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Comparative Analysis of the Institutional, Legal, and Financial Status Quo of DHC

- Insights from the REHEATEAST countries

Deliverable 1.2.2

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PP4: Technical University of Cluj-Napoca (UTCLUJ), RO

PP5: Local Energy Agency Pomurje (LEAPOM), SLO

PP6: European Grouping of Territorial Cooperation Via Carpatia (VIACARP), SK

PP7: Standing Conference of Towns and Municipalities (SCTM), SRB

PP8: Jožef Stefan Institute (JSI), SLO

PP9: Resource Aarhus Center in Bosnia and Herzegovina (AC-BIH), BiH

PP10: Center for Energy Efficiency Eneffect (ENEFFECT), BG

PP11: ABE Renewable (ABE), SRB

Content

Executive summary

This report presents a comprehensive comparative analysis of the institutional, legal, financial, and technical status quo of district heating and cooling (DHC) systems in the REHEATEAST project region. The objective is to identify common trends, challenges, and enabling factors across participating areas to support the transition toward energy-efficient, low-carbon DHC networks. The study aims to identify existing challenges, gaps, and best practices to inform the development of sustainable, efficient, and low-carbon DHC systems in alignment with EU energy and climate policies. The analysis builds on stakeholder surveys, policy reviews, and technical assessments to evaluate the current state and development potential of the sector, guide regional efforts toward cleaner, more resilient infrastructure, and catalysing investment in DHC infrastructure.

Core insights

Sector structure and variability

The DHC sector across the region exhibits significant diversity in system size, coverage, and operational maturity. While some areas benefit from high-density networks and well-established infrastructures, others are characterized by fragmented systems, limited reach, and lower service reliability. **Differences in client density, heat production capacity, and technical efficiency reflect uneven development trajectories and point to the need for targeted modernization strategies.**

Energy sources and efficiency

Most DHC systems still depend heavily on fossil fuels, particularly natural gas, as their primary heat source. While there is growing momentum to integrate RES like biomass, geothermal, and waste heat, **their uptake remains limited due to outdated infrastructure, weak investment incentives, and insufficient technical expertise**. In addition, many systems experience **high thermal losses and operational inefficiencies**, which severely impact overall energy performance. These challenges highlight the urgent need for modernization, where RES integration, lower operating temperatures, and parallel improvements in building energy efficiency can jointly create better conditions for adopting clean energy solutions.

Regulatory and Policy Alignment

Regulatory frameworks vary widely in their support for sustainable DHC development. Some jurisdictions exhibit robust alignment with EU directives and promote long-term decarbonization strategies. Others lag in legislative transposition or face challenges due to fragmented governance and limited institutional capacity. **Gaps in planning coordination, weak enforcement of strategic documents, and inconsistent municipal engagement hinder cohesive progress.**

Financing and investment readiness

Public funding, especially from EU instruments and international financial institutions, is the primary driver of DHC investment in the region. While some areas have successfully leveraged co-financing mechanisms and technical assistance programs, others struggle with limited administrative capacity and underdeveloped project pipelines. **High reliance on operational subsidies, particularly for fossil-based systems, further constrains financial sustainability and discourages innovation.**

Emerging financing models such as public-private partnerships, energy performance and supply contracting, and citizen-led energy communities remain largely untapped. Expanding access to these models requires improved planning frameworks, bankable project design, and dedicated national investment programs for RES-based and fourth-generation DHC systems.

Social equity and consumer engagement

Affordability, energy poverty, and consumer perception are significant factors influencing DHC uptake and stability. In many areas, households face high heating costs due to inefficient systems and limited support mechanisms. **Social housing integration with DHC remains inconsistent, and targeted subsidies or pricing models for vulnerable users are rare.**

Consumer engagement practices vary, with very limited participation in planning or tariff-setting processes. Transparency, service quality, and trust are key factors influencing consumer retention and satisfaction. Integrating social considerations into energy planning, particularly at the local level, can enhance the societal value and resilience of DHC systems.

Technical capacity and future orientation

Technical readiness for modernization varies significantly. While some systems show high operational efficiency and are well-prepared for RES integration, others still lack basic digital infrastructure and planning tools. **The transition to low-temperature, interconnected, and smart DHC networks largely depends on local expertise, consistent access to modern technologies, and strong institutional support.**

The future direction of DHC systems is increasingly focused on decarbonization, digitalization, and cross-sector integration. Prioritized technologies include heat pumps, geothermal energy, solar thermal, advanced RES-based CHP, and waste heat recovery. Sector coupling (linking heating with electricity, mobility, and other sectors, such as hydrogen systems) is also gaining interest as a means of enhancing energy system flexibility and resilience.

Abbreviations and acronyms

BiH	Bosnia and Herzegovina
BG	Bulgaria
CapEx	Capital expenditure
CBA	Cost-benefit analysis
CCGT	Combined-Cycle Gas Turbines
CHP	Combined heat and power (cogeneration)
DC	District cooling
DH	District heating
DHC	District heating and cooling
DHS	District heating system
EBRD	European Bank for Reconstruction and Development
EE	Energy efficiency
EED	Energy Efficiency Directive
ERDF	European Regional Development Fund
EU	European Union
GHG	Greenhouse gas
H&C	Heating and cooling
H2020	Horizon 2020 (EU Research and Innovation Programme)
HP	Heat pump
HR	Croatia
HU	Hungary
IFI	International financing institutions
LA	Local authority
LIFE	LIFE Programme (EU's funding instrument)
LTRS	Long-Term Renovation Strategy
NECP	National Energy and Climate Plan

NG	Natural gas
OpEx	Operational expenditure
PP	Project partner
RES	Renewable energy sources
RO	Romania
ROI	Return on investment
RRF, RRP	Recovery and Resilience Facility, Plan
SHC	Solar heating and cooling (programme, International Energy Agency)
SK	Slovakia
SLO	Slovenia
SO	Specific Objective
SRB	Serbia
WH	Waste heat

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1. Introduction

The REHEATEAST project seeks to reduce fossil energy demand in DHC systems by minimizing energy waste in buildings and networks while integrating renewable energy – particularly geothermal – and WH. It encourages multi-stakeholder, cross-sectoral, public-private cooperation and develops, tests, promotes and disseminates practical, technical, and nature-based solutions that support large-scale rehabilitation programs and climate adaptation measures.

Through knowledge-sharing, awareness-raising, and stakeholder cooperation, REHEATEAST promotes catalytic, adaptable solutions to decrease fossil energy reliance. It advocates a holistic approach over siloed strategies, facilitating transformative investments in EE, WH recovery, heat storage, geothermal energy, and improved billing practices. Its communication campaign, "Over 10 under 100", aims to lower annual heat consumption of buildings with at least ten apartments in cities with over 10,000 DHC users to below 100 kWh/m^2. This aligns with the Energy Efficiency Directive (EED), which emphasizes 'energy efficiency first' in all policy and investment decisions. Achieving targets under the EU Energy Performance of Buildings Directive (EPBD) is unfeasible without efficient DHC systems.

On the supply side, REHEATEAST aims to meet EED criteria for "Efficient DHC," requiring at least 50% RES, 50% WH, 75% cogenerated heat, or a combination of these sources. This must align with sound energy planning and management principles, ensuring capacities meet demand without waste.

Specific Objective 1 (SO1) aims to gain a comprehensive understanding of the technical, regulatory, social, and financial conditions of DHC systems, while also identifying key challenges and best practices within the REHEATEAST region. This objective was pursued through Activity A.1.1, which involved an extensive stakeholder survey focused on the technical, regulatory, operational, and financial aspects of the DHC sector in the region. Complementing this, Activity A.1.2 concentrated on identifying challenges, barriers, and opportunities for the development of energy-efficient, economically viable, and environmentally sustainable DHC systems. The findings from the stakeholder analysis (D.1.1.5, District heating and cooling stakeholder survey and analysis of results), the assessment of challenges, gaps, and best practices in the DHC sector across REHEATEAST countries (D.1.2.1, Analysis of Challenges, Gaps and Good Practices in District Heating and Cooling), and other public sources (such as EC web page with National Building Renovation Plans[1]), were further analysed from institutional, legal, financial and other perspectives. These comparative insights have been consolidated and are presented in this deliverable (D.1.2.2).

[1] *https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/national-building-renovation-plans_en#national-long-term-renovation-strategies-2020*

2. The comparative analysis framework

This section provides a framework for a comparative analysis of DHC systems, focusing on various key factors that influence their development and implementation. The analysis examines the current state of DHC sector and systems across all eight REHEATEAST countries, considering institutional, regulatory, market, and financial dimensions, while addressing socioeconomic factors, technological options, and financing schemes. By systematically addressing these aspects, this comparative analysis aims to enhance understanding of the sector's current status and future potential, offering valuable insights for policymakers, stakeholders, and industry professionals.

The comparative analysis is structured as follows:

a) Overview of the DH sector and selected utilities

This section delves into the current state of the DH sector within the countries, examining the overall landscape and specific sampled DH utilities. It provides insights into some basic operational characteristics, scale, and performance of these utilities.

b) Policy and regulatory environment

Here, we explore the policy and regulatory framework governing DHC systems. This includes identifying gaps, barriers, and controversies in existing policies, as well as evaluating the relevant policies and institutional capacities necessary for advancing DHC systems. The section also assesses the alignment and compliance with EU energy and climate related directives, such as RED II, EED, and Fit for 55, and their integration into national frameworks. Additionally, it examines the governance structures and local planning that support DHC development and collaboration mechanisms between key stakeholders.

c) Market, funding and economic considerations

This part of the analysis focuses on the economic aspects of the DH markets, including their structures and pricing models. It highlights initiatives aimed at maximizing consumer benefits. The section also explores financial schemes and mechanisms for DHC development, financing options from international financing institutions like the EIB or EBRD, and innovative funding solutions. Furthermore, it examines the impact of DH on alleviating energy poverty, and its dependence on subsidies and public funding.

d) Technical feasibility, capacities and energy planning

This section addresses the technical feasibility and capacities for modernisation of DH systems. It also looks at preferred future energy sources and technologies in DH, as well as the role of DH in long-term building energy renovation strategies.

3. Comparative insights on policy, market, and technical aspects

3.1. Overview of the DH sector and selected utilities

Building upon the data gathered in earlier stages of the REHEATEAST project, particularly during the DHC survey (D.1.5.5) and the analysis of challenges, gaps, and best practices in DHC (D.1.2.1), the project further refined the DH profile for specific countries. This was achieved by integrating a range of indicators. Some of these indicators were calculated at the national level to provide an overview of the sector (section 3.1.1), while others were developed for a selected set of DH utilities, chosen by individual countries to offer a more detailed and localized perspective (section 3.1.2).

3.1.1. DH sector

DH coverage and client structure

The classification of DH systems by thermal power range, as presented in the Table 1 (see note[A]), reveals that most countries, with the exceptions of Slovakia and Slovenia, do not have systems with installed thermal power below 1 MW. In contrast, these micro systems represent a significant share in Slovakia (49%) and Slovenia (40%). Small systems dominate in Croatia (78%) and Slovenia (42%), medium-sized systems prevail in Hungary (75%) and Serbia (63%), while large systems are most prominent in Romania (38%). The overall structure across all countries is illustrated in Figure 1.

Table 1: DH client base and network scale

		BG	BiH	HR	HU	RO	SK	SRB	SLO
Residential DHC clients (= flats)	(in 000)	627	122	153	674	1,086	735	657	144
Other DHC clients	(in 000)	221	*	7	13	13	37	36	10
Number of flats in the country	(in 000)	2,100	1,133	1,433	4,593	9,587	1,833	3,613	846
Ratio of flats heated by DHC	%	30	11	11	15	11	40	18	17
Estimated number of residents using DHC (in 000)	(in 000)	1,380	318	409	1,409	2,889	2,059	1,675	417
Average number of residents in flats of the country (statistics)		2,20	2,60	2,67	2,09	2,66	2,80	2,55	2,90
Total pipelines length (km)	km	3,205	*	448	1,962	4,624	2,800	2,776	910
Total count of DH systems		10	29	60	213	49	200	64	101
Shares of DH systems by thermal power[A]:	micro	*	*	0%	0%	0%	**49%**	0%	40%
	small	*	*	**78%**	0%	29%	33%	21%	**42%**
	medium	*	*	13%	**75%**	33%	13%	**63%**	14%
	large	*	*	8%	25%	**38%**	5%	15%	5%

* no data provided; [A] Classification by thermal power: micro – up to 1 MW_{th}; small – 1-10 MW_{th}; medium - 10-100 MW_{th}; large – above 100 MW_{th}.

