Status-quo Assessment Report

Partner name and number:
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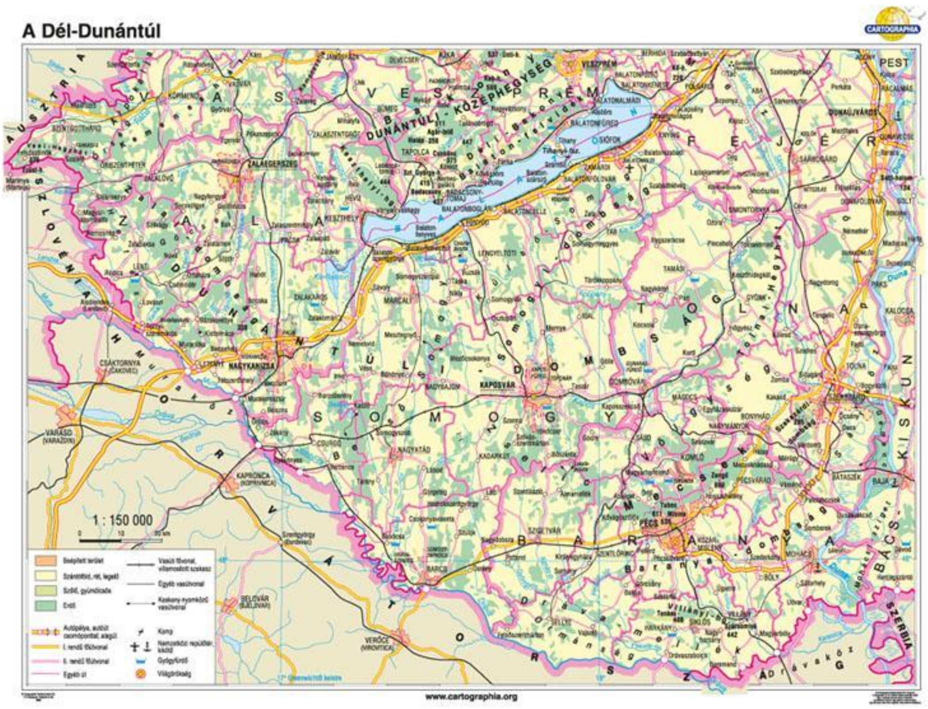
1. General description of the South Transdanubian region and its demography

1.1 Land area by type

South Transdanubia encompasses three counties (Somogy, Tolna, Baranya). Situated in the south-west of Hungary, South Transdanubia has common borders with Western Transdanubia in the north-west, Central Transdanubia in the north and Southern Great Plain in the east. The southern border is an international one, with Croatia. (Eurostat (europa.eu), 2004).

In the region stretching from Lake Balaton to the river Dráva and surrounded by the Danube and the Zalaapáti ridge, flat areas such as the valley of the Danube alternate with higher hills like the Mecsek or the Villány hills arising suddenly from the land. The mild, Mediterranean-like climate having more precipitation than in the Great Hungarian Plain is favourable for rare plants such as the sweet chestnut, or the fig. The region is rich in animals, too. Many kinds of birds and mammals hide in the flood area of the Danube and in the thick hornbeam and oak forests of the hills: e.g. the black stork, the egret or the deer. Nature protection is provided by the Danube-Dráva National Park, the most beautiful part of which is the forest of Gemenc. (Hungary - Southern Transdanubia (1hungary.com), 2023). The undulating countryside has excellent quality soils, forests and favourable environmental endowments that are good basis for agriculture and animal husbandry.

Map 1: The map of South Transdanubia (administrative borders, topography, main lines of transport)



Source: Dél Dunántúl Térkép - marlpoint

The topography of the region varies between gentle hills, valleys, basins, mountains and plains. 33% of South Transdanubia is flat land, and the same ratio is 73% in the whole territory of Hungary. This fact is favourable with regard to the load on electric mobility, too.

As regards industrial terms, machinery, textile and food processing are the main branches. When it comes to public administration, health services, higher education, labour, cultural and municipal services, public transport are the main contributors. The public road network is peripheral, does not allow direct and effective connections towards the key transport and logistic channels of Eastern-Central Europe. Therefore South Transdanubia is an underdeveloped, modest innovator region, characterized by relatively low share of manufacturing and foreign direct investment (FDI), few innovative companies and low support absorption capacity. From this point of view the IT and the cultural, also the green industries could be regarded as the main ones being present. Despite intensifying gross fixed capital formation and substantial investment in R&D infrastructure and in new technology, ST is among the least developed European regions. (European Commission, n.a.).

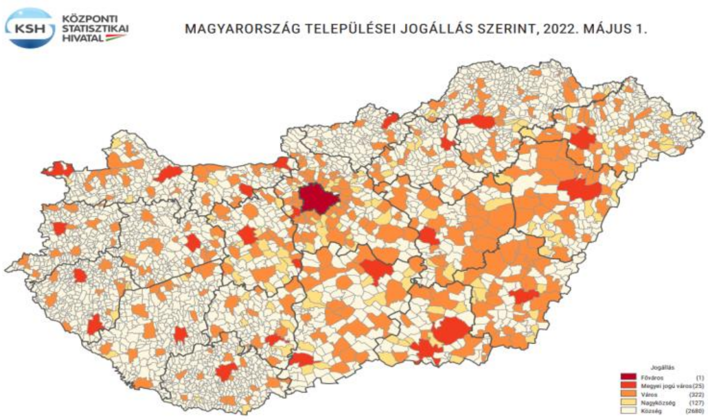
1.2 Population density (including population in urban areas/total)

South Transdanubia has a population of 853,561 inhabitants in 2023 (Hungarian Central Statistical Office, 2023) and an area of 14,169 km². The population density of 60 people/km² makes South Transdanubia the most sparsely populated area of Hungary.

1.3 Municipalities

The regional centre is Pécs (county seat of Baranya), a city with 145 thousand inhabitants that concentrates a major part of the economic and cultural life of the region. Kaposvár (60 thousand) and Szekszárd (30 thousand inhabitants) are the two other county seat towns (Somogy and Tolna, respectively) being the most populated settlements of their counties. The region consists of 24 districts and in the 3 counties there are a total of 656 settlements. More than half of these settlements have less than 1,000 inhabitants.

Map 2.: Settlements of Hungary according to their legal status in May 2022



Source: [Területi atlasz – Települések – Központi Statisztikai Hivatal (ksh.hu)]

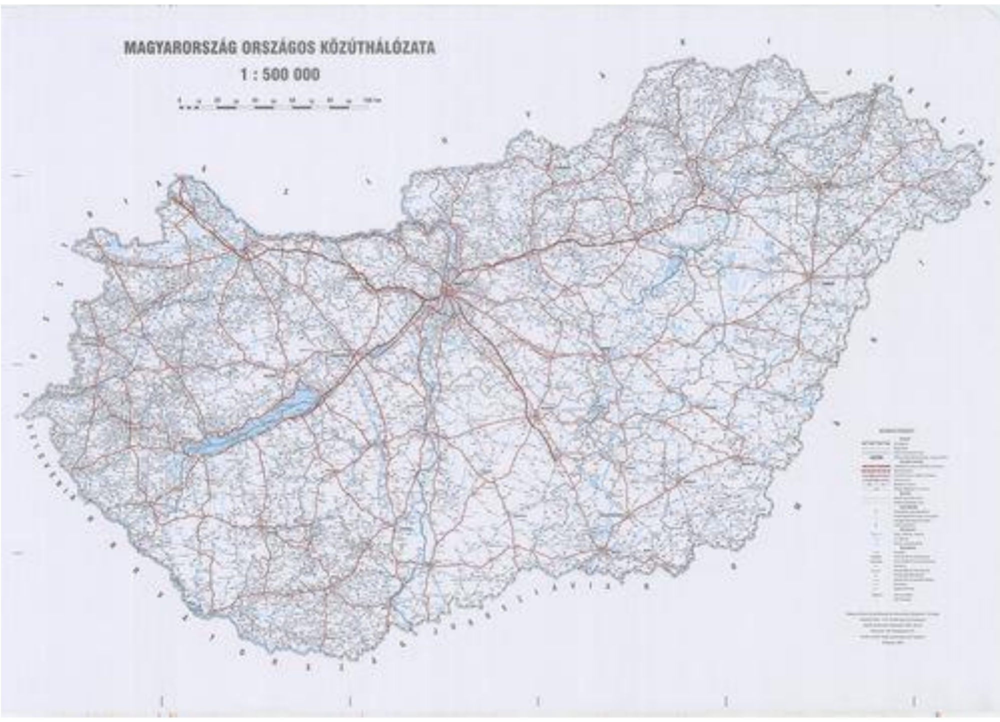
2. Regional factors concerning the theme

