infrastructure deserving different fiscal treatment.

3. CROSS-SECTORAL CLIMATE VULNERABILITY AND RESPONSE EFFECTIVENESS (CCVRE)

Definition:

This set of indicators include two comprehensive indicators measuring the vulnerability of essential services to climate impacts and the effectiveness of response mechanisms across sectors.

Measurement methodology:

- Track cross-sectoral interdependencies (e.g., energy-water-housing cascading risks)
- Measure response effectiveness through metrics like:
 - Service restoration times after climate-related disruptions
 - Number of households experiencing service interruptions
 - Percentage of critical infrastructure with climate adaptation plans
 - Level of integration between sectoral adaptation strategies

Data sources:

- National climate vulnerability assessments
- Service disruption data from providers
- Emergency response statistics
- Adaptation strategy documents from all three sectors

Implementation rationale:

The stakeholders and the recent calamities reveal pressing cross-sectoral vulnerability challenges. The storm in Ireland, the floods in Spain, the outage in Spain and Portugal are just the most dramatic examples of how climate-change and critical vulnerabilities interplay to create havoc and negative impact on the economy and society. Thus, there is a need to monitor the vulnerability and response effectiveness for critical infrastructures. This indicator directly supports recommendations to develop standardized climate vulnerability assessments and establish an integrated EU infrastructure resilience framework that coordinates housing, energy, and water sectors to ensure synchronized climate adaptation planning and implementation.

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