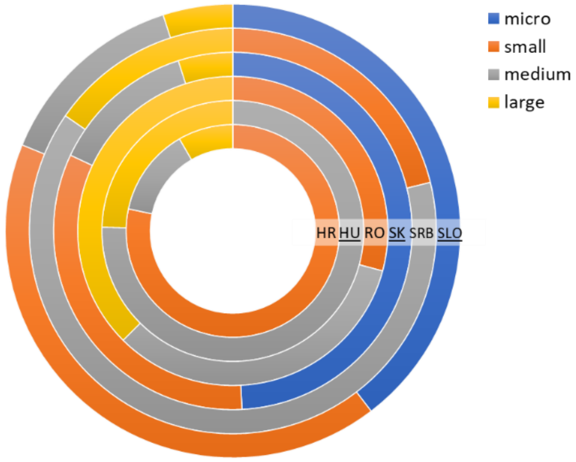

Figure 1: Shares of DH systems by thermal power range

A clear variation among countries can be observed when analysing the ratio of flats connected to DH per kilometre of DH pipeline. As shown in Figure 2, Slovenia exhibits the lowest ratio, while in contrast, Hungary and Croatia show ratios that are more than twice as high. Other countries, such as Slovakia, Romania, and Serbia fall within a middle range, further highlighting the significant differences in the density of DH connections across the region.

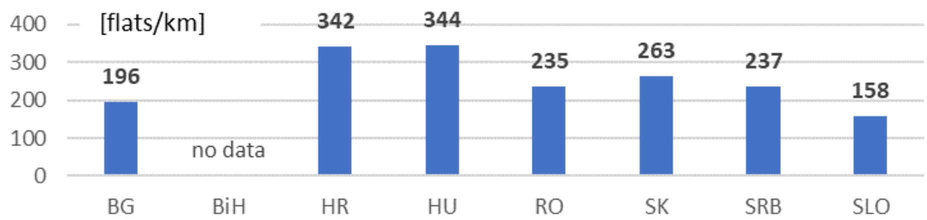

Figure 2: Number of flats served by DH per kilometre of DH pipeline

DHS heat production by technology

The Table 2 and Figure 3 provide an overview of the shares of heat production by different technologies in DHS across countries in the region. The data reveals significant variation in the technology mix used in DHS heat production, reflecting differing energy policies, resource availability, and infrastructure development. CHP emerges as the dominant heat production technology in most countries, underscoring its attractiveness and efficiency for simultaneously generating heat and electricity. Bulgaria, Croatia, Slovakia, and Slovenia exhibit a strong reliance on CHP, while Hungary and Romania show moderate dependency on this technology. Geothermal energy plays a noticeable role in Hungary and Slovakia, whereas its use is minimal or nonexistent in other countries, likely due to limitations in resource availability, energy policies, or infrastructure for geothermal development. Countries with missing data (BiH and SRB) cannot be evaluated, but their absence in geothermal and CHP categories may suggest a reliance on traditional or less efficient heat production technologies, potentially pointing to opportunities for modernization and increased sustainability.

Table 2: DH – heat generation technology mix

	BG	BiH	HR	HU	RO	SK	SRB	SLO
CHP	75%	*	77%	47%	68%	75%	*	74%
Geothermal	0%	*	0%	11%	1%	17%	*	0%
Other	25%	*	23%	42%	31%	8%	*	26%

* no data provided

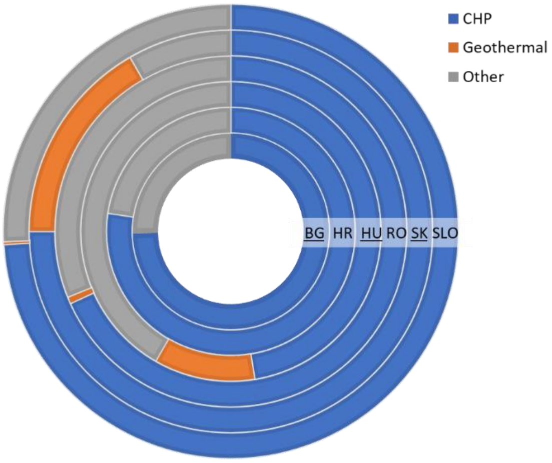

Figure 3: DHS heat production by technology in the REHEATEAST region

DHS primary energy utilization for heat production

The Table 3 outlines the primary energy sources used for heat generation in DHS. NG is the dominant energy source for most countries, reflecting its widespread availability, established infrastructure, and lower emissions compared to coal.

Table 3: Fuel source composition of DH systems

Primary energy source	BG	BiH	HR	HU	RO	SK	SRB	SLO
Natural gas	88%	*	67%	66%	80%	80%	78%	40%
Biomass	4%	*	23%	10%	2%	12%	2%	19%
Coal	8%	*	0%	0%	14%	4%	13%	36%
Biogas, landfill gas	0%	*	4%	0%	0%	3%	0%	0%
Nuclear - waste heat	0%	*	0%	2%	1%	0%	0%	0%
Waste	0%	*	0%	5%	0%	0%	0%	3%
Other	1%	*	6%	17%	3%	1%	6%	1%

* no data provided

However, Slovenia stands out for its relatively lower reliance on NG, instead exhibiting the highest reliance on coal among the listed countries. Coal remains a notable energy source in Romania and Serbia, although its overall use is declining as countries transition to cleaner energy alternatives. Bulgaria, Romania, Slovakia and Serbia rely heavily on fossil fuels, indicating needs or potential opportunities for diversification and cleaner energy adoption. Biomass, while playing a relatively small role in most countries, is more prominent in Croatia (23%), Slovakia (12%) and Slovenia (19%), showcasing efforts to leverage renewable and locally available resources. Biogas and landfill gas contribute negligibly across all countries, underscoring their limited adoption in DH. Similarly, waste heat from nuclear plants plays a minimal role, contributing to DH heat production only in Hungary and Romania, reflecting its niche application. Waste as a heat source is underutilized, with Hungary (5%) and Slovenia (3%) being the only countries reporting its use. This indicates a significant opportunity for expanding waste-to-energy technologies, which could contribute to both energy production and waste management in the region. The structure of primary sources for heat production in DHS is visualised in Figure 4.

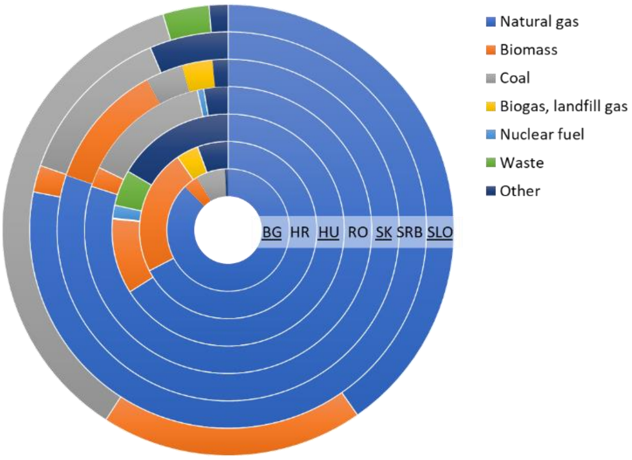

Figure 4: Composition of DH primary energy sources in REHEATEAST countries

Distribution of DH systems by number of residential clients

The Table 4 and Figure 5 provide an overview of the structure of DHS based on the number of residential clients (r. c.) they serve, offering valuable insights into the scale and organization of DHS in each country.

It highlights significant variations in system size and client concentration across the region. The largest DHS systems, serving over 20,000 r. c. are relatively limited in number. Romania (11 systems) and Hungary (8 systems) have the highest concentration of large DHS, indicating the presence of well-established, large-scale DH networks to serve dense urban areas. Medium-sized DHS, serving over 10,000 r. c., are more common than large systems, suggesting an intermediate scale of DHS infrastructure in most countries that likely caters smaller urban centres or suburban areas. Small DHS systems, serving fewer than 5,000 r. c., are by far the most common across nearly all countries (except in Bulgaria), reflecting the decentralized and localized nature of DH in many areas, particularly in countries such as Croatia and Slovenia, where smaller systems dominate.

Table 4: Overview of DH system sizes by number of residential clients

No. of residential clients in DHS	BG	BiH	HR	HU	RO	SK	SRB	SLO
>20,000	4	3	1	8	11	*	4	1
<20,000 and >10,000	5	1	1	11	15	*	5	2
<10,000 and >5,000	0	*	2	17	21	*	7	1
Total number of DHS	10	29	60	213	49	200	64	101

* no data provided

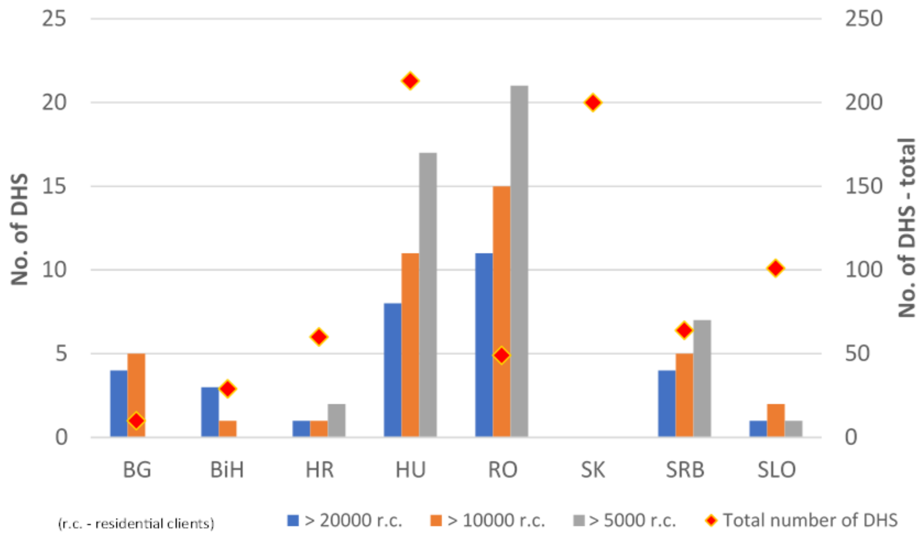

Figure 5: Distribution of DH systems by number of residential clients

DH capacity, the share of DH heated flats and natural gas imports per citizen

The Table 5 provides a comparison of DH and NG usage, highlighting key metrics, which indicates:

- SK and BG have the lowest installed DH capacities per user, at 1.12 kW and 1.32 kW respectively, while HU leads with a value over five times higher;
- The share of flats heated by DH is highest in SK (40%) and BG (30%), whereas HR and RO have the lowest share (11%), approximately one-quarter of the highest value;
- The number of residential clients per kilometre of DH pipeline is highest in HR and HU, with values around one-third lower in RO, SK and SRB, and approximately half as much in BG and SLO;
- Annual NG imports per citizen are highest in SK (1,556 m³) and HU (1,254 m³). SRB imports roughly one-third of SK's volume, SLO about one-fifth, HR and RO about half of that and BiH's less than 5% of Slovakia's per capita imports.

Table 5: DH capacity, coverage, and NG dependency overview

	BG	BiH	HR	HU	RO	SK	SRB	SLO
Installed DH capacity per DH user (kW)	1.32	16.66	4.50	5.80	2.60	1.12	3.82	4.73
Ratio of flats heated by DHC	30%	11%	11%	15%	11%	40%	18%	17%
No. of DH r. clients per km of DH pipeline	196	*	358	351	238	276	250	169
Natural gas (NG) imports per citizen (m^3)	290	70	165	1,254	184	1,556	447	358

* no data provided

Further insights into the correlation between these values are provided in Figures 6 to 8.