2.1 Mobility

2.1.1 Public network of transport system available in the region

In Hungary the roads are divided into public roads and private roads. National public roads owned by the state and local public roads owned by municipalities. The length of the national public roads is 32,552.1 km, and in 2018, there was also a network of approximately 1,000 km of bicycle paths in Hungary. This latter, according to the 355/2017. (IX.29.) government decree, came into the management of the Hungarian Public Roads. The length of local public roads is 183,988.6 km. The national road network handles about 75% of the country's total road traffic. 9,439.8 km of national public roads are the main network, of which 2,485 km are "E" roads, i.e. part of the European road network. The total length of the expressway network is 2,422.1 km, of which 1,324.4 km are motorways, 554.5 km are highways, and 543.2 km are highways or highway intersections. 26% of the length of national public roads pass through settlements, so they also play a significant role in managing local traffic in settlements. There are 8,216 bridges and 1,853 road-railway crossings (of which 1,390 are at-level, of which 77 are uninsured), and 6,711 pedestrian/bicycle crossings on the national public roads. (Source: https://www.kozut.hu/kozerdeku-adatok/orszagos-kozuti-adatbank/az-allami-kozuthalozatrol/)

Figure 1.: The national public road network of Hungary



Source: Magyarország országos közúthálózata. [B XV c 1236] | Térképek | Hungaricana

Within the three South Transdanubian counties the length of the public road network is 4,746 km (KSH, 2023 24.1.2.1. Az országos közutak hossza vármegye és régió szerint (ksh.hu)). This involves different levels of roads. According to the Hungarian legislation, a 5 level public road network covers the region, 1 digit roads being the main roads among them. On the eastern and south eastern part of the region the M6 (E66, E73) and the M60 motorways are located. The traffic on these motorways are modest. The

M6 is part of V/c Trans-European Transport Corridor (TEN-T). The M7 motorway (E65, E66, E71) is the oldest Hungarian motorway and is located on the north-west and north domestic border of the region. M7 is part of the TEN-T V/a corridor. Its traffic is significant as the motorway connects Central-European economic centres and capitals. There is also a short section of the M9 motorway on the eastern border of South Transdanubia, with long ago planned interconnecting developments that are still ahead.

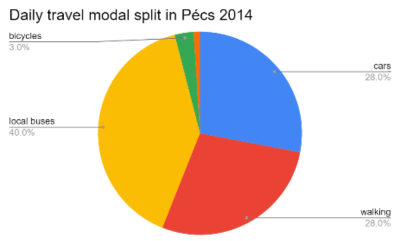
The length of the rail network of the country varies between 8,057 and 7,893 kms (depending on the source), and of that 3,066 kms are electrified. The South Transdanubian sections (1,085 kms, KSH, 2023 24.1.2.3. A vasútvonalak hossza vármegye és régió szerint (ksh.hu)) are regarded to be peripheral ones in their location and service area. The main regional line is part of the TEN-T V/b corridor, connecting Zagreb (HR) and the Hungarian capital, Budapest. Passenger transport is the typical use of the regional rail network.

As for waterways, the Danube as part of the TEN-T VI. corridor constitutes the eastern border of South Transdanubia, with several passenger and freight transport inland ports on its regional section (the one at town of Mohács being the most important of those).

In terms of airports the region has infrastructure with regional/national importance, with locations at Őcsény (Tolna), Siófok-Kiliti and Taszár (both are in Somogy) and Pécs-Pogány (Baranya).

To close this part, some words about the modal split in the region. Local personal transportation in Hungary based on Hungarian Central Statistical Office (Központi Statisztikai Hivatal, KSH) 2022 year data (numbers in millions of people): bus 955.1, tram 408.1, trolleybus 87.9, subway 278.4, local rail 63.3, in total it is 1,792.9 which equals 6,808.5 million passenger kilometers (source: 24.1.1.21. A helyi személyszállítás országos és budapesti forgalma közlekedési módok szerint (ksh.hu)). The inland passenger transport in HU (2016 data, KSH): 69% cars, 21% motor coaches, buses and trolleybuses 10% trains. According to the impact of the COVID-19, and the falling numbers of public transport, the share of the passenger cars increased until the outbreak of the Russo-Ukrainian war that gave boost for the extended use of public transport means. To provide an interesting and locally rooted data, the daily travel modal split in Pécs (2014) was 28% cars, 28% walking, 40% local buses, 3 % bicycles, 1% taxis.

Graph 1: Daily modal split in Pécs, 2014



Source: own editing based on Sustainable Urban Mobility Plan of Pécs, (2014)

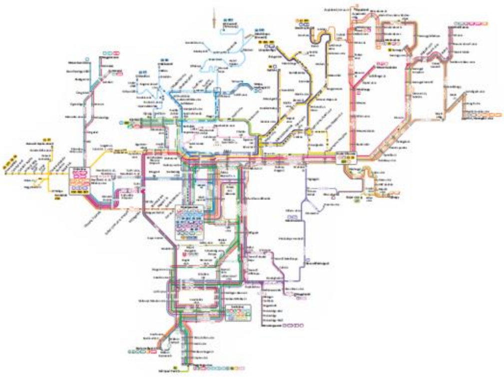
2.1.2 Description and data on current bus fleet (non e-buses and e-buses) in city/area

In South Transdanubia, the bus depots operate on several locations taking into account the needs of the passengers. In Baranya county there are 5 traffic sites (Pécs, Szigetvár, Komló, Mohács, Siklós) and 3 vehicle maintenance sites (Pécs, Komló, Mohács). In Somogy county there are 7 traffic sites (Kaposvár, Barcs, Csurgó, Marcali, Nagyatád, Siófok, Tab) and also 3 vehicle maintenance sites (Kaposvár, Nagyatád, Siófok). In Tolna county there are 4 traffic sites (Szekszárd, Bonyhád, Dombóvár, Paks) and the only maintenance site is in Szekszárd. (Source: Status Quo Definition, eBussed Interreg Europe project.)

There are local buses and couches (intercity or distance buses) as well in South Transdanubia. Nowadays, passengers expect additional services from the bus companies, not just a high-quality transport service. That is also the reason why Tüke Busz Plc. (the public transport organisation (PTO) of Pécs, the regional capital) wants to provide this extra need to satisfy the passenger's particular demand. As an additional service, Tüke Busz Plc. has a GPS-based bus tracking system that allows passengers to see real time where buses are heading. The service also includes a Route Planner which allows them to plan complete journeys including transfers and travel times. At Kaposvár, the PTO is the Kaposvár Közlekedési Zrt. (Kaposvár Transport Plc.) operates a mixed fleet of CNG and e-buses. Volánbusz Plc. provides coaches in South Transdanubia and provided local bus services in Paks until 31st of December 2020. From 1st of January 2021 the Paks Transport Ltd. will continue to provide the bus services in the city. At other main cities of the region, such as in Szekszárd, county seat town Tolna County, up to now Volánbusz is the PTO when it comes to operating bus lines within the administrative borders of the settlement.

Illustration 1: Public bus service networks in Pécs, Kaposvár and Paks

Pécs, the regional capital and the county seat town of Baranya



Source: Source: Biokom Mobility Center, Pécs 2020

Kaposvár, the county seat town of Somogy

Source: [Vonalhálózati térképek | Kaposvári Közlekedési Zrt. (kaposbusz.hu)]

Paks, the district seat town at Tolna County

Source: Presentation of the Paks Transport Ltd.

The regional capital, Pécs is located in a hilly area, at the southern foot of the Mecsek Mountains (Mecsek) in a valley in the north-western direction. The bus network includes Mecsek routes and it causes difficulties because of the slope of these roads. Also, Mecsek changes the wind directions which explains the bad air pollution in Pécs besides the emission.

Kaposvár is the center of Somogy county. It is located on the two banks of the river Kapos in the area of the Somogy hills in a wonderful environment between the slopes of Zselic.

Szekszárd is the center of the wine region in Tolna county. It is located at the confluence of the Transdanubian Hills and the Great Plain. There are several streams flowing in the city. Paks is the second biggest city in Tolna county. The highest point of the city is the 103-meter-high loess hill Sánchegy which is under landscape protection because it is one of the largest loess formations in Central Europe.

As for the total number of buses (e-buses included) in the region based on data coming from various calendar years, in Hungary, the number of all type of buses registered is 17,597454 in 2022 (KSH, 2022 24.1.2.2. A közúti gépjárművek száma vármegye és régió szerint, december 31. (ksh.hu)).

Volánbusz Plc. has (country-wise) 6,200 buses (Volánbusz – Wikipédia (wikipedia.org)). Volánbusz operates settlement level public transport in 64 cities in Hungary, including major regional towns and cities in South Transdanubia.

Formerly, in 2019, 1,150 buses (source: eBussed Interreg Europe project) were operated by the predecessor companies of Volánbusz. At the Paks Transport Ltd. there are 10 e-buses in operation, with further 18 buses in procurement. Tüke Busz Plc. has 190 buses, with 18 e-buses included. Kaposvár Transport Plc. has 40 buses (CNG powered buses) and 2 e-buses. Therefore, in the region there are – approximately – 1,392 buses delivering public transport services.

In terms of the average age of buses, the indicator was 13.25 years in Hungary (2019) and 11 years at Tüke Busz Plc. (2020). It is worth mentioning that Tüke Busz Plc. Procured new or newer buses in the frame of the Bus Replacement Program of Pécs ("Pécsi Buszcsere" program) to decrease the average age of their buses and their e-missions. Tüke Busz Plc. has been reducing continuously the age of buses with 30 % since 2012 on. Volánbusz Plc. goes with 10 years average age of the buses.

As regards the average annual mileage (kms) based on data coming from various calendar years, Volánbusz Plc. reported 81,647,000 kms with 1,150 buses, the average is: 7,100 kms. Paks Transport Ltd made 227,233 kms with 20 buses, the average is 11,361 kms (the data is coming from the year before the total transition of the fleet to 10 e-buses). At Tüke Busz Plc. the 190 buses produced a mileage of 248,014,200 kms, the average being 1,305,337 kms. In case of Kaposvár Transport Ltd. the same data is not available.

2.1.3 Description and data on current private vehicles (non & electric ones) in the city/area

Below we take into account the main data as available in terms of South Transdanubia or Hungary.

In terms of the private motor vehicles and the percentage of electric on total, the data available shows that in South Transdanubia there are 369,027 motor vehicles (2022, KSH). The percentage share of electric on total is not available at regional level. Considering the country level data of Hungary, there are 4,094,129 motor vehicles (2022, KSH), percentage of electric on total at national level is (39,560 in July 2023, 32,587 in December 2022): 32,587 / 4,094,129 = 0,8%. (Source: KSH (https://www.ksh.hu/stadat_files/sza/hu/sza0040.html), Ministry of Interior (https://villanyautosok.hu/2023/08/07/egyre-nepszerubbek-az-elektromos-motorkerekparok/))

To summarise, this is still a modest ratio and illustrates the untapped potential of registering / putting into circulation of private motor vehicles.

As regards motor bikes and the percentage of electric on total, data available shows that in South Transdanubia there are 20,025 motor bikes (2022, KSH), and the percentage of electric on total is not available at regional level. At the same time in Hungary there are 210,746 motor bikes (2022, KSH), and the percentage share of electric on total at national level is (76,206 in July 2023, 63,597 in December 2022): 63,597 / 210,746 = 30,18%. (Source: KSH (https://www.ksh.hu/stadat_files/sza/hu/sza0040.html), Ministry of Interior (https://villanyautosok.hu/2023/08/07/egyre-nepszerubbek-az-elektromos-motorkerekparok/))

To derive a conclusion, taking into consideration the upward going trend on the number of electric motorbikes in term of registration / putting into circulation, it is a definite greening trend within the transport means.

2.1.4 Description and data on other modes of e-mobility in the region (e.g. e-bicycles, e-taxis etc.)

With reference to bicycles and pedelec (also the percentage of electric on total), we have not that much precise data at our hands. On the contrary, several surveys and opinion polls reflect that cycling is a very popular mean of transport in Hungary. In 2022, for example, the proportion of people travelling primarily by bicycle per region showed that in South Transdanubia 15% of the population primarily used this mean of transport, compared to 13% value of the same figure in 2018. (Source: https://kerekparosklub.hu/kerekparoskutatas-2022) Several sources underline that the number of pedelec (or quite often called electric or ebikes) sold year by year is strongly increasing, and amounts up to 23,000 ebikes per year (2021, Source: https://e-cars.hu/2022/09/07/nagyot-nott-az-elektromos-kerekparok-magyarorszagi-piaca/). Governmental initiatives back up this trend and the non-reimbursable subsidies play important role behind the promising pedelec sales data.

At the same time, at annual level around 270,000 bikes are sold in the country, and the share of ebikes quickly approaching the 10% of this figure (source: https://uzletem.hu/-statisztikaarak/270-ezer-kerekpart-adtak-el-tavaly-magyarorszagon).

We can summarise the above bicycles and pedelec trends by saying that the numbers could be regarded as a real success story. The COVID-19 pandemic and the rising fuel prices counted from the 2022 outbreak of the Russo-Ukrainian War also supports the more intensive penetration of ebikes into the daily communting / spare time / sports activities carried out by people using bicycles.

To close this part, as for scooters and the percentage of electric on total, and in terms of other ways of local electric mobility: e-taxis, e-ferries, e-light commercial vehicles, these means of transport are present and has potential for the greener private transport locally or in between settlements. The following 6 paragraphs are cited from situation analysis of the eBussed Interreg Europe project.

“The e-bicycle system in Pécs, called PécsiKe, which is completely electronic and gives the opportunity for public bike rental. It has a 40 km range with only one charging. The system was handed over in 2019. “One of the new forms of public transport, PécsiKe combines the freedom of individual transport with the reliability of fixed transportation. The aim of the system is that as many people as possible use the bikes as part of their daily life, thus reducing the air pollution, traffic jams and noise of the city. In addition, the main goal is to make this effective and environmentally-friendly alternative more popular among travellers in the city centre” (PécsiKe 2018)

Municipality of Paks and the Protheus Holding Plc. (Paks Town Municipality subsidiary) coordinate together the „Protheus Project” in the ELENA ((European Local Energy Assistance) program. The aim of this project is to build up a sustainable e-mobility system, produce renewable electricity, and store that energy for the use by the city of Paks and the surrounding municipalities. The projects’ main goal is the creation of a healthier, more energy-efficient and inhabitant friendlier city.

Another e-bicycle system, the so-called PaCi, is part of the Protheus Project in Paks. It will give the same opportunity as in Pécs but also there is the possibility to rent an e-roller. Municipality of Paks has 2 e-bikes which makes it easier for workers to go to work. “This new way of transport gives an alternative method for urban transport supplement. It gives an excellent possibility for people to reach their destination without being stuck in traffic or stress. The name of the system is PACI which comes from PAksi biCIkli. 4 stations are established all over the city which execute the storage and charge of 40 electric bicycles and 10 electric rollers. The system of shared electric bikes and rollers supports going to school or work and going through daily administration, shopping and exercising. Twice a day half an hour is going to be free to motivate the use of it.” (Protheus Holding Plc.) The e-bike system is also part of the Smart Grid System of the Protheus project.

The e-taxis are available also in Pécs and in Paks. In Pécs it has lower volume since the driver has to invest in the car and could apply for financial support from the government.

In Paks,10 e-taxis provide the transport service. Protheus Plc. owns them and 3 taxi operators pay the renting fee to Protheus Plc. The taxis types is Nissan Leaf Acenta. These are capable of 240 km with one charge and this taxi fleet is optimal to serve people in Paks. The investments payback time are only 4-5 years and the charging are free at the charging stations.

Blinkee.city is the electronic scooter system in Pécs and E. ON AG is the service provider. It requires only a B license/scooter license and the app. The e-scooter’s number was 37 in 2020. The range is 60-70 km with using a 35Ah accumulator. This alternative is very popular among youth and students because of its advantages: fast, relatively cheap and just a driving license necessary.”

2.1.5 Description and data on charging infrastructures

The number of electric charging stations publicly available for private and public vehicles is rapidly growing in Hungary. As for South Transdanubia, delivering a desk research based on a map available at Elektromos autó töltőállomások Magyarországon - Villanyautósok (villanyautosok.hu), STRIA calculated that in Baranya county there are 29, in Somogy 55 and Tolna 21 ones. The so-called travel chargers are located along highways and main roads. There are still few of them in the region, but in all cases, these are high-performance (at least 40 kW) “lightning chargers”. When arriving at a destination, destination station chargers are to be used. These chargers are of low-power, and these are in Hungary mostly the 22 kW AC chargers.

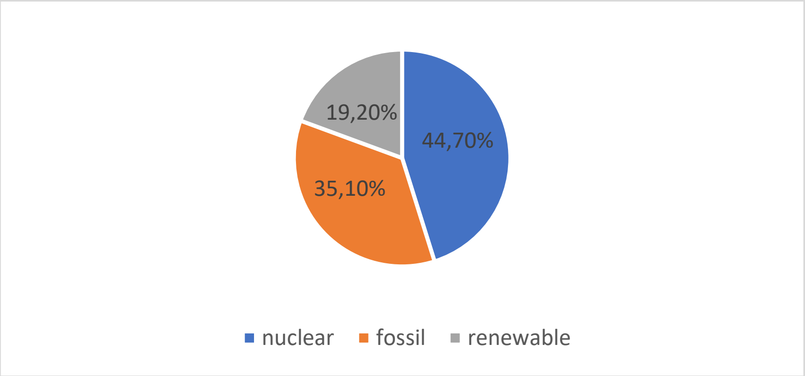
There are also further electric charging stations deployed at public transport organisations at Pécs, Kaposvár and Paks, their number depends on the procurement of electric buses and the improvement of the e-bus network locally. These chargers are typically depot or overnight chargers.

2.2 Energy

2.2.1 Availability of renewable energy in the region

When we have a look at the main categories of the energy mix of Hungary (2022, Így áll helyt Magyarország az energiaválságban - Greendex), we have 44.7 % nuclear, 35.1% fossil and 19.2 % renewable energy sources.