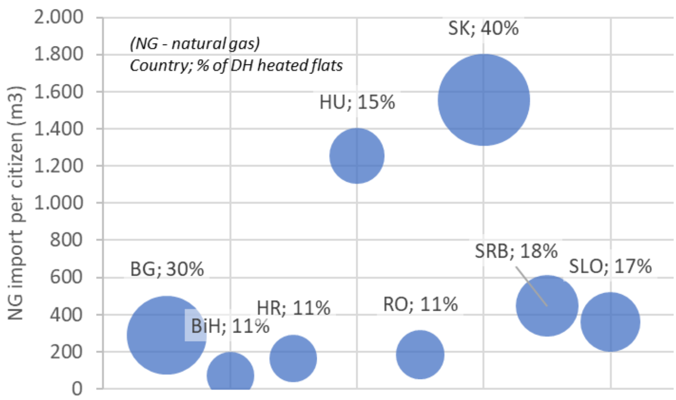

Figure 6: Correlation between NG imports and share of flats heated by DH

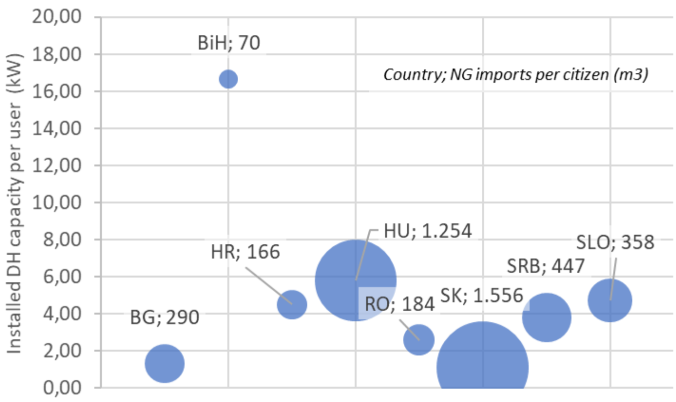

Figure 7: Correlation between Installed DHS capacity and NG imports

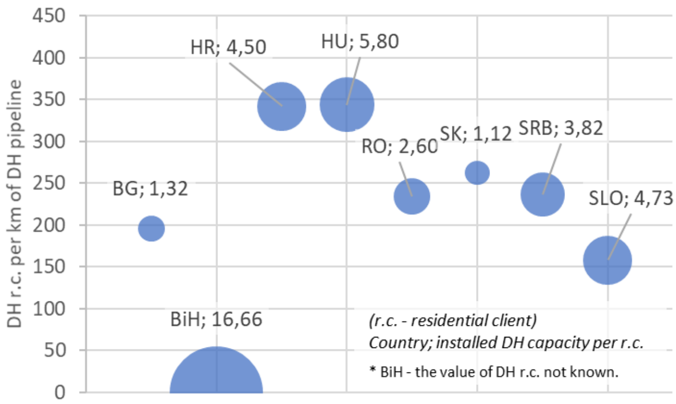

Figure 8: Correlation between number of DH residential clients and installed DH capacity

3.1.2. Sampled DH utilities

The REHEATEAST partners were tasked with providing data from a representative sample of DH utilities. This data was used to conduct an in-depth comparison of the structure and operation of DHS in specific countries. The sample size for each country is detailed in the following table. However, it should be noted that not all DHS within the country samples offer complete data.

	BG	BiH	HR	HU	RO	SK	SRB	SLO
No. of DHC utilities included	10	6	7	33	49	*	55	11

* no data provided

Specific heat consumption

The energy efficiency (EE) of buildings served by DHS has a direct impact on the overall efficiency of the DH network. As buildings become more energy-efficient, heat demand decreases, often accompanied by a reduction in temperature ranges. Lower operational temperatures in DH networks enable utilities to integrate higher shares of RES more effectively while also minimizing thermal losses during heat distribution. When DH systems have detailed insights into the structure and energy efficiency characteristics of their connected building stock, they can better predict and plan for future energy demand. This information also facilitates the transition towards more optimisation and sustainable supply-side solutions.

This analysis compares the specific heat consumption of the least and most efficient 10% of residential consumers connected to DH systems reported by the sampled utilities. Table 6 and Figure 9 present the minimum and maximum values submitted by participating countries (data is missing for countries marked with), offering a basis for cross-country comparison. Values for Croatia (HR) are indicative only, as data was reported from a single sampled DHC utility.

Table 6: Overview of specific heat consumption

SHC in [kWh/m^2]		BG	BiH	HR**	HU	RO	SK	SRB	SLO
Least energy efficient decile	Min	*	271	(123)	36	110	*	*	75
	Mean	*	317	(123)	68	175	*	*	109
	Max	*	362	(123)	101	203	*	*	191
Most energy efficient decile	Min	*	77	(32)	6	61	*	*	25
	Mean	*	78	(32)	22	86	*	*	41
	Max	*	79	(32)	32	111	*	*	58

* no data provided; ** HR: data reported for one sampled DHS; SHC - specific heat consumption [kWh/m^2];

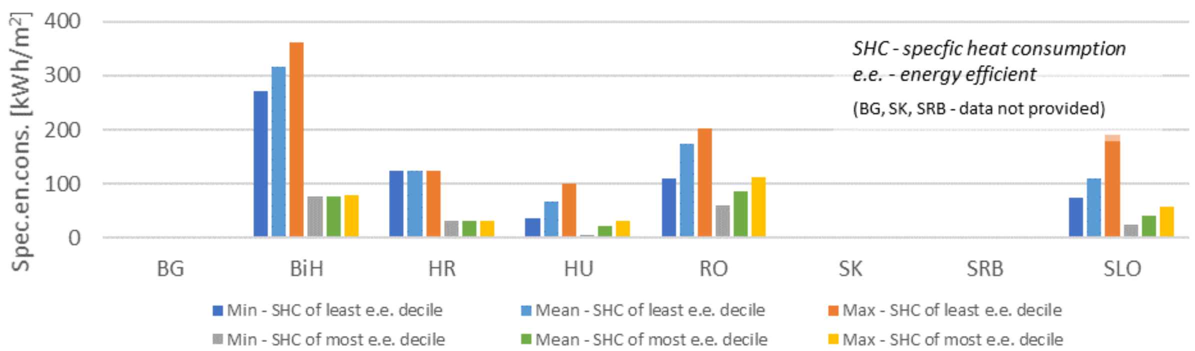

Figure 9: Specific heat consumption of the least and most en. efficient decile of residential users

The comparison highlights Hungary as a leader in energy efficiency among buildings connected to DHS. This may be attributed to more advanced heating technologies or stricter building standards compared to other countries in the region. In contrast, especially BiH's and also Romania's buildings, both the least and most energy-efficient, consume significantly more energy than those in Hungary and Slovenia. This suggests challenges with renovating older buildings and higher overall energy losses. Unfortunately, the limited data for Croatia prevents a more detailed analysis, though its values appear broadly aligned with those of other countries. Due to the lack of data from Bulgaria, Slovakia, and Serbia, a more comprehensive regional analysis could not be conducted. While differences in climate can influence energy consumption, these effects are often mitigated by insulation quality and building efficiency. Overall, the findings emphasize the critical need for targeted investments and policies to enhance energy efficiency, particularly in countries that are lagging behind.

Residential heat sales

The proportion of residential heat sales to total heat sales in a DH utility indicates the share of heat delivered to residential customers relative to the total heat distributed by the utility. This metric provides general insights into the customer composition, utility focus and seasonal demand fluctuations. The structure may have notable implications on energy efficiency measures, the pricing structures and investment priorities.

A higher proportion of residential heat sales suggests that the utility primarily serves residential buildings, while a lower proportion indicates that a significant share of heat is supplied to other sectors, such as commercial buildings, industrial facilities, or public institutions. Utilities with a higher residential proportion often benefit from more predictable heating demand patterns and moderate energy loads. However, residential heating demand is typically seasonal, with peaks during colder months, which can lead to more pronounced seasonal variations in overall heat demand. The customer mix also plays a critical role in the efficiency of heat generation and distribution. Residential customers usually require lower-temperature heating compared to industrial users, which can significantly influence the design and operational strategies of the DHS.

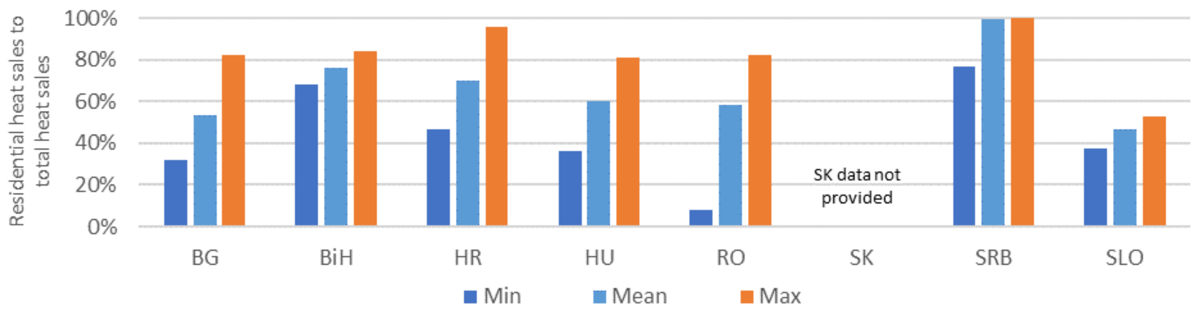

Figure 10: Proportion of residential heat sales to total heat sales

The Figure 10 highlights substantial variations of proportions among countries (data is missing for SK). Some countries, like Serbia, exhibit a strong emphasis on residential heat sales, while others, like Hungary, Romania, and Bulgaria, display a more balanced mix, with average residential heat sales proportions ranging from 58% to 70%. Notably, Bulgaria, Croatia, Hungary, and Romania show significant discrepancies between their minimum and maximum values, reflecting diversity in the operations of DH utilities. Countries with strong urban areas and a significant proportion of multi-apartment buildings (e.g., Hungary, Romania, Serbia) tend to have a higher proportion of residential customers connected DH.

Heat sales per flat

The average annual heat sales per flat are presented as minimum (Min), mean (Mean), and maximum (Max) values, derived from the DHS sample data from the participating countries (BiH and SK did not provide data). The comparison highlights significant diversity in heat sales per flat among the countries (Figure 11), reflecting variations in regional practices, infrastructure, and customer base connected to DHS. Romania and Serbia show a wide gap between minimum and maximum values, reflecting substantial variation in heat sales per flat. Notably, some Serbian systems report exceptionally high values – almost three times higher than the highest levels observed in other countries. Romania has the lowest minimum value, indicating some flats have very low heat sales. Hungary shows a balanced set of values, with moderate levels across all parameters. Serbia has a notably higher average heat sales per flat (12.5 MWh) compared to other countries, suggesting higher demand or usage in residential areas. Croatia follows with an average of 6.8 MWh, while values for Bulgaria, Hungary and Slovenia range between 4 and 6 MWh.