Graph 1.: The mix of energy sources in Hungary, 2022



Source: own editing based on Így áll helyt Magyarország az energiaválságban - Greendex

Within the region all the three types of energy sources present. The town of Paks is home to the one and only nuclear power plant of Hungary. When focusing on renewable energy resources, in South Transdanubia those come from solar energy, biomass and geothermal energy.

2.2.2 Share of renewable energy source in energy production

As for the whole country in 2022, 65.6 percent of the electricity produced from renewable energy sources was provided by solar energy, 21.7 percent by biomass sources, and 6 percent by wind energy, according to the information provision of the Hungarian Energy and Public Utility Regulatory Authority (MEKH). (Source: Folyamatosan tolódik el a magyar energiamix a megújulók irányába - Infostart.hu)

As for the photovoltaic production, the main cities of South Transdanubia have capacities for production. At Pécs a 10 MW built-in capacity photovoltaic power operates. One of the largest photovoltaic (PV) facility in Hungary is in Paks. It's 51 hectares and its built-in capacity is 20.86 MW, with 6 smaller PV power plants (each has 0,5 MW built-in capacity). This facility operates from 2019 on. The biggest capacity one in Central Europe is also a Hungarian one: at Kaposvár a 200 hectares area solar power plant has been operating since 2019, too, with a 100 MW production capacity (source: Átadták Közép-Európa legnagyobb napelem parkját - Hír TV (hirtv.hu)). The number of household-size small power plants in the region is not available.

As for biomass sources, at the city of Pécs Veolia operates the biggest biomass fuelled power plant in Central Europe. It generates 100% green energy and allocates that for 31.554 households and 483 public, state or municipality owned entities at Pécs. Th facility co-generates energy: its heat energy output is 188 MWth, whilst the electricity output is 85 MWe (source: Erőműveink | Veolia Hungary).

Illustration 2.: The Pécs co-generation power plant of the Veolia Group

Source: Pécsi erőmű | Veolia Hungary

There are neither wind, nor waterpower plants in South Transdanubia.

At the same time the utilisation of the geothermal energy is present in the region, via different ways. 14 thermal baths and spas operate by exploiting and offering the hot water coming from the different layers of the crust of the earth (source: Főoldal | Deldunantulifurdok). Besides those, in total country-wise 64 district heating systems operate, and the number of flats provided by district heating is 60,706, whilst the number of flats provided by hot water supply is 56,710 (source: KSH, 2022 (15.1.2.26. Távfűtés- és melegvízszolgáltatás, vármegye és régió szerint (ksh.hu))).

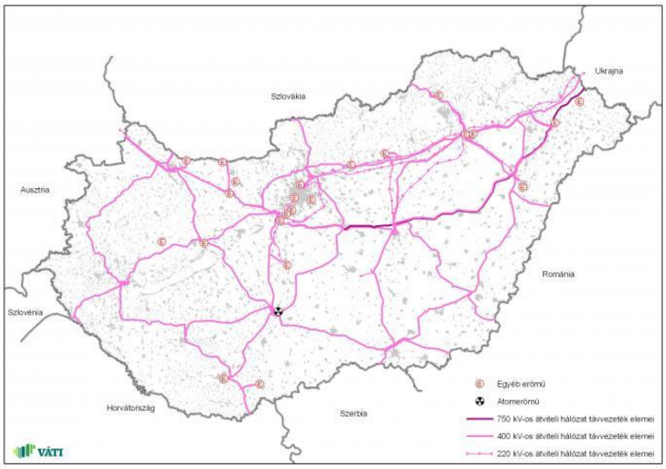
2.2.3 Regional energy market structure (e.g. energy production, electricity grids, transport of energy, energy delivery to customers, ownership and operation)

On the Hungarian electricity market consisting of 7 regions, currently three Distribution System Operators (DSOs) are providing universal services for natural persons (and their households) and market priced services for the enterprises and further consumers. These are Hungarian Electricity Works (MVM), the Germany based E. ON and the OPUS TITÁSZ. The three counties of South Transdanubia are covered by the services of E.ON Hungária Group, its regional company being responsible for the above three counties is the E. ON South Transdanubian Electricity Plc.

The national electricity grid consists of high voltage transmission and lower (transformed) voltage distribution sections. The map below shows the transmission grid and also indicates the 7 DSOs as quoted above.

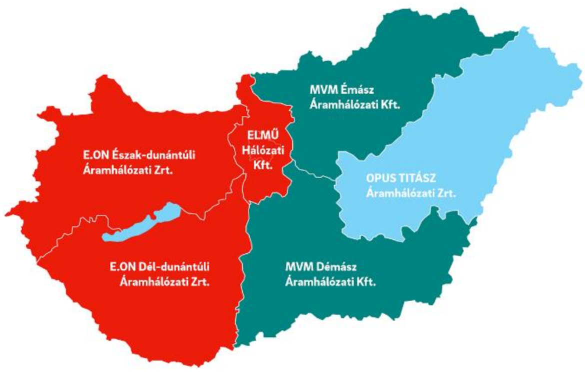
Map 3: The national electricity transmission grid and and the location of the 7 DSOs in Hungary

The transmission grid



Source: http://www.terport.hu/kategoria/tematikus/1467.html

The location of 7 electricity distribution system operators in Hungary



Source: https://www.eon.hu/

The Hungarian law on Electric Energy (VET, Law No. LXXXVI. of year 2007. and its amendments) regulates the energy delivery to customers and the related ownership and operation issues. In such contexts the VET defines the notions of universal service, the vulnerable customers, the conditions of accessing to the grid (citizens and business units included), the services to be provided by DSOs and the corresponding ownership issues. As regards the latter, customers are entitled to use the grid and the meters installed (as an exception, smart meters could be owned by customers) which is the property of the DSO. The seamless operation of the grid and the security of energy provision are obligations set towards the DSOs.

2.2.4 Description of current state of Energy Communities

As a baseline statement for the current report, energy communities are to be regarded as a chance to establish a sustainable, decentralised and democratic energy transition. Energy communities are bottom-up, open and democratic organisational forms with voluntary membership, being in contrast with the traditional for-profit energy market companies. As a consequence, it is not the activity, but the form of organisation is in the centre of energy communities.

Within the framework of the Clean Energy Package of the European Union, the amended Renewable Energy Directive (RED II) defines "renewable energy communities" (RECs), and for the sake of establishing RECs, each Member State should elaborate a "enabling framework". Before setting up such framework, each Member State should evaluate the barriers and drivers of energy communities. The form of this evaluation is a study and writing of that is a requirement for Hungary, too.

The Clean Energy Package makes a distinction of two types of energy communities. The first is the "citizen energy community" (CEC) as part of the Internal Energy Market Directive (IEMD), whilst the second is the "renewable energy community" (RECs) as defined in the RED II. The analysis within the PROMOTER project focuses especially on the RECs.

The VET transposes the European Union requirements into the Hungarian legal system. Both the REC definition (VET amendment of May 18, 2021) and "citizen energy community" (VET amendment in December 2020) are integrated in the VET. The former focuses on the renewable energy sources, the latter concentrates on the legal form of operation of ECs (cooperatives or non-profit economic companies could be ECs delivering at least one task from the several ones that are listed in the VET).

In comparison with the above written, the status of legislation regarding renewable energy production by EC in Hungary as of August 2023 is as follows. Currently there are 4 barriers against the wider uptake of ECs and these are:

- clear legislation in favour of citizens: need for extending scope of EC activities, reducing interest assertion of opportunities of large companies in citizens' initiatives,
- funding sources (EU, domestic) should allow proper implementation of ECs,
- creation of a nonprofit energy agency in service of establishing ECs, especially for training and capacity building of EC members,

- locally produced electricity should be made available for local electricity consumption, without feeding up to the grid and paying fees for using the grid when consuming that energy. This aspect is pre-requisite of establishing ECs.

Addressing the above barriers would very much facilitate the establishment of local inhabitants and municipalities ECs that exploit renewable energy production.

Taking into account the above, in Hungary there are especially pilot projects that test the feasibility of RECs. To our best knowledge 20 such pilots were co-financed by European Union and Emission Trading System funds. Below, in Table 1. we indicate the 7 pilots that are co-financed by the National Research, Development and Innovation Office.