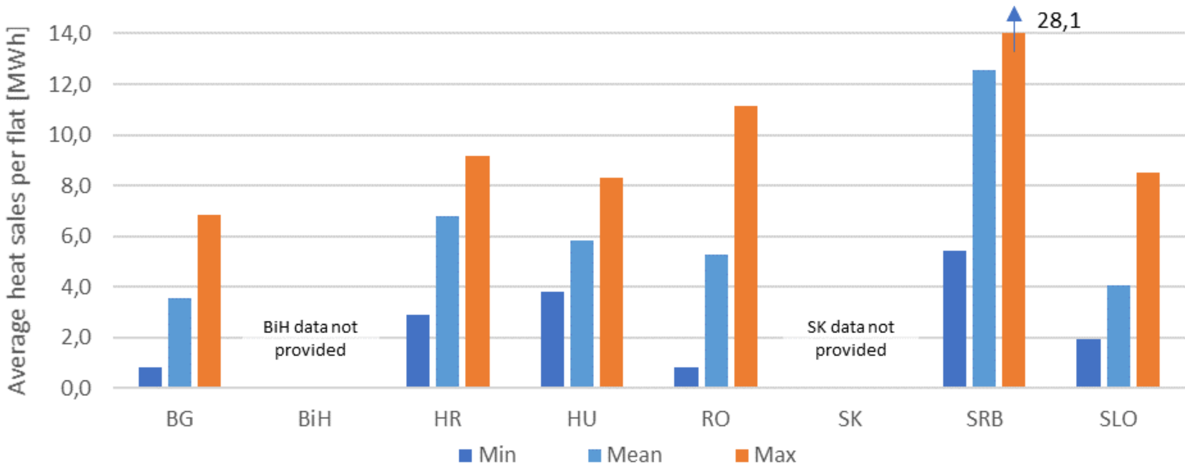

Figure 11: Average annual heat sales per flat

Heat sales per kilometre of DH network

The provided data for heat sales per kilometre of DH network are given as minimum (Min), mean (Mean), and maximum (Max) values in MWh. This comparison highlights substantial variations among different countries, reflecting differences in infrastructure, urbanization, and DH network efficiency (Figure 12).

Bulgaria shows relatively low heat sales per km, with a mean value around the mid-range compared to other countries. Croatia stands out with high mean values, indicating strong and relatively balanced heat sales per km of DH network on average. Hungary and Serbia display moderate values overall, while Slovenia shows a slightly higher maximum value, suggesting some areas with significant heat sales per km of DH network. Romania presents a wide range of values, characterised by a low minimum and an exceptionally high maximum. This suggests areas with very low heat sales, along with significant variability in heat sales per kilometre of the network.

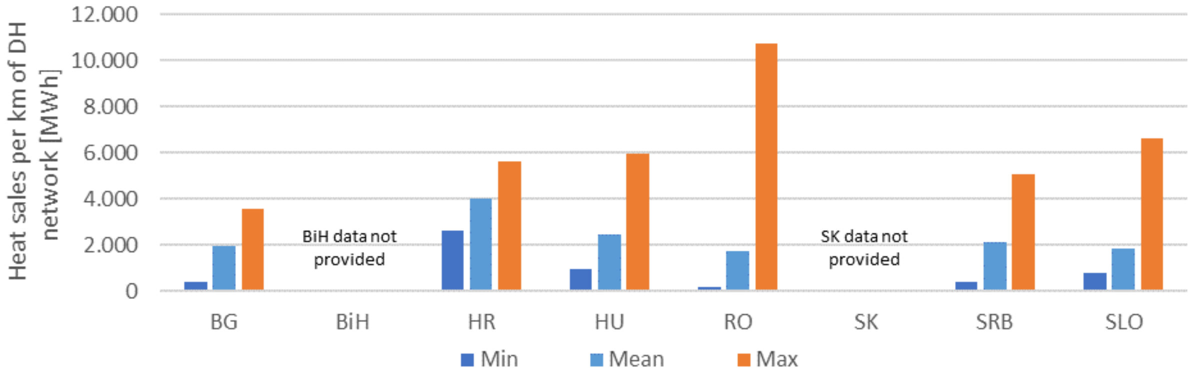

Figure 12: Heat sales per kilometre of DH network

Share of sampled utilities with specific RES or WH

This comparison (Table 7) illustrates the presence of various RES and WH sources in the representative DH utility samples from different countries (Figure 13). The results reflect country-specific infrastructure conditions, resource availability, and how energy policies progress on sustainable DH sources. Only five countries provided data.

Table 7: The number (share) of sampled DHC utilities using each respective heat source

	BG	BiH	HR	HU	RO	SK	SRB	SLO
The size of sample (no. of DHC utilities)	**10**	**6**	**7**	**33**	**49**	**-**	**55**	**11**
Heat from biomass cogeneration	0 (0%)	0 (0%)	0 (0%)	*	1 (2%)	*	*	2 (18%)
Heat from natural gas cogeneration	9 (90%)	0 (0%)	1 (14%)	*	16 (32%)	*	*	8 (72%)
Heat from coal-based cogeneration	3 (30%)	3 (50%)	0 (0%)	*	6 (12%)	*	*	2 (18%)
Waste heat from urban infrastructure	0 (0%)	0 (0%)	0 (0%)	*	0 (0%)	*	*	0 (0%)
Waste heat from industry	0 (0%)	0 (0%)	0 (0%)	*	0 (0%)	*	*	2 (18%)
Geothermal	0 (0%)	0 (0%)	0 (0%)	*	4 (8%)	*	*	1 (9%)
Biomass boiler	1 (10%)	1 (16%)	2 (29%)	*	9 (18%)	*	*	2 (18%)
Biogas or landfill gas	0 (0%)	0 (0%)	0 (0%)	*	0 (0%)	*	*	0 (0%)
Other renewable or waste heat sources	0 (0%)	0 (0%)	1 (14%)	*	1 (2%)	*	*	2 (18%)

* no data provided;

None of the countries reported any DH utilities in the categories of "Waste heat from urban infrastructure" and "Biogas or landfill gas". Heat from natural gas cogeneration (CHP) has been reported as the most common heat source among the sampled DH utilities, except in Croatia where biomass boilers dominate, and in BiH where coal-fired CHP systems are predominant. In

Bulgaria, the vast majority of sampled utilities (90%) use heat from natural gas fired CHP, followed by coal-based CHP (30%) and biomass boiler (10%). No other significant RES or WH sources are used. The Romanian DH sample exhibits a mix of heat sources from various CHP facilities (natural gas 33%, coal-based 12%, biomass 2%), along with some use of biomass boilers (18%) and geothermal (8%). The Slovene DHS sample demonstrates high usage of heat from natural gas and coal-based cogeneration (73% and 18%), respectively), followed by rather significant shares of biomass boilers, industrial WH, and other renewable or WH sources.

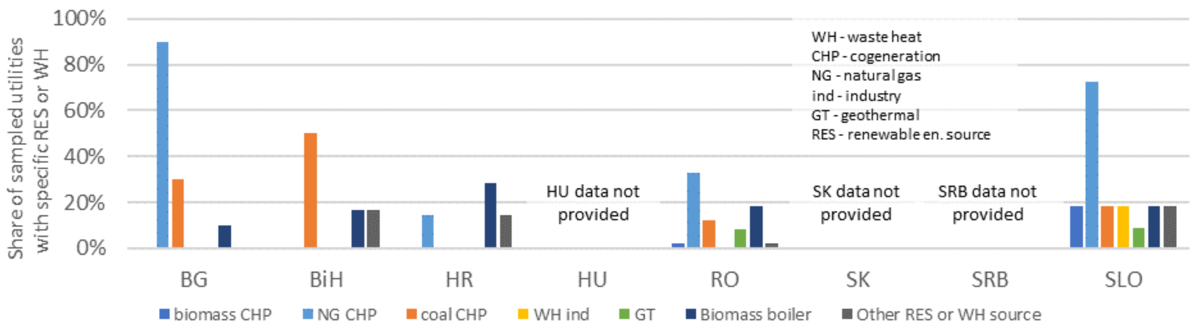

Figure 13: The percentage of DHC utilities in the sample using the respective heat source

DH network thermal losses

The DH network thermal losses typically indicate the age of the infrastructure, quality of insulation, and management practices. They can also be strongly influenced by low network or user density. Modern infrastructure, optimized temperature levels of DH operation, regular maintenance, network improvements, and increased heat demand density significantly impact the reduction of DH thermal losses. Effective energy policies can further support these measures. Countries with stringent energy efficiency standards and incentives for upgrades are likely to experience lower thermal losses.

The comparison of data highlights substantial differences among countries and within countries (Figure 14). The average DHS losses data originates from national statistics[2], and these values closely align with the mean values of the sampled utilities. Utilities in Hungary, Slovenia, and Serbia generally show moderate network loss rates, suggesting a mix of older and newer or refurbished infrastructure affecting overall efficiency. DH systems in Romania exhibit a wide range of network losses, with the highest maximum value among the listed countries. Romania also shows the most significant gap between minimum and maximum values, a trend seen in Bulgarian DH systems as well. This indicates considerable variability and potential issues in certain areas, such as ageing infrastructure and inadequate maintenance.

[2] *More information can be found in the REHEATEAST deliverable D.1.2.1.*

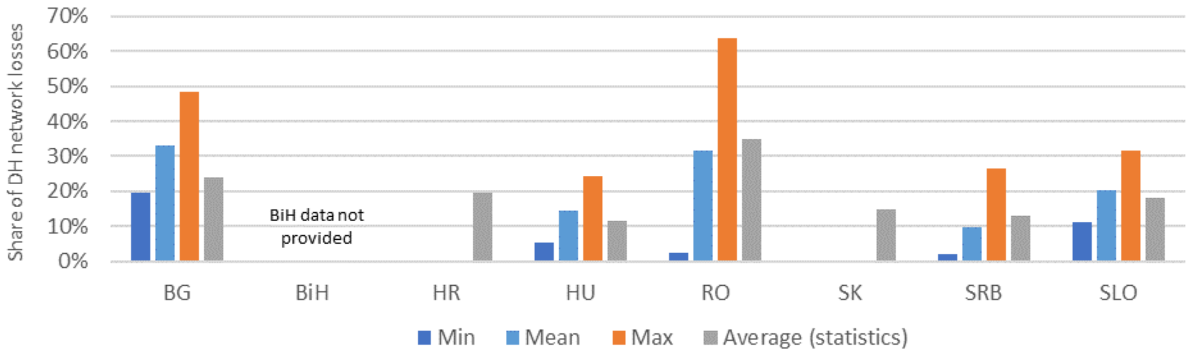

Figure 14: Share of network thermal losses

3.2. Policy environment and cooperation

3.2.1. Barriers and controversies in developing DH

Key barriers to DHS development across the region (Table 8) include heavy reliance on fossil fuels, outdated infrastructure and other technical barriers, regulatory misalignments, socio-economic constraints, as well as low public awareness and consumer resistance. While countries like Hungary, Slovakia, and Slovenia generally face moderate challenges, Bosnia and Herzegovina, Serbia, and Romania continue to lag behind due to persistent economic, financial, and technical obstacles (Table 9).

Table 8: Key barriers in DH

BiH	**BG**	**HR**	**HU**
Significant dependency on fossil fuels such as coal and NG. Resistance to decarbonization initiatives. Aging infrastructure causing inefficiencies in both heat production and distribution. Very limited integration of RES. A lack of comprehensive policies promoting RES integration and modernization. Lack of robust financing mechanisms, limited financial resources and access to funding pose significant obstacles to the implementation of RES and EE projects. Low public awareness and acceptance of DHS modernization efforts.	Outdated technology and older systems unable to integrate RES efficiently. Limited modernisation efforts. Regulatory barriers and policy misalignments, e.g. concerning subsidies for RES integration. Delays in aligning national energy policies with EU directives. High initial investment costs for modernization and limited private sector participation. Limited consumer trust in DHS operations due to perceived inefficiencies and lack of transparency (e.g. unclear pricing, limited control over heat supply). Low public awareness about DH.	Lack of incentives for DHS, in particular decentralized systems in rural areas. High upfront investment costs and limited local financing options for RES projects and upgrading infrastructure. Challenges in consumer engagement and public acceptance of higher tariffs for improved services. Consumers prefer individual heating solutions, perceiving them as more reliable and cost-effective.	Many systems lack the capacity to transition to low-temperature (LT) DH, and the integration of RES is difficult due to the existing high operating temperature ranges. Dependence on NG. Lack of attractive (innovative) financing models. Fragmented policies at regional and national levels and inconsistent implementation creating uncertainties (e.g. for investors). Limited collaboration and misalignment among key stakeholders, such as utilities, regulators, and consumers, hinder modernization efforts.