Table 1.: Implementation of a model project supporting the establishment and operation of energy communities - call code: (2020-3.1.4-ZFR-EKM) - list of approved projects

Project ID	**Partnership**	**Project title**	**Grant (HUF) / partner**	**Total budget (HUF) / partner**
2020-3.1.4-ZFR-EKM-2020-00003	NKM Optimum Zártkörűen Működő Részvénytársaság	Energy communities in Hungary – Model project for the creation of energy communities and the community solar parks they own and the development of their sustainable operating models.	235 415 650	403 981 000
2020-3.1.4-ZFR-EKM-2020-00011	1. Felsőörs Község Önkormányzata 2, Ewiser Forecast Korlátolt Felelősségű Társaság 3, Pannon Egyetem	Local solar energy community in Felsőörs	23 252 108 208 131 449 69 083 645	42 563 516 273 274 061 69 083 645
2020-3.1.4-ZFR-EKM-2020-00010	1. Danubia Energia Fejlesztő és Tanácsadó Korlátolt Felelősségű Társaság 2. Energiatudományi Kutatóközpont 3. Berkenye Község Önkormányzata	Berkenye the village of the future - Community PV+ES (photovoltaic solar power plant plus energy storage) park model project	240 148 809 50 192 000 11 700 000	306 504 012 50 192 000 14 625 000
2020-3.1.4-ZFR-EKM-2020-00008	1. Capital Consulting Magyarország Zártkörűen Működő Részvénytársaság 2. Óbudai Egyetem	Tállya Energy Community Project	229 011 282 151 276 912	290 757 540 151 276 912

Project ID	Partnership	Project title	Grant (HUF) / partner	Total budget (HUF) / partner
2020-3.1.4-ZFR-EKM-2020-00013	1. Magyar Természetvédők Szövetsége 2. Szövetkezeti Központ Korlátolt Felelősségű Társaság 3. Szövetkezetiséget Támogató Egyesület	Creation and operation of Community Energy Service Provider (KESZ).	45 077 436 51 817 194 15 564 112	71 084 661 80 798 760 15 564 112
2020-3.1.4-ZFR-EKM-2020-00012	1. EVIN Erzsébetvárosi Ingatlangazdálkodási Nonprofit Zrt. 2. DDRIÜ Dél-Dunántúli Regionális Innovációs Ügynökség Nonprofit Korlátolt Felelősségű Társaság 3. Budapest Főváros VII. Kerület Erzsébetváros Önkormányzata 4. Erzsébetvárosi Piacüzemeltetési Korlátolt Felelősségű Társaság	Creation and operation of an energy community in Erzsébetváros	87 540 850 76 000 000 5 815 193 34 348 943	129 739 667 76 000 000 12 922 650 50 967 650
2020-3.1.4-ZFR-EKM-2020-00001	1. VPP Magyarország Befektetési és Vagyonkezelő Zártkörűen Működő Részvénytársaság 2. Besenyszög Város Önkormányzata 3. Szabadszállás Város Önkormányzata 4. Gyöngyösfalu Község Önkormányzata	Creating an energy community - involving renewable producers and storage technology	460 064 577 1 853 280 1 853 280 1 853 280	763 881 320 3 706 560 3 706 560 3 706 560

Source: https://nkfih.gov.hu/palyazoknak/egyeb-tamogatas/energiakozossegek-kialakitasat-mukodeset-tamogato-mintaprojekt-megvalositasa-2020-314-zfr-ekm/palyazati-felhivas

Although STRIA is consortium member of the Budapest located “Erzsébetváros” pilot project (2020-3.1.4-ZFR-EKM-2020-00012 in the above table), within the South Transdanubian Region there is no REC operating.

For more information on RECs you are kindly advised to read “READINESS INDICATOR MODEL South Transdanubia / Hungary written by PP8 STRIA August, 2023” xlsx table produced within the PROMOTER project by STRIA in August 2023. From this content we highlight (as we will make references to those in the SWOT analysis later on) that licensing, grid connection, access to relevant information and assistance, the IT systems and services, also renumeration schemes are to be described as problematic for the wider roll-out of RECs in the region and in Hungary.

2.3 Infrastructures as potential hubs

2.3.1 Buildings and other premises (public)

Starting this part of the report by defining what is public building or such premises, we focus on social purpose organizations. Such ones are institutions established by the state or an authority, under its jurisdiction, and serving the goals of the state or community. Schools, libraries, cultural halls and spaces, municipalities and their other real estates, the buildings of the central government and of central governmental institutions, among others, could be considered here.

Regarding the buildings and other premises of social purpose organisations, there are not databases accessible classified as list of buildings. Therefore, with reference to subchapter 2.3.2 (as that is below), and the electricity consumption of units that are regarded not to be households, we can indicate that:

- the concerned 527,219 units represent both the social purpose organisations and the agricultural/industrial/market service units,
- and the energy distributed to these units was 27,360,900 thousand kWh, resulting in the 51,897 kWh allocation per such units (source of the above data is: https://www.ksh.hu/stadat_files/kor/hu/kor0044.html).

Focusing on social purpose organisations in terms of RECs, they may access the necessary administrative procedures and financial opportunities (national or European Union) easier than other REC members, such as citizens or enterprises. As it is also visible from Table 1., these organisations are quite often take part in REC initiatives, too.

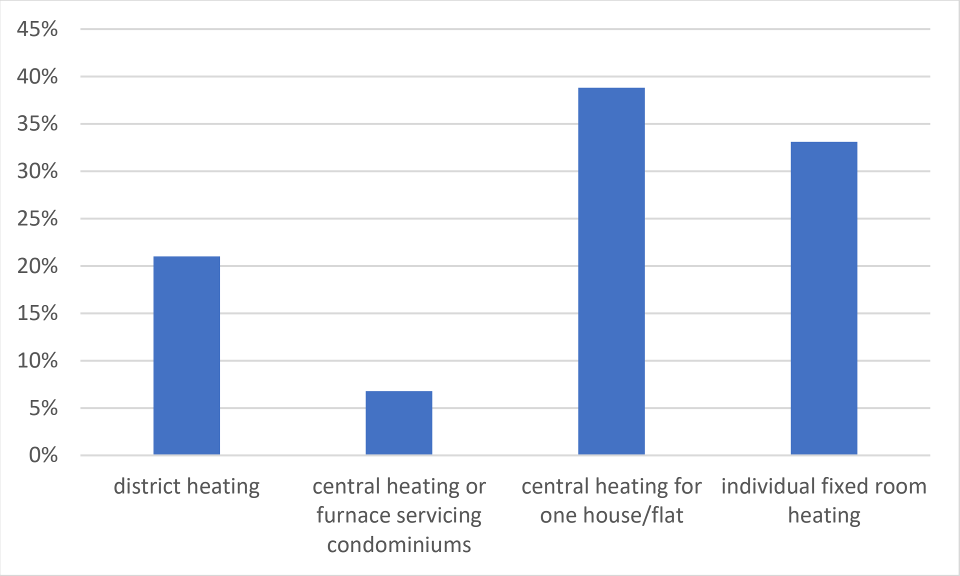
2.3.2 Buildings and other premises (private)

Based on a Hungarian Central Statistical Office (KSH) 2021 database called “Housing-related data by region and settlement type”, we can derive some South Transdanubian particularities illustrating infrastructures and potential hubs (source: 14.1.2.6. Lakással kapcsolatos adatok régió és településtípus szerint, 2021 (ksh.hu)).

In terms of housing rights, 74.8% of the houses/flats are own properties without mortgage loans. 12.2 of the those are owned with mortgage loans registered. When houses/flats are not owned by its inhabitants, 5.2% are used upon market level rental fees, 4.2% are used upon non-market level rental fees, whilst 3.5% by apartment courtesy users. The different types of ownership has consequences when it comes to smart metering, renewable electricity production and consumption and finally in terms of joining any RECs as well.

When it comes to the type of heating used, district heating is indicated at 21% of the houses/flats, central heating or furnace servicing condominiums at 6.8%, central heating for one house/flat at 38.8%, individual fixed room heating at 33.1% of the cases observed. As for mobile heating and no heating available at all there is no data available / published. The share (on all the houses/flats) of electric or heat pump heating solutions is 2.0%.

Graph 2.: The type of heating used at private houses / flats



Source: own editing based on [14.1.2.6. Lakással kapcsolatos adatok régió és településtípus szerint, 2021 (ksh.hu)]

When considering the division of houses/flats according to the energy source used for heating in 2021 within the region, gas is the 2nd most frequently used resource (43.1%), electricity is used significantly lesser (4.0%), firewood, other wood and substances of plant origin are the most popular (46.2%). Another important information is that the average size of houses/flats in South Transdanubia is 81.9 m^2.

In case we take into account the provision of electricity (source: KSH, 2022, 15.1.1.44. Villamosenergia-ellátás (ksh.hu)), in Hungary and in 2022, the distributed electricity is 39,038,553 thousand kWh, 29.91% of that (11,677,653 thousand kWh) is allocated to households. The total number of consumers is 5,793,717, and the total number of households of this figure is 5,266,498. The average household consumption was 2,226 kWh last year.

2.3.3 Open areas

According to the information made available by KSH, reflecting the situation in 2021 (source: https://www.ksh.hu/ffi/3-15.html), we start with some important definitions:

- built-up areas and arable land are considered biologically inactive. Here, full plant coverage cannot be achieved due to the design and cultivation method,
- agricultural area is the totality of the used arable land, the kitchen garden, the orchard, the vineyard and the lawn,
- areas taken out of cultivation include agricultural areas with abandoned cultivation, as well as buildings, roads, courtyards, ornamental gardens, water reservoirs, etc. areas inside and outside settlements,
- by construction we mean the area under construction, affected by earthworks, and the areas where earth and rock extraction takes place.

The extent of inhabited areas in Hungary increased linearly between 1990 and 2018, by a total of 8.4%. But instead of a connected settlement structure, the surface is covered in a significantly larger proportion by neighbourhoods interspersed with green areas. A similar increase in volume can be observed in the extent of the road and railway networks, a significant part of the more than 14,000 hectares covered for this purpose satisfied the demand for highways built after the turn of the millennium.

After the change of regime (1989-1990), the size of construction areas nationally increased sixfold in 15 years, but in 2018 they were only three times the value of 1990. Between 2012 and 2018, the artificial surface formed by the connected settlement structure and industrial or commercial areas increased the most (by 17 and 16%, respectively). The contiguous settlement structure, which has stagnated since 2000, was also affected by the boom in the real estate market and the increase in the number of housing constructions. The size of the areas classified as industrial and commercial increased continuously, almost one and a half times the value measured in 1990.

Since the turn of the millennium, a continuous decrease can be observed in the area of landfills and waste dumps, while the significant increase in raw material extraction between 2000 and 2006 is characterized by a smaller decline between 2012 and 2018. The largest part of the artificial surface, about three quarters, is made up of the non-contiguous settlement structure, which has not changed significantly over the last 6 years.

In 2021, more than 54% of the country's territory is agricultural land, of which 82%, i.e. 4 million 143 thousand hectares, is used as arable land. The proportion of arable, kitchen garden, vineyard, orchard and lawn cultivation branches that make up the agricultural area has changed slightly in the last ten years. This can be explained by the removal of aged vines and uncultivated kitchen gardens, as well as abandoned or recently broken up lawns.

Open areas, as introduced above, although covering significant sized areas in the region and in the country, are isolated from inhabitants, municipalities and other potential actors that could initiate ECs. Therefore such areas play minor role in the establishment and rolling out of ECs.

3. Stakeholders

The stakeholders in Interreg Europe terms are linked to the issue tackled by PROMOTER in different ways. They usually:

- take part in project events, study visits, peer reviews, etc.,
- by doing so, stakeholders, i.e. "both the people and also their organisations will discover inspirational policies from counterparts elsewhere, gain new useful knowledge, and increase their professional capacities." Besides that, by taking part in "projects" that "supporting stakeholders' involvement" enhance "more generally the learning at organisational level". (Source: Interreg Europe 2021-2027 Programme Manual and Annexes, pp. 14.),
- benefit from the projects as "enhancing the institutional capacity of public authorities, in particular those mandated to manage a specific territory, and of stakeholders" (same source, pp. 15.),
- contribute to project implementation in accordance with the "the nature of the policy instruments addressed". When doing this, "the partners and stakeholders involved in the project may also indicate the most relevant specific objective" (the same source, pp. 18.) for action planning and follow-up purposes,
- assist and multiply the spillover effect of Interreg Europe project communication and dissemination activities.

As regards the PROMOTER project that focuses on "PROMoting TERritorial strategies for sustainable mobility through green energy prosumer hubs", the table below illustrates the key and non-key stakeholders according to the professional contacts of STRIA as at the end f the 1st project period (01.03.2023. – 31.08.2023.)-

Table 2.: List of Hungarian PROMOTER stakeholders

Name of the stakeholder	Regarded to be key or non-key stakeholder
Managing Authority of the Environment and Energy Efficiency Operational Programme Plus	**key** / non-key
Managing Authority of the Integrated Transport Development Operational Programme Plus	**key** / non-key
National Research, Development and Innovation Office	**key** / non-key
municipalities of major South Transdanubian towns and cities (Kaposvár, Paks, Pécs, Szekszárd)	**key** / non-key
Dissemination System Operators (in South Transdanubia and in the rest of the country)	**key** / non-key
MVM Group (Hungarian Electricity Works),	**key** / non-key
Hungarian Energy and Public Utility Regulatory Authority	**key** / non-key
ECs, enterprises, civic organisations, local inhabitants / citizens	**key /** non-key

Name of the stakeholder	Regarded to be key or non-key stakeholder
ENERGIAKLUB	key **/ non-key**
National Society of Conservationists – Friends of the Earth Hungary	key **/ non-key**
Hungarian Central Statistical Office	key **/ non-key**
Regional and Settlement Development Operational Programme Plus	**key** / non-key
Digital Renewal Operational Programme Plus	**key** / non-key
Modernisation Fund	**key /** non-key
commercial banks and financial intermediaries	**key /** non-key
76 government offices that have competences in connection with ECs	**key /** non-key
National Network of Energy Experts	**key /** non-key
RECs, members of RECs	**key /** non-key
public transport organisations of the of major South Transdanubian towns and cities (Kaposvár, Paks, Pécs, Szekszárd)	**key /** non-key
media operators	**key /** non-key
Települési Önkormányzatok Országos Szövetsége (National Association of Local Municipalities)	key **/ non-key**
Megyei Jogú Városok Szövetsége (Association of Cities with County Rights)	key **/ non-key**
HUMDA Hungarian Motorsport and Green Mobility Development Agency	key **/ non-key**
University of Pécs	key **/ non-key**
Budapest University of Technology and Economics	key **/ non-key**

Source: own editing

In terms of strategies for mobilising stakeholders in the core and follow-up phase of PROMOTER, it is high importance that their benefit should be related to their key competences or to their future plans. When inviting them to local stakeholder group (LSG) meetings (be those organised online or with personal participation) to assist STRIA delivering proper Hungarian outputs of the PROMOTER project, it is important that such outputs should have value added for these stakeholders, or at least provide them with some updates in the issues tackled. Last, but not least the partner and project level communication-dissemination deliverables will be shared with them.

4. Legislative and financial environment in support to renewable energy initiatives

In this part of the report, given that the issue of addressing renewable energy initiatives is quite wide, we focus on the renewable energy communities, RECs exclusively.

4.1 Legislation, regulations

In terms of legislation and regulations we avoid repeating here once again what has been written under 2.2.4 “Description of the current state of Energy Communities”.

To start with, the Hungarian law on Electric Energy (VET, Law No. LXXXVI. of year 2007. and its amendments) is the legal instrument that is to transpose the European Union requirements into the Hungarian legal system. Both the REC definition (VET amendment of May 18, 2021) and "citizen energy communiy" (VET amendment in December 2020) are included in the VET. The former focuses on the renewable energy sources, the latter concentrates on the legal form of operation of ECs (cooperatives or non-profit economic companies could be ECs delivering at least one task from the several ones that are listed in the VET).

As for the enabling framework – beyond the VET and the transposal activities of the legislation –, there should be an environment that basically facilitates ECs.

In Hungary the National Climate and Energy Plan (NECP, 2019) as strategic document makes several proposals in terms of renewable energy production by Energy Communities, ECs. This is properly summarised in the excerpt cut from the 79. page of the Hungarian NECP: "Hungary will encourage initiatives that ensure the local consumption of electricity. In this regard the support of developing energy communities is a priority; the energy community – as a separate consumer-producer unit and settled entity – should be clearly defined in regulation. In relation to the above it is also necessary to define in regulation a community metering point in addition to the metering point of production-consumption. It is a priority to extend net metering (or an equivalent incentive programme) to apartment blocks, as the means of the distribution of produced energy beyond the sole connection point is irrelevant in terms of the distribution network. The programme also contributes to reducing network losses. Laying the groundwork for establishing communities within the transformer zones is a second-level goal. The option of managing ‘village heating plants’ as energy communities is a third-level goal." (Source: https://energy.ec.europa.eu/topics/energy-strategy/national-energy-and-climate-plans-necps_en).

To support the establishment and operation of RECs, the following proposals are made:

- introduction of fair pay-as-you-use system charges is a necessity,
- ensuring VAT exemption for electricity sharing among energy community members is a useful incentive,
- introduction of billing systems enabling billing the shared energy produced by the consumer (i.e. the prosumer) within the financial information system of distribution systems operators (DSOs) is a must,

- ensuring public participation in the development of business codes of network licensees and DSOs is advised,
- set a deadline for the development of detailed by-rules.

(Source: https://hirlevel.egov.hu/2021/09/05/mi-kell-a-hazai-energiakozossegeknek/)

Further sources such as the ENERGIAKLUB (https://energiaklub.hu/en/news/lessons-learned-from-developing-citizen-energy-in-central-and-eastern-europe-5090) introduces more aspects that are based on the current Hungarian EC legislation. These are as follows:

- EC legislation focuses exclusively on electricity, does not address, for example, biogas or geothermal energy/renewable district heating,
- non-governmental organisations (NGOs) or civic organisations can assist or if necessary, replace the often understaffed municipal organisations or local authorities,
- less red tape, i.e. less bureaucracy would mean easier establishment of local energy communities,
- more intensive involvement of local enterprises and local citizens into ECs increase the social capital around these initiatives.