RO	SRB	SK	SLO
Aging systems with inefficient pipelines and production plants, and poor maintenance cause significant energy losses and increase operational costs. Limited national public funds for large-scale modernization projects and heavy reliance on EU funding with inefficient utilization of these resources. Policies on RES and WH integration are weak and underdeveloped. Challenges in aligning heat planning with EU-level goals. Declining consumer base due to poor service quality.	Over-reliance on fossil fuels and lack of diversified RES. Heavy reliance on public funding, coupled with minimal private involvement, slows the pace of infrastructure upgrades. Insufficient policies to effectively promote RES, WH utilization and cross-sectoral integration. Lack of awareness and expertise in deploying modern DH technologies. High heat costs, unreliable service and public mistrust in the sector discourage the adoption of DH.	Insufficient utilisation of WH and the absence of modern, low-temperature DH networks capable of integrating diverse low-carbon energy sources. Weak strategic (local) planning for integrating RES and WH into DHS. Financial constraints in retrofitting aging systems with advanced technologies. Consumer resistance driven by mistrust in DH pricing mechanisms, and limited public awareness about DH benefits.	Predominantly the 2nd generation DHS with low share of RES and WH; the stagnation of DH development. High upfront costs for infrastructure upgrades and integration of new technologies, limit adoption. The cost of DH supply is typically 2-4 times higher than heat provided by HP (in certain DHS prices even exceed the national DH price average by 20-50%). Inclusion of DH in local energy planning is not effectively implemented, often due to insufficient knowledge and skills among stakeholders. Policies lack adequate support from financial mechanisms and technical assistance. Limited understanding of DH advantages and benefits by stakeholders and end-users.

Table 9: Severity of key barriers in DHC

Barrier category	**BiH**	**BG**	**HR**	**HU**	**RO**	**SRB**	**SK**	**SLO**
Policy & Regulation	3	3	2	2	3	3	2	2
Financial barriers	4	3	3	2	4	4	3	2
Technical barriers	4	3	3	3	3	4	2	2
Reliance on fossil fuels	4	4	3	2	4	4	3	3
Market barriers	2	3	2	2	3	2	2	2
Economic constraints	4	3	3	3	3	3	2	2
Awareness & knowledge	4	3	3	3	4	3	3	3
Social acceptance / Consumer resistance	3	3	3	2	2	3	3	3

The strength of barrier: 4 - Severe (= major obstacle to DHC development); 3 - High (= considerable impact than needs mitigation); 2 - Moderate (= noticeable but manageable issue); 1 - Low (= minor or no significant barrier).

As shown in Table 9, none of the countries exhibit low critical barriers to DH development across any category.

3.2.2. DH technologies supported by national regulation and legislation

The regulatory landscape for DH development varies significantly across countries being analysed, reflecting differences in energy policies, renewable energy adoption, and financial support mechanisms. While EU-aligned nations demonstrate stronger regulatory frameworks with clear incentives for RES integration, others remain fossil-fuel dependent, with policies that lag behind the transition to more sustainable heating solutions. While some countries are making significant strides in aligning with EU energy directives, many still face regulatory gaps, lack of incentives, and financial constraints that hinder the transition towards cleaner, more efficient DH systems.

Countries such as Slovakia and Slovenia exhibit well EU-aligned regulations, promoting the integration of RES, such as biomass and geothermal, and WH technologies into DH. In contrast, nations like Bosnia and Herzegovina and Serbia maintain weaker regulatory frameworks, still relying on coal and natural gas-based heating with limited support for renewables. Bulgaria, Croatia and Hungary are gradually shifting towards RES integration, with policies increasingly supporting CHP, biomass, and geothermal energy. Romania is benefiting from EU funding and subsidies to modernize DH systems and incorporate renewable technologies, though their regulatory frameworks remain in development. The following two tables (Table 10, Table 11) provide a more detailed country-by-country comparison of regulatory support for DH development.

Table 10: The strength of regulatory support for DH development

BiH Weak, fossil-focused	**BG** Moderate, EU-driven.	**HR** Moderate, EU-aligned.	**HU** Moderate, with subsidy support
RO Weak-moderate, EU-funded	**SRB** Weak, affordability-focused	**SK** Progressive, RES-focused	**SLO** Progressive, EU-aligned

Table 11: Current regulatory priorities in DH development

BiH	**BG**	**HR**	**HU**
Weak policy framework for renewable energy. Focus remains on upgrading existing fossil-fuel systems. Emerging support for biomass as part of RES integration. The main challenges include regulatory barriers and a lack of incentives for renewables energy integration.	The government supports CHP technologies to improve efficiency. Limited integration of biomass and geothermal energy. Interest exists in integrating RES, but regulatory support is still developing.	CHP and geothermal energy are priorities, gradually shifting towards greater integration of solar thermal and increased utilisation of biomass. Strong alignment with EU directives. National policies promote renewable energy in DH systems, particularly through the National Recovery and Resilience Plan.	Focus on decarbonization, energy efficiency, and integrating RES like geothermal and biomass. National strategies aim to reduce NG use in DH below 50% by 2030, supported by EU-aligned legislation and financial incentives. Stakeholders call for stronger regulatory support for RES and mandatory DH use in new developments where feasible.

RO	SRB	SK	SLO
Recent efforts aim at modernizing DH systems and adopting renewables under EU frameworks like the Modernisation Fund. Limited utilization of geothermal and biomass technologies.	Early-stage adoption of biomass and solar thermal energy instead of currently dominated NG and coal. Weak but developing frameworks to support renewable energy integration into DH systems.	Biomass, geothermal, and WH integration are leading technologies, supported by regulatory framework that promotes RES integration and DH modernization.	DH still relies on a mix of NG, coal and biomass, while geothermal and solar thermal haven't been gaining effective support or legislative backing so far. In recent years, support has primarily focused on biomass and solar energy, while HPs are now gaining traction.

3.2.3. Alignment of legislation with EU directives

Countries are at different stages of compliance with EU energy and climate directives. While some have made significant progress, others still face challenges in fully aligning their national frameworks with EU targets. Continued efforts and investments are essential for achieving the EU's ambitious climate and energy goals.

Table 12: Legislative alignment with EU Directives in the DH sector

BiH	BG	HR	HU
EU directive transposition remains incomplete with notable gaps, though progress is being made. Strategic guidelines are set in the Framework Energy Strategy and the 2020–2030 Climate Adaptation and Low-Emission Development Strategy. (Note: Governance is fragmented also due to the country's complex political structure.)	The country is making strides in aligning with EU directives, focusing on energy efficiency and decarbonization targets. NECP 2021-2030 and the Energy Strategy until 2030 emphasize the modernization of DH systems and their transition to RES such as biomass and geothermal energy.	NECP aligns well with EU directives, emphasizing the integration of RES and the modernization of existing DHS. The country prioritizes DH in its energy policy, and focuses on increasing EE across production units, infrastructure, and end-user equipment.	Compliance with EU directives is rather robust, with an emphasis on DH infrastructure efficiency and alternative energy sources. The National Energy Strategy 2030 aligns with EU principles of secure, sustainable, competitive, and affordable energy. It prioritizes reduced NG consumption, increased RES uptake, and improved EE.
RO	**SRB**	**SK**	**SLO**
The country is making significant progress in aligning with EU directives, focusing on RES integration and smart energy distribution networks. National Energy Strategy highlights the importance of DHC in improving EE. The strategy aims to integrate the most efficient technologies into DHC systems, supported by high-efficiency CHP.	The country is progressing toward EU directive compliance, though further alignment is needed. The 2025 Energy Strategy and 2024 NECP focus on DH modernization, RES integration, reduced reliance on liquid fuels and coal, increased biomass use, and CHP promotion.	NECP aligns well with EU directives, emphasizing GHG emission reductions and EE. The national strategy prioritizes DHC in modernizing energy infrastructure and supporting sustainable urban development. The country focuses on incorporating RES like biomass and geothermal energy, enhancing EE, and reducing fossil fuel reliance.	NECP aligns with EU directives, emphasizing energy security and climate neutrality. The strategic direction focuses on energy-efficient DHC systems, especially in urban areas, and the sustainable use of wood biomass for heating. The country aims to transition DHS to 4th generation systems, facilitating efficient RES integration and cross-sector energy integration.

3.2.4. Governance structures that support DHC development

The governance of DHS, particularly in terms of planning, varies widely across the region (Table 13). While all countries generally maintain centralized frameworks, implementation responsibilities are often delegated to regional and local levels. In countries like Bulgaria, Hungary, and Romania, governance structures tend to be fragmented, with limited integration at the local level. Bosnia and Herzegovina also faces a highly fragmented governance landscape, posing challenges for coherent and consistent planning. In contrast, Croatia and Slovenia present more balanced models, combining strong national frameworks with active municipal involvement, although implementation at the local level often remains limited. The quality and scope of local action plans are uneven across the region: Slovenia, Croatia, and Serbia offer promising examples, whereas Bosnia and Herzegovina and Bulgaria struggle with resource limitations and gaps in spatial planning. Digitalization and strategic alignment are emerging as important tools for enhancing system effectiveness and improving coordination between governance levels.

Table 13: Governance and local planning of DHC

Country	Governance structure	Local and/or regional action plans
BiH	Fragmented - with energy responsibilities divided between state, entity, and cantonal levels. (Remark: stakeholders stress the need for stable frameworks and long-term RES planning)	Limited; municipalities show different levels of engagement, often lacking resources.
BG	Centralized; the Ministry of Energy oversees policy, with the Energy and Water Regulatory Commission (EWRC) as the main regulator.	DH is often included in SECAPs, but spatial planning lags behind policy needs. Municipalities also play a role, especially for urban planning.
HR	Strong national policy via Ministry of Economy and Sustainable Development; local governments involved in implementation.	Integration of DHC addressed in regional development strategies; municipalities are playing a significant role in operationalizing DHC systems, while DH companies lead implementation.
HU	Centralized - vertical (national-local) but fragmented; MEKH regulates the sector, municipalities own most DH systems. DHC development is supported by the National Energy Strategy and NECP.	NECP and Energy Strategy 2030 provide strategic guidance; city plans vary in quality. Local plans are limited but evolving.
RO	National authority ANRE oversees regulation; responsibilities shared with local authorities.	Several municipalities have urban heating strategies; integration with NECP is moderate.
SRB	Ministry of Mining and Energy governs; municipalities manage local utilities and are driving local DHC development.	Varied development across cities; larger municipalities more advanced (e.g. biomass DH in Priboj - partner with EU projects)
SK	Strong national guidance from Ministry of Economy; regulated by ÚRSO. Barriers exist due to fragmented responsibilities.	SEAPs/SECAPs used in several cities, where municipalities often cooperate with energy companies; demand-side integration underdeveloped.
SLO	Advanced integration between national and local levels: The Ministry of the Environment, Climate and Energy provides the strategic framework, while municipalities are empowered to lead the implementation and development efforts.	Local energy concepts (LECs) should incorporate DHS strategic planning as a core component, aligned with urban planning, but broader coordination is limited (only a few good practice examples exist). The digitalization of LECs is envisioned to enhance regulatory effectiveness.

3.2.5. Coordination among stakeholders

Table 14 shows that robust stakeholder coordination in DH depends on municipalities having both the legal authority to plan and the practical tools to act – such as access to funding, clear mandates, and the ability to convene stakeholders including utilities, investors, and end-users. When any of these levers are missing, coordination tends to fall back on isolated, project-based efforts rather than sustained, strategic collaboration. Municipal capacity is strongest when underpinned by national-level incentives, clear strategic-planning requirements and continuous participation in EU-funded programmes. Key municipal tools, such as zoning powers, ownership or control of utilities, stakeholder forums, and targeted incentives, can elevate collaborative governance across all countries.

Municipal ownership or control of DH operators, which is common in most REHEATEAST countries, provides a stable platform where technical, financial, and social objectives can be aligned more effectively. Planning tools are the backbone of coordination. Examples include mandatory DH zones in Romania, heat-supply zoning powers in Hungary and Slovakia, and DH integration in spatial plans in Bosnia and Herzegovina, Bulgaria, and Slovenia. These mechanisms support coordination – provided they are properly enforced. In contexts where municipal capacity is limited, dialogue platforms can play a crucial role. National and regional DH associations (such as SZVT in Slovakia) and EU-funded projects offer training, stakeholder workshops, and finance matchmaking. These initiatives help transform ad-hoc engagements into structured, long-term collaboration.