As regards the legislation issues, the pilot EC projects play important role in terms of creating the proper regulatory environment. As being said by the communal energy expert of the National Society of Conservationists – Friends of the Earth Hungary, the VET creates and opportunity to make an adaptive regulatory test environment. Although the by-laws for the final legal environment are not elaborated yet, and because of the communal energy plays important role in terms of energy independency, ECs in the future will be entitled to obtain state grants / funding in case the pilot projects will be successfully implemented and will deliver the expected impacts. This is why piloting has major importance in the context of ECs. (Source: https://mtvsz.hu/hirek/2023/05/elakadt-a-magyar-energiakozossegi-pilot-projektek-megvalositasa)

Last, but far not least, it is key to the successful establishment and operation of ECs that they should have their own legal personality that is different from the (legal) personality of its members. The legal form of a given EC very much depends on its activities, its ownership composition and the type of projects the EC plans to carry out. Therefore it is of key importance that key market actors if being members of ECs should not individually benefit from the legal forms of ECs, the rights and obligations of ECs, but they should act for a better good beyond their own individual interests. Therefor the current VET legislation - which is rather CEC, in a lesser extent REC focused - explicitly forbids that large market companies take part in the management of ECs, at the same time citizens, municipalities, small and medium size enterprises are allowed to do so. It is also a disadvantage that the optional activities for ECs are not listed in VET in accordance with the IEMD.

Here comes the aspect that renewable energy communities (RECs) differ from CECs. One of the most important aspect is that whilst CECs are focusing on electricity only, RECs have a wider portfolio, including renewable heat production, biomass and biogas. Another difference is that large companies by RED II are excluded to be members of ECs. In the VET RECs are also limited to electricity, and other cooperation for further forms of renewable energy production cannot be initiated by ECs. Also, in the Hungarian VET, large companies are not banned from EC membership.

As the consequence of the above written, the ideal legislation for ECs should or rather could take a form a separate national law on renewable energies. It is also a valid consequence that the IEMD and RED II are not fully transposed into the Hungarian legislation as the requested European Union contents are integrated into VET in a mixed way. (Source: https://mtvsz.hu/uploads/files/Megujuloenergia-kozossegek_Ertekelo_tanulmany_MTVSZ-SZGK-EMLA_final.pdf)

4.2 Financial incentives

Continuing our description with focus on RECs, the following financial incentives are available in Hungary.

The financing of ECs, owing to the still to be solved / assisted administrative, licensing, grid connection process and fees of network use makes it necessary that the public funds should facilitate the establishment and operation of ECs. In other words, ECs should not automatically be dealt with the way as applied for market actors.

As written in the RED II, financing of ECs is of high importance, be it provided by private/market sources or state funding within a special framework (dedicated to ECs).

International benchmark cases underline that state subsidies are the basic financial means for small and locally rooted (bottom-up) ECs, during their start and initial development periods. The state subsidy / grant could also facilitate the creditability of ECs and / or could foster their ability to earn their own capital needed for further operation / development.

The optimal financing of ECs is subject of:

- their ownership structure (non-profit, for-profit, municipalities, enterprises, well-of or vulnerable inhabitants as members of EC, etc.),
- their business model (timing of investment and operational costs differs in communal renewable investments, green electricity provider, local communal consumption by sharing the energy generated),
- their activities and the type of renewable energy technology applied (varies in terms of capital needed to be invested),
- their current stage of development (concept making phase, preparation phase, investment phase, operation phase).

(Source: https://mtvsz.hu/uploads/files/Megujuloenergia-kozossegek_Ertekelo_tanulmany_MTVSZ-SZGK-EMLA_final.pdf)

Below we take an inventory of the most frequent forms of financing ECs:

- Traditional market financing,
- Communal financing (charity, crowdfunding),
- State subsidies / grants, calls for proposals.

(Source of the following subchapters is: https://mtvsz.hu/uploads/files/Megujuloenergia-kozossegek_Ertekelo_tanulmany_MTVSZ-SZGK-EMLA_final.pdf).

4.2.1 Traditional market financing

Traditional market financing: its main features are that it means provision of 1.) own capital or 2.) commercial credit:

- 1.) The non-profit organisations leading CEs most frequently have very low amount of own capital (equity). Therefore involvement of market investors or a financing partner could be a solution, but their participation decreases the community nature of ECs.
- 2.) The commercial credit results in the proper ratio of external capital (debt) / own capital (equity) - debt to equity D/E indicator. It is quite commonly applied at bigger scale industrial renewable investments (photovoltaic parks, for example) and at private houses. At the same time there is a lack of experience in case of financing community projects such as ECs. In general, at the commercial bank sector the nonprofit and communal clients are not frequent, there are no special products developed for them. Despite of it, the National Bank of Hungary recommends in its "green recommendation" that novel and innovative financial means should target ECs.

4.2.2 Communal financing

Communal financing is more often functions as the alternate to traditional market financing:

- 1.) communal giving or in other words charity is a typical form of financing nonprofit organisations, at the same time this form of finance is marginal in case of ECs,
- 2.) communal investment or in other words crowd investment / funding is a more effective way of raising funds. At the same time we have no information about its application neither in the energy sector, nor in the field of ECs. The nonprofit communal financing is problematic because of the Hungarian legal rules and procedures (related problems of shared ownership and micro-crediting) around that.

4.2.3 State and European Union subsidies, further grants

As the current last resort, the state and European Union subsidies, further grants mean the most frequently used way if EC financing. It has also further sub-categories which are as follows:

- 1.) participation in grants schemes for renewables (ECs and renewable ECs are eligible): the shift of these schemes towards auctions for production capacity instead of providing directly grants for these capacities and for the applying ECs. In Hungary there is a "Renewable Grants Scheme" (METÁR), using the abbreviation of the Hungarian expression). METÁR has two categories, the smaller fits the ECs (0,3-1 MW capacity with a maximum grant of 200 million HUF allocated per application). In the 2021 call 30 projects were approved, typically with a maximum capacity 1MW, at an average price of 22,35 HUF / kWh. Having the particularities of ECs in mind, METÁR has started to develop a special scheme tailored for renewable ECs: only ECs could be applicants. The details of this scheme are still under elaboration. Last, but not least the granting of social enterprises (ECs included) are often credited by commercial banks in Europe and in Hungary (in a lesser extent) as well.
- 2.) targeted EC grants: as it has been mentioned under readiness indicator 2.1, the National Research, Development and Innovation Office launched a special call (2020-3.1.4_ZFR-EKM) for

establishing and operating pilot ECs in Hungary. It supported 7 applications, and the call itself was a major advancement beyond providing finance for ECs: it also piloted their business models, and also challenged the current electricity legislation practice in favour of ECs. STRIA is also partner in one of the supported 7 consortiums. It is important to note that these 7 projects still have been not finished and implemented.

Ideally, among the observed EC grants non reimbursable grants, beneficial credit, revolving fund financing and tax relief represent the typical forms of targeted EC grants. Only the main forms of these are overviewed below:

- EU grants of the 2021-2027 programming period:
    - Cohesion Fund: allocated within different operational programmes, for the purpose of communal electricity and heat production based on renewable energy sources,
    - the Environment and Energy Efficiency Operational Programme Plus has measures to (co-)finance ECs, whilst the Regional and Settlement Development Operational Programme Plus advises the involvement of municipalities into these ECs. The two operational programmes aim at fostering the self-sufficiency of the ECs and improving their energy effectiveness as well. The forms of financing could be both non- and reimbursable ones. The operational programmes also target the local inhabitants and the enterprises, especially of the small and medium ones (SMEs),
    - additionally, the Digital Renewal Operational Programme Plus supports the digitisation of renewable EC initiatives,
- the Resilience and Recovery Fund: its "F" component (Energy - Green Transition) provides funding for the local inhabitants for deploying heat pumps and PV system in a household size. ECs are quoted here as the communal use of the individual productions of the inhabitants, but that would need the reform of legal frameworks enabling ECs. Its component "C" (Catching-up settlements) 300 settlements would have their own communal PV technology-based ECs,
- the Just Transition Fund concentrates on three counties, Baranya being one of those representing South Transdanubia. In Baranya it is proposed for observation to establish ECs as to support local inhabitants to replace fossil energy-based heating with EC solutions,
- revenues coming from the Emission Trading System (ETS) in Hungary are use to support green transition programs and projects via the Green Economy Financing System (ZFR). ZFR provides excellent opportunity to (co-)finance ECs in a permanent way,
- another fund operating from the ETS is the Modernisation Fund. This financial mean targets the development of the grid itself in the ten less developed EU member states. As part of this fund, providing subsidies to ECs are planned and the creation of independent aggregators as well. Electric vehicle charging via ECs and energy storage are also among the eligible activities.

Beyond the above mentioned abundant and at the same time, mainly programming period based financial means a constant, stable set of finances for ECs would be desirable. The ideal financing would be subject of development level of ECs. For example enablement grants in the initial periods of ECs, development funding at later stages (for innovative projects and their licensing) and capital funding for already matured ECs.

4.3 Components of supportive framework for renewable ECs according to RED II

The table below includes proposals that build on subchapters 4.1 and 4.2. It also completements the issues tackled there with further concerns. In case decision makers intend to improve the current enabling framework of the RECs, these proposal are worth taking on board.