Table 14: Stakeholder coordination in the DH sector

Country	Extent and form of coordination	Support mechanisms
BiH	Key stakeholders (municipalities, regulators, utilities) mostly operate in silos (isolated, weak coordination). Municipalities are involved, but integrated local planning is minimal. Regulatory and financial coordination is lacking. Cantonal/municipal authorities often own DH utilities and define DH zones, but enforcement is weak. DH systems face competition from gas and individual heating solutions. Municipalities often lack the capacity and resources to lead DH development. Roles and responsibilities are poorly defined, leading to ad-hoc cooperation. Stakeholder engagement is limited and unstructured. Utilities acknowledge the need for funding but show little coordination with users or investors. Decarbonization is not a strategic priority; EE efforts focus on basic technical fixes like pipe upgrades and digitalization.	Very few formal mechanisms; most coordination is project-based and driven by external funding (e.g. EU). Municipalities have limited capacity; fossil fuels still dominate strategic thinking.
BG	Moderate; structured at the national level but weak at the municipal level - some alignment between authorities, utilities, and suppliers exists, but significant gaps remain. Coordination is driven more by national policy and EU-funded projects. Coordination often depends on individual city leadership and participation in EU-funded projects (e.g. solar integration in Burgas)	SECAPs support some level of planning integration, but cooperation between local authorities and utilities is inconsistent. Municipalities often lack planning capacity. Public-private partnerships (PPPs) are promoted for DH modernization.
HR	Relatively strong at the national level, with growing municipal participation. Coordination occasionally stumbles on outdated national acts and poor syncing with parallel utilities. Municipalities are still dependent on national funding. Consumer engagement is improving, but integration of stakeholders is uneven.	Cities like Zagreb and Rijeka have implemented DHS revitalisation projects supported by national strategies; local authorities played a facilitating role.

HU	Municipalities actively participate, and national coordination supports EU funding absorption. All main groups engaged. Limited municipal autonomy; most decisions are centralized, which sometimes reduces flexibility for local initiatives. Strong policy coordination mechanisms exist. National KEHOP grants aligning local and utility investment.	Public-private partnerships and community engagement are underdeveloped. Kaposvár and Pécs demonstrate successful models of municipal-utility cooperation.
RO	Extent of coordination is moderate and varies by locality with strong regional disparities in coordination and capacity (national policy pushes for modernization, but municipalities vary in capacity). As law obliges municipalities to adopt annual heating plans and create "unitary heating zones" ("one area, one source") where connection is mandatory, relatively strong coordination is expected.	Integrated urban planning supports DHS innovation. Strong municipal role and support is observed in successful cases (e.g., geothermal-based DH projects in Beius and Oradea reflect coordinated local action).
SRB	Coordination is improving in recent years, with active engagement of municipalities and utility operators in some regions (municipal involvement is increasing). Local authorities have full legal control and run most DH companies, but beyond spatial plans there are few compulsory coordination mechanisms; initiatives rely on individual city leadership. The main challenges are regulatory inertia, low consumer trust, and fragmented local governance.	Municipalities lead most DHS modernization efforts, often through EU projects and international financial institutions (IFI) loans. User coordination and local heat planning are insufficient. Priboj biomass DH plant and Energetika Kragujevac reflect good practices in improving coordination.
SK	Structured stakeholder cooperation framework exists, especially through EU projects and planning tools. Municipalities and regional utilities often collaborate. Collaboration is advanced on paper: municipalities embed DH in urban zoning, can require new buildings to connect; the national DH association (SZVT) leads efforts, campaigns and training to engage stakeholders in the transition to RES-based DH.	Examples of effective local planning exist. Participation models (energy communities, crowdfunding) promoted by SZVT and SIEA.
SLO	Legal tools exist (mandatory Local Energy Concepts) but many municipalities lack data, resources and clear business models; coordination is therefore sporadic. Spatial-plan procedures that should align gas & DH networks, yet seldom enforced.	Municipalities are proactive in planning and coordinating DHC development. Local energy agencies play a pivotal role in planning and implementing DHC improvements. Ljubljana and Maribor's heat pump integration; coordinated municipal-utility approach

3.3. Market, funding and economic considerations

3.3.1. DHC market structure

The market structure for DHC systems varies significantly across the countries analysed, reflecting differences in regulatory frameworks, levels of competition, ownership models, and pricing strategies (Table 15). Countries with flexible, competitive structures and dynamic pricing models –

such as Slovakia and Hungary – are better positioned to modernize their DHC sectors and integrate renewable energy. Meanwhile, monopolistic markets in Bosnia and Herzegovina, Bulgaria, and Romania must address inefficiencies and attract investment through policy reforms and targeted subsidies.

Table 15: DH market - pricing models, consumer engagement and regulatory overview

Country	Pricing model	Consumer engagement	Regulatory oversight
BiH	Regulated; local approval	Public consultations, representative involvement	Local councils oversee
BG	Regulated; cost-based	Public consultations and hearings	EWRC monitors transparency
HR	Regulated; cost-recovery	Complaint mechanisms available	CERA ensures pricing fairness
HU	Regulated; capped profits	Focus on billing accuracy	Stringent transparency measures
RO	Regulated; local approval	Indirect through local governance	Localized regulatory oversight
SRB	Regulated; affordability	Annual satisfaction surveys	AERS mandates consumer protections
SK	Regulated; cost-plus	Public consultations	ÚRSO enforces transparency
SLO	Regulated; cost-based	Public disclosure and consultations	AGEN-RS protects vulnerable groups

EWRC - Energy and Water Regulatory Commission; CERA - Croatian Energy Regulatory Agency; AERS - Energy Agency of the Republic of Serbia; ÚRSO - Regulatory Office for Network Industries; AGEN-RS - Energy Agency of the Republic of Slovenia;

All countries have monopolistic DH markets with minimal competition, which is strongly related also to the DH service nature. All countries employ regulated pricing to ensure affordability and cost-recovery, with some (e.g., Hungary and Bulgaria) capping profits or basing tariffs strictly on operational costs. Public consultations and transparency measures are common for ensuring the consumer protection, but the depth of consumer engagement varies. Most countries feature robust regulatory oversight frameworks to balance affordability with utility sustainability, although the enforcement mechanisms and scope differ.

3.3.2. Initiatives for maximizing consumer gains

DH systems offer various benefits to consumers across different countries. The Table 16 below outlines the strategies employed by each country to enhance consumer benefits, key features of these strategies, and the contributing factors that influence their effectiveness. This comparative overview highlights the diverse approaches and underlying reasons that shape the consumer experience in district heating.

Table 16: National approaches to enhancing DHC consumer benefits

Country	Strategies to enhance consumer benefits	Key features	Contributing factors
BiH	Subsidies for energy production from fossil fuels and biomass.	Subsidies reduce consumer expenses short-term but lack structured policies for long-term consumer focus.	Political motives drive subsidies rather than structured policies, leading to short-term benefits.

Country	Strategies to enhance consumer benefits	Key features	Contributing factors
BG	No specific criteria exist.	No measures to ensure lower heating prices or profit reinvestment for consumer benefits.	Lack of regulatory framework for consumer-focused benefits.
HR	Act on Heat Market protects consumers by promoting fair pricing, transparent billing, and effective complaint resolution.	Tariffs for production and distribution are regulated; supply fees are market-based.	Market-driven approach with regulated tariffs for central systems.
HU	Fixed price for residential users; government subsidies for DH companies.	Predictable heating costs for consumers; subsidies cover operational expenses of DH companies.	Government subsidies ensure predictable costs, but may not incentivize efficiency improvements.
RO	ANRE regulates DH pricing; local authorities set heat prices and may subsidize costs.	Fair pricing practices; subsidies for vulnerable populations to cover cost differences.	Local authorities play a significant role in setting and subsidizing prices.
SRB	AERS Methodology for heat energy prices; Law on communal services limits price differences.	Pricing based on fixed and variable costs; limits on price differences between residential and commercial users.	Methodology ensures fair pricing, but lacks specific consumer benefit criteria.
SK	ÚRSO sets pricing guidelines; utilities operate on a cost-recovery basis.	Fair heating costs; profits reinvested in infrastructure upgrades and service quality; transparency and accountability.	Strong regulatory framework ensures fair pricing and reinvestment in service quality.
SLO	Act on the methodology for setting the heat price for DH.	Prices set based on actual production and distribution costs; transparency and fairness in price formation.	Detailed methodology ensures fair pricing and transparency.

Countries like Slovakia and Slovenia have strong regulatory frameworks that ensure fair pricing and transparency, which helps maximize consumer benefits. In contrast, Bulgaria and Serbia lack specific criteria, leading to less consumer-focused approaches. Bosnia and Herzegovina and Hungary rely on subsidies to reduce consumer costs. While this provides short-term relief, it may not promote long-term efficiency or consumer-focused operations. The political motives behind subsidies in Bosnia and Herzegovina further complicate the situation. Croatia's market-driven approach with regulated tariffs for central systems ensures a balance between market dynamics and consumer protection. This contrasts with Bulgaria's lack of criteria and Hungary's fixed pricing. In Romania, local authorities play a significant role in setting and subsidizing prices, which can lead to fair pricing practices but may also result in variability depending on local governance.

3.3.3. Financing schemes

A comparative analysis of current financing schemes for renovation and investment in DHS across the REHEATEAST countries (Table 17) reveals that most rely heavily on EU structural and cohesion funds. However, access to these funds is often limited by administrative capacity or the need (requirements) for national co-financing. In countries such as Bosnia and Herzegovina and SRB, IFIs like EBRD, WBIF, and bilateral donors remain the primary sources of financing. However, both countries face the challenge of developing robust, bankable project pipelines to attract such funding. Public-private partnerships (PPP) remain underutilized across the region, though promising in some countries, such as RO and SERBIA.

To address these gaps, countries should consider scaling up technical assistance through instruments like ELENA or other EU-funded grants to prepare investment-grade projects. Additionally, fostering PPPs could play a key role in attracting private capital for DHS construction and retrofitting. Empowering municipalities and citizen-led energy communities within the DH sector could further accelerate progress. Building on the momentum of the European Green Deal and national energy and climate plans (NECPs), dedicated national programmes for DHS construction and modernisation should be launched. These should focus on deploying 4th and 5th generation DHS technologies and maximizing the use of WH recovery.

Table 17: Overview of key current financial support mechanisms

BiH Heavily reliant on funding from international development banks and EU programs (e.g. EBRD KfW); EE projects are supported by EU structural and IPA (Instrument for Pre-Accession) funds. Very limited other (direct state) financial support for DHS upgrades, as well for RES integration	**BG** Utilization of EU Structural and Cohesion Funds for energy efficiency projects in DHS. National Energy Efficiency and Renewable Sources Fund supports the modernization projects, but no DH project yet. EU Cohesion Funds for municipal-level DHC upgrades; operational programs (e.g., OP Environment). Feed-in tariffs exist for RES in DHC.	**HR** EU RRF: Funding allocated for geothermal and solar integration in DHS. Leverages EU-backed projects like D2Heat for establishing support schemes. National Energy Programs: Focus on infrastructure modernization and efficiency improvement. Integrated Territorial Investments (ITU mechanisms) Some pilot schemes co-financed by EIB, EBRD.	**HU** National Energy Strategy channels some support. KEHOP offers EU-backed funding for DHS modernization. Targeted state subsidies for geothermal DHS projects also exist.
RO Over €1 billion is available through Modernisation Fund as EU-backed financing, available also for DHS decarbonization. In focus of the National RRP is support to a high-efficiency CHP integration. EIB: funding and assistance though Large Infrastructure Operational Program (LIOP/POIM) and by ELENA assistance	**SRB** National budget allocations for RES projects in DHC. Support from WBIF (Western Balkans Investment Framework), and bilateral donors (e.g., Germany's GIZ); International development loans from KfW and EBRD for infrastructure upgrades (projects such as ReDEWeB). Feed-in tariffs and PPAs evolving.	**SK** Strong support of the Cohesion Fund for modernizing DHS infrastructure and integrating biomass.	**SLO** The national scheme for co-financing RES-based DHS partly uses financial sources from the Cohesion Fund. The national public environmental fund Eko sklad manages program for enhancing energy efficiency, including support for residential connections to DHS. Includes innovative public-private partnership (PPP) models to address infrastructure upgrades and RES integration, but not yet implemented for DH.

3.3.4. DH and energy poverty

The REHEATEAST project finds energy accessibility and affordability as essential social sustainability criteria for DH systems. A major barrier to the sustainable operation of DH is the lack of alignment between DH development and broader social policy objectives. This challenge is often compounded by outdated infrastructure, continued reliance on fossil fuels, and insufficient financial and regulatory incentives to integrate DH with social housing. Additionally, public perception and social acceptance issues remain significant obstacles in several countries.

Across the REHEATEAST region, strategic local energy planning that systematically includes DH integration with social and public housing is still limited. There is a noticeable gap in experience and successful practices in this area. Table 18 provides a comparative overview of how DH contributes to alleviating energy poverty in the participating countries, highlighting existing systematic solutions and regulations aimed at connecting socially vulnerable groups to DHS.

DH systems could play a more significant role in reducing costs for vulnerable populations if upgraded and integrated with RES. There is a lack of systematic solutions connecting DH to social housing. Current frameworks focus more on energy efficiency in public buildings rather than residential complexes. When providing municipal energy plans, assessment and consideration of energy poverty shall be taken into account, enabling better linking zoning for DH with social housing. Targeted DH-specific subsidies or tariff structures for vulnerable users could improve the stability and sustainability of DH systems. DH presents key opportunities for alleviating energy poverty by leveraging EU funding for system modernization, introducing innovative financing mechanisms to support vulnerable populations, and expanding the use of renewable energy sources.

Table 18: DH and its energy poverty alleviation role

Country	Impact of DH on energy poverty and its role in alleviation	Regulations and systematic solutions
BiH	District heating (DH) coverage is limited to urban areas and primarily based on fossil fuels. Affordability is a significant issue due to low income levels and limited subsidies.	No consistent national framework for connecting vulnerable users or energy-poor households to DH; local DH projects may integrate social elements on a case-by-case basis.
BG	DH serves large urban populations, particularly in Sofia. Affordability is challenged by high and unstable prices, driven by reliance on natural gas and outdated infrastructure.	The Energy Act obliges DH operators to provide services under regulated tariffs, but there's no targeted support for energy-poor households to connect or stay connected. National strategies include DH modernization projects, but direct links to social housing remain weak. Some NGOs advocate for better energy poverty protections, but systemic measures are lacking.
HR	DH is available in major cities. Social tariffs and subsidies apply to electricity and gas. While DH-specific support is limited, household consumers benefit from a reduced VAT rate, lowered from 25% to 13% in 2022 and extended annually. Targeted programs are also enhancing DH system efficiency, indirectly aiding low-income households.	Integration with social housing or vulnerable groups is not institutionalized; support is ad hoc or locally funded. Projects focus more on technical upgrades than social equity. Ongoing projects under the national RRP integrate DH with public housing, emphasizing geothermal and solar energy.

Country	Impact of DH on energy poverty and its role in alleviation	Regulations and systematic solutions
HU	DH systems are widespread. Socially supported pricing exists through national utility cost caps (to keep costs manageable for households), which include DH.	Cost-regulation at national level indirectly supports vulnerable users; municipalities play a role in implementation. Subsidized DH connections are encouraged in social housing developments, supported by EU funding.
RO	DH networks cover many cities, but many have collapsed due to poor maintenance and lack of investment. Energy poverty is high. DH systems, while extensive, suffer from inefficiencies and high reliance on fossil fuels, making them less effective in reducing energy poverty; this diminishes the potential of connecting social housing to DH systems.	No national framework for DH and energy poverty. Local programs (e.g., heating aid vouchers) exist but are fuel-neutral and not specific to DH. Modernization efforts do not prioritize connecting energy-poor users or social housing
SRB	DH systems serve many cities; heat is subsidized for vulnerable groups; pricing support exists but is not linked with wider renovation or access programs. DH remains underutilized for tackling energy poverty due to its high reliance on fossil fuels and limited coverage.	Municipalities often provide discounts or exemptions for certain groups. Still, there's no consistent national approach. Investments in modernizing DH systems and integrating RES are necessary for broader impact.
SK	DH is a cornerstone of urban heating systems and plays a crucial role in reducing heating costs for vulnerable populations. The government defines energy poverty and offers support for heating bills.	Regulatory frameworks recognize energy poverty and support low-income users through national aid programs. DH connections for social housing are supported by regulation, with a strong focus on affordability and energy efficiency.
SLO	DH is well-developed in cities larger and urban centres. Social housing users are occasionally connected. Integration with RES and innovative financing have made DH systems a key player in combating energy poverty - DH systems are expanding, with increasing reliance on biomass and geothermal energy to ensure affordability and sustainability.	The new generation of local energy concepts (LECs) will include considerations for vulnerable groups; spatial planning often integrates DH with public buildings and social housing.

3.3.5. Subsidy dependence and public funding of DHC

All countries show moderate to high reliance on public funding for DH modernization and RES integration. The highest dependence on subsidies is observed in Bosnia and Herzegovina, BG, and SRB, where support tends to be fragmented or localized, lacking comprehensive national frameworks. HR and RO demonstrate moderate progress, with more balanced approaches combining policy support and funding, although both countries still face challenges related to infrastructure and regulatory modernization. HU, SK, and SLO are comparatively more advanced, having better aligned financial incentives, regulatory frameworks, and sustainability targets for DHC development—though their systems remain significantly reliant on public funding. While direct fossil-fuel subsidies are rarely documented, indirect support exists through regulated tariffs favouring NG or coal and cost-recovery mechanisms and operational subsidies.

To accelerate the decarbonization of DH systems and align with EU climate objectives, a strategic policy shift is needed. This includes phasing out fossil fuel subsidies and redirecting financial resources toward renewable energy integration and the modernization of DH infrastructure. National incentive schemes for RES-based district heating should be strengthened and harmonized with EU directives on energy efficiency and renewables. At the local level, municipalities should be empowered through enhanced energy planning capacities and improved access to EU funding instruments.

Table 19: Comparison of public funding and subsidy reliance for DH systems

Country	Subsidy dependence for DH financial viability & RES integration	Fossil-fuel subsidies in DH
BiH	Very high dependence on donor and IFI funding (e.g., EBRD, KfW). Local budgets are limited. No structured national incentive scheme for RES-DH integration, public funding is insufficient and uncoordinated.	Substantial implicit fossil fuel support through outdated infrastructure relying on coal or heavy oil. No CO_2 taxation or fossil fuel disincentives in place.
BG	Moderate-to-high subsidy dependence. EU Structural Funds are key for modernization. Few incentives specifically promote RES in DH.	The DH sector remains heavily reliant on NG, with limited RES integration. Regulated prices and weak fossil fuel disincentives reinforce this dependence, while subsidies often indirectly support gas-fired CHP plants through capacity payments and lower input costs.
HR	Moderate reliance on public support (EU + national co-financing). National RRP supports DH retrofitting and RES (geothermal, solar). Some grants for integrating renewable heat plants (biomass, biogas).	Some DH systems still fully rely on NG or oil. Fossil fuel subsidies persist indirectly through price regulation and lack of taxation on CO_2 emissions from DH systems.
HU	Medium-to-high subsidy reliance. State-regulated utility pricing includes DH, suppressing real operating costs. Public grants support biomass and geothermal projects. Strong national support via KEHOP (EU funds).	DH pricing caps act as indirect fossil fuel subsidies, hindering full-cost recovery and discouraging transition. High dependence on NG persists, with subsidies sustaining this infrastructure that underpins much of the DHC sector.
RO	Very high dependence. Most DH systems are financially unsustainable without state or EU support. Incentives for high-efficiency cogeneration.	High fossil fuel dependence, particularly in collapsed municipal DH systems. Coal and natural gas remain dominant, supported by regulated energy prices and aid for centralized heating plants. Subsidized tariffs and heating vouchers reinforce fossil fuel lock-in.
SRB	High reliance on public and donor funds (e.g., EBRD, KfW). RES integration is limited to donor-funded, mainly biomass projects. No national RES-incentive framework for DH.	Most systems rely on NG and heavy fuel oil. Heat prices are politically controlled, and fossil fuels are not taxed or penalized in DH.
SK	Moderate reliance on EU and national support mechanisms. Regulatory environment supports cost-reflective tariffs and enables RES uptake (e.g., geothermal). Incentives for biomass/CHP.	Still uses NG in many networks, but strong policy shift toward RES. Fossil fuel subsidies are decreasing, with better integration of carbon pricing mechanisms.
SLO	Dependence is low to moderate. Many DH systems operate sustainably, with strong integration of RES like biomass, WH, and HPs. Still, progress is uneven. Although EU funds are available for decarbonization, too few mature projects exist to fully absorb them.	Fossil fuel use is declining. Incentives favour RES (biomass, solar); geothermal under-supported. Strong regulatory push for RES and relatively low fossil fuel support, aided by carbon pricing and local policies.

3.4. Technical feasibility, capacities and energy planning

3.4.1. Technical feasibility and capacities for modern DH

Hungary, Slovakia, and Slovenia lead in terms of modernization, technical capacity, and integration of RES into DH systems. Bosnia and Herzegovina, Serbia, and Bulgaria face challenges related to outdated infrastructure, weak access to modern technologies, and limited RES integration. Romania and Croatia show mixed performance: strong foundational infrastructure and pilot projects exist, but broader planning and skills gaps persist. Across the region, integration with other sectors (electricity, transport, gas) remains limited.

To strengthen DH systems, targeted training and technical assistance should be expanded, especially in Bosnia and Herzegovina, Romania, Bulgaria, and Serbia. Peer learning between advanced countries and less advanced regions should be encouraged. Digitalization and smart system integration must be promoted across all networks, alongside improved spatial and energy planning to enable scalable integration of RES and cross-sectoral connections.

Table 20: Technical feasibility and access to knowledge for modernisation of DH

Country	**Technical feasibility & capacity**	**Access to knowledge & technologies enabling RES & sector integration**
BiH	Limited technical capacity and largely outdated infrastructure, with most DH systems still reliant on fossil fuels; While some expertise exists, decarbonization efforts remain minimal.	Access to modern technologies is limited; few operators have experience with digital tools or energy efficiency measures. RES integration remains low. Access to EU and expert knowledge is improving, but local capacity for project development is weak.
BG	Reliable NG-based CHP; RES feasible but challenging; Moderate technical capacity in urban DH networks, though many are aging. Some success in pilot RES-DH integrations (e.g., solar in Burgas).	Access to relevant knowledge and technologies exists but is underutilized. Skills gaps persist in integrating RES and managing complex sector coupling. Advanced tech like smart grids and heat pumps are not widely deployed. Need for stronger technical assistance and training.
HR	High expertise in leading utilities, with several modernization projects and pilots for low-temperature and geothermal DH underway. Broader RES integration remains limited due to insufficient funding.	Good access to EU knowledge platforms and technical solutions, but needs scaling. Strategic planning tools (from some EU projects) have been applied in pilot areas, but wider implementation is needed.
HU	Strong technical base in large cities (e.g., Pécs, Miskolc). Capable of implementing biomass and geothermal DH with EU co-financing.	Good access to RES-DH technologies and planning expertise. High expertise; strong university and private sector support. Needs improved integration with electricity and gas sectors.
RO	Solid infrastructure and skilled workforce; Large-scale networks exist but vary greatly in condition (mixed capacity) - some cities have advanced systems (e.g., Oradea), while others suffer from decayed infrastructure.	Access to technologies exists, but fragmented implementation. Stakeholder interest in RES is growing, yet integration remains low outside a few examples. More capacity building needed.