Table 3.: Components of supportive framework for renewable ECs according to RED II

Category	**Barrier**	**Proposal(s)**
Legal-administrative	Fragmentation and delays in local government office and distribution system operator licensing	Authority guidance for applicants; uniform guidance and training for local authorities
Access to grid and market	Disorganised collective self-consumption (e.g. apartment buildings, local energy sharing)	Detailed legal, technical and financial guidance for condominiums; discounted system usage fee for sharing local electricity
Finance	Difficulties of traditional market financing	Harmonising EU calls for proposals for the benefit of energy communities
Social-economic	Energy poverty, negative heritage / connotation of cooperatives	Establishing a non-profit energy agency for provision of information and consultancy
Knowledge and ability	Lack of knowledge and information, lack of competences	

Source: https://mtvsz.hu/uploads/files/Megujuloenergia-kozossegek_Ertekelo_tanulmany_MTVSZ-SZGK-EMLA_final.pdf

5. S.W.O.T Analysis

This chapter contains the SWOT analysis on RECs in accordance with the current report and the formerly quoted and partly introduced Readiness Indicator analysis.

Table 3.: Swot analysis for renewable energy communities and low emission mobility in South Transdanubia / Hungary

Legend: - S: Strengths - W: Weaknesses - O: Opportunities - T: Threats

S **STRENGHTS**	W **WEAKNESSES**
• Regional renewable energy potential in solar, biomass and geothermal terms are favourable for RECs. • Low-emission mobility is on the rise in the region and in the country, public and private transport-wise equally. • Favourable environment pollution levels related to mobility needs to be preserved by renewable developments. • There are already REC pilots initiatives and pilot financing that function as a sandbox to further deployment of RECs. • The necessary technologies are available for smart metering, signal transmission and balance circles. These technologies prove to be successful in isolated operation. • ICT companies are striving to join REC projects and integrate their technologies. • Potential REC members (natural persons (households), municipalities, cooperatives, SMEs) are showing interest.	• IEMD and RED II directives are not fully transposed into HU legislation. • The scope of RECs are limited only to electricity, utilisation of biomass. geothermal and village heating systems are not defined by the law. • Electricity prices for feeding up to the grid are too moderated to provide impetus for RECs in terms of trading. • Potential REC members are not aware of the benefits of the RECs and there is not awareness raising that would facilitate access to information.

OPPORTUNITIES	THREATS
• The implementation of REC pilot projects highlight the regulatory, licensing, grid connection shortcomings that will be corrected by the necessary legilsation and administrative steps. • Learning from RECs of other Hungarian regions, and from international level keeps encouraging the South Transdanubian uptake of RECs. • Extended REC financing actions/calls, renumeration schemes for proposals targeting potential REC members for a more intensive establishment of RECs. • Supporting REC members: creating customer energy profiles for improved access to the electricity market via accurate consumption history and possibilities to benefit from demand flexibility. • Lack of information, guidelines, templates will be addressed by relevant public administration and energy market stakeholders. • The market supply of IT devices and services keeps on developing and being accessible to REC members.	• Deficiencies of the current regulations, licensing, grid connections will further hamper the planning and establishment of RECs. • Economic hardships in renumeration schemes, feeding up tariffs or purchasing and procuring the necessary metering, balance circle, IT, etc. equipment will become constant.

Source: own editing

6. Readiness model indicator results

This chapter contains the summary of data and information in an integrated manner. In case you are interested for more details, be kind to study the Readiness Indicator Model itself. It is elaborated for South Transdanubia and Hungary and goes into details in terms of the 5 REC aspects that are shortly cited here.

In the below table you find a semaphoric evaluation of a concerned aspect addressed, based on its drivers and barriers. In case the colour is red, then barriers prevail, if it is green, then drivers dominate the given aspect. The orange / yellow colour illustrates that the implementation of that aspect is in halfway: both barriers hindering and drivers supporting that.

Table 4.: The 5 aspects of the Readiness Indicator Model according to their current state in semaphoric colours

1.) Legislative aspects					
			Semaphoric colours		
Maturity parameter / indicator	Drivers	Barriers			
Regulations	Legislation operative	Several aspects of legislation still not clear			
Regulations	Licensing process in place and speedy	Bureaucratic and time-consuming licensing process			
Service provision: type of services offered by a EC	Grid connection facilitated	Grid connection barrier			
Regulations	Legislative incentives to EC establishment available	Legislative incentives to EC establishment absent			

2.) Behavioural/organisational aspects					
			Semaphoric colours		
Maturity parameter / indicator	Drivers	Barriers			
EC structure complexity	Existence of EC already operational in neighbouring regions	Finding the adequate energy community			
Identification of EC network area	Extensive information available on network area of EC location	Extensive information needed on network area of EC location but not yet available			
Administrative process	Existence of a one-stop-shop approach for administrative tasks	Non-existence of a one-stop-shop approach for administrative tasks			
EC establishment guidelines	Guidelines, templates etc. already available	Lack of templates for statutes or typical articles of association in a EC creation			
Communication	Awareness and capacity building / Information dissemination completed/ongoing/ planned	Lack of awareness and capacity building / Information dissemination			
Regulations: Grid connection	Speedy and clear processes	Lengthy processes			
Market conditions	Grid connection – EC possible in all distribution grids due to a Distributor System Operator (DSO) intervention already in place	Grid connection barrier – EC not possible in all distribution grids due to a necessary (but not mandatory) Distributor System Operator (DSO) intervention			

3.) Economic aspects					
			Semaphoric colours		
Maturity parameter / indicator	Drivers	Barriers			
Complexity and understanding of EC concept – How to start?	Process completed/in progress	Not yet started			
Finding the adequate energy community	Presence of potential players meeting the current regulations for EC establishment	Absence/not yet identified potential players meeting the current regulations for EC establishment			
Information on network area of EC location	Information acquired/available	Information not yet available/not acquired			
One-stop-shop approach for administrative tasks	Operational	Not yet in place			
Financing	Financing available as well as financing entities willing to take on risks	Lack of financing; absence of financing entities willing to take on risks			
Remuneration for excess production	Remuneration schemes in place	Absence or limited remuneration schemes			
Grid connection for energy sharing	Clear procedural requirements for DSOs to facilitate energy sharing	Grid connection barrier – Lengthy processes			
Energy agencies and Energy Communities: a new path for energy decentralization	Established/in progress	Absent			

4.) Technological aspects					
			Semaphoric colours		
Maturity parameter / indicator	Drivers	Barriers	■	■	■
Market supply	Equipment supply and installers available	Market difficulties due to equipment supply and installers unavailability		■	
Market environment	Communication materials in place	Market difficulties due to lack of communication material	■		
Adaptation of IT processes on the Distributor System Operator (DSO) side	Already completed	Need of adaptation of IT processes on the Distributor System Operator (DSO) side		■	
Smart metering	Installed and operational	Smart meters still required to be installed and operating	■		
Grid connection	Adequate	Low capacity / Congestion of grids	■		
Data access and sharing	Developed platforms for local energy sharing and trading. Non-discriminatory role of DSOs	Platform/s absent. Discriminatory role of DSOs	■		
Software development and IT infrastructure for energy sharing using the public grid	In existence	Lacking		■	

5.) Operation scope and environment aspects. Other features				
		Semaphoric colours		
Maturity parameter / indicator	Description			
Sustainable mobility: electrically powered mobility system	Percentage of electric transport means on total – private motor vehicles			
Sustainable mobility: electrically powered mobility system	Percentage of electric transport means on total – public road transport			
Sustainable mobility: electrically powered mobility system	Percentage of electric transport means on total – motor bikes			
Sustainable mobility: electrically powered mobility system	Percentage of electric transport means on total – bicycles, pedelec			
Sustainable mobility: electrically powered mobility system	Percentage of electric transport means on total – scooters			
Sustainable mobility: electrically powered mobility system	Percentage of electric transport means on total – other ways of electric mobility			

			Semaphoric colours		
Maturity parameter / indicator	Drivers	Barriers			
Sustainable environmental conditions: above limit CO emission	Reduced local emissions	Excess local emissions			
Sustainable environmental conditions: above limit NO2 emission	Reduced local emissions	Excess local emissions			
Sustainable environmental conditions: above limit PM10 emission	Reduced local emissions	Excess local emissions			
Sustainable environmental conditions: above limit NMVOC emission	Reduced local emissions	Excess local emissions			

			Semaphoric colours		
Maturity parameter / indicator	Drivers	Barriers			
Operation scope and environment. Other features	Solar Renewable energy potential	Solar Renewable energy limitation			
Operation scope and environment. Other features	Wind Renewable energy potential	Wind Renewable energy limitation			
Operation scope and environment. Other features	Biomass Renewable energy potential	Biomass Renewable energy limitation			
Operation scope and environment. Other features	Water Renewable energy potential	Water Renewable energy limitation			
Operation scope and environment. Other features	Geo-thermal Renewable energy potential	Geo-thermal Renewable energy limitation			

Source: Readiness indicator model South Transdanubia / Hungary written by PP8 STRIA August, 2023