Country	Technical feasibility & capacity	Access to knowledge & technologies enabling RES & sector integration
SRB	Skilled professionals in DH utilities; Basic technical capacity in smaller cities; stronger in larger systems (e.g., Kragujevac). Ongoing transitions to biomass in selected municipalities.	Increasing access to donor-supported RES technologies. Knowledge sharing and skills for managing integrated systems remain limited.
SK	Advanced technologies and operational experience; Advanced technical know-how in utilities such as Košice and Galanta. Proven capacity for geothermal integration and digital control systems.	High access to modern DHC planning tools, training, and smart technologies. Sector coupling (with gas/electricity) is emerging in pilot areas.
SLO	Extensive DH systems supported by diverse heat production expertise. High technical capacity, with leading use of biomass, CHP and digital systems. The adoption of HP and WH remains limited. Major utilities often demonstrate innovation and modernization efforts.	Strong institutional access to EU programs exists. Strategic spatial energy planning and the integration of DHC into broader urban systems is weak and insufficiently implemented.

3.4.2. Future energy sources and technologies in DH

Across the REHEATEAST region, the future of DH is firmly oriented toward decarbonization, diversification, and digitalization (Table 21). Biomass remains a transitional anchor, while geothermal, solar thermal, HPs, and WH are the long-term growth areas. Countries like Hungary, Slovakia, and Slovenia are ahead in terms of technological readiness and integration, while Bosnia and Herzegovina and Serbia require stronger policy frameworks and investment in innovation.

Biomass is a foundational RES for all countries, particularly BiH, Serbia, and Bulgaria. However, its share is expected to plateau or decline in places like Romania and Slovenia in favour of more advanced options. Geothermal energy is prioritized in Croatia, Hungary, and Slovakia, reflecting favourable geological potential and growing policy support, but some other countries (like Slovenia and Romania) also see its potential. Solar thermal and HPs are gaining ground, but implementation is still mostly nascent. WH recovery is a cross-cutting technology seen as crucial for efficiency in Slovenia, Slovakia, Bulgaria, and Hungary. Digital and smart technologies, such as smart meters, system automation, and heat storage, are more and more emphasized as they importantly support integration and flexibility. As well sector coupling (linking DH with electricity, gas, hydrogen) is emerging in Romania, Slovakia, Hungary and elsewhere, helping to align DH with broader decarbonization.

Table 21: DH futures: energy source preferences, technological pathway and strategic priorities

Country	Preferred energy sources	Key technologies envisioned	Strategic Priorities
BiH	Solid biomass (major), aerothermal HPs (limited use)	Basic DH upgrades; CHP; no geothermal/solar planned	Expand RES supply; improve EE and retrofit networks; limited diversification planned, no current plans for geothermal, solar, or WH recovery integration.

Country	Preferred energy sources	Key technologies envisioned	Strategic Priorities
BG	Biomass, geothermal, solar thermal, WH	Biomass-based CHP, digital management, smart metering	Decarbonization via RES and EE; transition from NG and coal
HR	Geothermal, biomass, solar, HPs; potential integration of WH recovery from industry and data centres	Geothermal plants, electric boilers, low-temp DH (upgrades with pre-insulated pipes)	Strong increase in RES share; emphasis on geothermal cost-effectiveness; No formal strategy for future diversification of DH sources.
HU	Biomass, geothermal, solar thermal	Smart grid, seasonal storage, WH recovery, CHP (RES powered)	Diversified RES mix, sector coupling, advanced grid integration
RO	Biomass, biogas, geothermal, solar thermal, hydrogen (potentially)	CHP (biomass, CCGT), solar thermal, HPs, hydrogen integration	Expand CHP; pilot renewable gas compatibility; strong focus on RES + security
SRB	Biomass, solar, geothermal (NG remains dominant short term)	Biomass (in coal plants), low-temp DH, WH use	Gradual RES shift, mandatory RES quotas proposed, new infrastructure support
SK	Biomass, geothermal, solar (thermal), WH (industry)	HPs, thermal storage, RES-CHP, smart controls (for monitoring and energy use optimization)	Fossil phase-out; smart DHC systems; low-temp and sector integration focus
SLO	Biomass, WH, biomethane, hydrogen (some NG remains), geothermal (limited)	Waste incineration, digitalization, network optimization, heat storage, RES-CHP, large scale HPs, biomass boilers	Transition from coal/NG; RES scale-up with strong innovation capacity; Emphasis on low-temperature DH (LTDH) and digitalization for sector integration. municipal energy (heat) planning;

3.4.3. The role of DH in long-term building energy renovation strategies

The analysis of DH integration within long-term building renovation strategies (LTRS) reveals a diverse yet converging landscape. While national contexts vary significantly, several common trends and challenges emerge, shaping the region's pathway toward decarbonization and energy-efficient building stock. Across all countries, decarbonization, the integration of RES (especially biomass, geothermal, and solar thermal), and the adoption of smart technologies emerge as shared strategic priorities. These elements are viewed as essential not only for reducing GHG emissions but also for improving energy security, system flexibility, and user comfort in the face of rising energy demands and climate adaptation needs.

Slovakia, Hungary, and Slovenia stand out as frontrunners in the strategic integration of DH into deep renovation frameworks. These countries treat DH as a cornerstone of their energy transition, aligning building upgrades with the modernization and decarbonization of DH networks. Their approaches are characterized by rather strong policy alignment, substantial financial backing (often from EU sources), and clear commitments to integrating RES and smart technologies into DH. Bosnia and Herzegovina and Romania represent countries with emerging frameworks where the role of DH is getting recognized, especially in dense urban areas and multi-family buildings. However, to realize its full potential, both countries require stronger regulatory mechanisms, clearer national mandates, and significant infrastructure investment. Croatia, Bulgaria, and Serbia exhibit a partial or indirect emphasis on DH. Though each acknowledges the environmental and efficiency benefits of centralized heating, their national strategies either lack explicit integration with building renovation policies or are constrained by outdated infrastructure, insufficient financial support, or fragmented institutional frameworks. In these cases, the role of DH remains more potential than practice. Bridging the remaining regulatory, technical, and financial gaps will be critical to leveraging DH's full potential as a backbone of integrated building renovation strategies across the region.

Table 22: DH in long-term energy renovation strategies

Country	Role of DH in long-term building renovation strategies (LTRS)	Key developments and initiatives
BiH	The centralization and modernization of district heating systems represent a cornerstone of the Building Renovation Strategy of the Federation of Bosnia and Herzegovina until 2050 (BRS). The priority "Decarbonizing the existing building stock in FBiH" relies also on RES developments within DH.	The BRS sets that 30% of buildings shall use DH by 2030. Key activities include development and adoption of the Guidelines for the development of DH systems for the FBiH, adoption of DH development plans at the cantonal level, and establishment of regulatory frameworks and a tariff model.
BG	DH is recognized in LTRS as a key energy carrier in urban renovation, particularly in large cities and dense residential zones. The strategy acknowledges DH as more efficient than individual heating and suitable for integration with RES and WH. The strategy identifies clear potential for modernization and RES integration, but implementation gaps, limited financial mechanisms, and affordability issues currently hinder DH's contribution to large-scale building renovation. The role of DH in LTRS is underdeveloped in practice.	Upgrading DH substations and local systems is proposed to increase efficiency. The LTRS includes measures to promote centralized systems where feasible, especially in urban and multi-family buildings. The strategy identifies high use of polluting fuels (e.g., coal, liquid fuels) in public and residential buildings and promotes DH as part of the decarbonization pathway. There is a need for reforms and investment to modernize DH infrastructure and expand it to areas where solid fuels dominate.
HR	The role of DH is recognized as a vital enabler of deep renovation and decarbonization, particularly in urban area where direct RES installation in buildings is limited. Energy renovation of buildings is seen as complementary to sustainable DH operation. DH has mostly indirect role - with its potential for RES integration and cogeneration. The strategy promotes aligning building renovations with DH upgrades.	For each building under renovation, DH is to be considered as one of the two key technical options alongside separate boiler systems. LTRS highlights the need for policy and regulatory reforms to fully realize this potential.
HU	The LTRS explicitly recognizes DH as a priority in achieving its decarbonisation and EE targets. DH is considered both a means of reducing CO_2 emissions and improving heating affordability, particularly in multi-apartment housing. The strategy reflects a clear policy alignment between DH system upgrades and building renovation, positioning DH as a cornerstone of energy transition.	The strategy emphasizes integrating RES into DH (especially biomass and geothermal) and improving digitalization. Implementation remains dependent on financial incentives, institutional coordination, and deeper sector integration.

Country	Role of DH in long-term building renovation strategies (LTRS)	Key developments and initiatives
RO	DH is recognised as a key component in reducing heating-related energy consumption and decarbonizing buildings, especially multi-family housing and social infrastructure. It is addressed in the renovation models for residential, social, educational, and health buildings, particularly those already connected to central heating networks. Renovation packages are tailored for buildings using DH, indicating DH systems are seen as part of the cost-optimal decarbonization pathway. There is no consistent national regulatory framework linking building renovation directly with DH upgrades.	Multistage renovation approach includes DH as a technical solution, especially for large apartment blocks and public service buildings. The LTRS recommends pairing thermal insulation upgrades with improved DH efficiency, and supports integrating DH with solar thermal and HPs in the second renovation phase. Energy performance requirements and the s.c. "trigger points" (e.g. sale, lease, disaster recovery) are included that aim to coordinate building renovation with DH modernization opportunities. Cost-effective renovation packages propose continued or improved use of DH where connection exists, combining it with RES sources like solar thermal or geothermal HPs.
SRB	DH is acknowledged primarily in the context of public buildings and municipalities already served by DH. It is not a central pillar of the strategy but is included as part of broader renovation and decarbonization initiatives, particularly for urban and multi-family residential buildings. Emphasis is placed on upgrading DH systems in public buildings (such as schools and administrative buildings). DH-related upgrades are largely left to local governments and utility operators. There is no national mandate for DH expansion.	The strategy promotes the modernization of DH systems, including installation of substations and smart controls, expansion of RES (biomass, solar, geothermal) in DH, digitalization for system monitoring and improved energy management. In alignment with EU directives, the strategy proposes cost-optimal renovation packages for buildings connected to DH, considering DH as a strategic infrastructure. To maximize DH's impact, the strategy underscores the need for better planning, funding, and regulatory support.
SK	District heating (DH) is a central element of Slovakia's LTRS, especially for multi-apartment and public buildings. It is considered essential to deep renovation, with a strong emphasis on synchronizing building upgrades with DH system improvements. Modernizing DH networks is key to improving energy efficiency and meeting national renovation targets. The strategy also plans for the construction of new DHC systems and the transition of existing ones to high-efficiency, RES-based solutions.	Significant emphasis is placed on upgrading aging DH infrastructure, with around €116 million from the EU Modernisation Fund allocated for biomass-based projects, network upgrades, smart technologies, and CHP. A geothermal heating project in Košice, supported by €56 million from the Just Transition Fund, aims to boost thermal output by 2028. The strategy promotes the integration of RES such as biomass, geothermal, and solar thermal, and encourages the adoption of smart meters, automation systems, and digital controls. The public sector is positioned as a demonstrator and model for best practices.
SLO	The LTRS positions DH as a key pillar of sustainable renovation, particularly in urban areas and multi-apartment buildings. DH is promoted as the preferred heating option in zones with concentrated heat demand, especially where networks already exist. It plays a vital role in reducing CO_2 emissions and achieving nearly zero-emission buildings (nZEBs), especially when combined with RES like biomass, geothermal, and solar thermal. The strategy highlights the modernization, decarbonization, and expansion of DH systems in parallel with building retrofits, aligning DH with goals for climate neutrality, energy poverty reduction, and public sector innovation.	Encourages the use of smart technologies and energy-efficient upgrades in DH networks, particularly within broader building renovation packages. Public building renovations (e.g., schools, hospitals) include DH improvements, supported by EU Cohesion Funds and ELENA technical assistance. Highlights the need for coordinated spatial and energy planning to guide DH expansion during urban renewal.

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