Climate Innovators
Mapping in Central and Eastern Europe

Climate-KIC is supported by the EIT, a body of the European Union

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FOREWORD

Over the last four decades, Ashoka has been working to build an Everyone a Changemaker world, a world that responds quickly and effectively to social challenges and where each individual has the freedom, confidence and societal support to address social problems and drive change. Of the many global challenges we face today, few are as wide-reaching as climate change. While humans have enjoyed the convenience and comfort brought about by the Industrial Revolution, many of us have also lost touch with nature and as a result, directly and indirectly contributed to global warming and climate change. As a result, for the first time in its 40-year history, in 2019 Ashoka has decided to galvanize the strength of its community on climate action, through a new global initiative – Next Now: Planet & Climate. Within this flagship initiative, we aim to change the course of history by uniting leading changemakers around audacious goals that bring people and planet to a new equilibrium. Together, this ecosystem of visionary changemakers will build a brighter future. A future that addresses and anticipates the world's most urgent climate challenges. A future in which no one gets left behind. Because the world is changing fast and the time to act is Now.

For all these reasons, the partnership with EIT Climate-KIC has brought us great joy. We view the ecosystem mapping of climate innovators in nine countries in Central and Eastern Europe, which constitutes the object of this report, as a major first step in our global work on climate innovation. When it comes to global climate action, the scale and depth of the challenge we face as humanity is so severe, that we need moonshot goals and cathedral thinking. Yet, we first need to know who are the extraordinary women and men that can join hands, shoot for the moon and restore our planetary equilibrium. The fact we were able to do this ecosystem mapping in Central and Eastern Europe has been an honour and a privilege. The massive transformation this region went through, after half a century of oppression, is largely due to changemakers that stepped up to the mission of bringing a new vision for the region to life. A vision based on active citizenship, participation and inclusion. In this landscape, have the concerns for our planet fallen through the cracks? Statistics point out climate skepticism is wider and more far-reaching in Eastern Europe than in the West. But is it really so? If not, who are the regional champions that are driving a new wind of age? What are their obstacles and which are the opportunities they see in their work?

Our qualitative deep-dives, authored by regional experts from Poland, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Estonia, Lithuania and Latvia complemented a thorough quantitative network analysis in all these countries, performed with specialized teams of market analysis consultants, based on a carefully planned and tested methodology. 502 phone interviews helped us surface 827 innovators, changemakers and leading players in several fields which we saw as paramount for climate action in our region: energy efficiency in buildings, climate-smart agriculture, socio-economic transformation in post-coal regions and air pollution.

We hope you will enjoy this reading, which condenses months of scrutiny and search. The first chapter details the rationale and aim of the study. The second one presents in greater detail the methodology we used. If you have little time for reading, do not miss Chapter 3 – it sums up the main findings and insights of our whole analysis. Chapter 4 looks at all the field areas we examined and describes in great detail the general context of each of them, main policies in the region, main innovations, as well as socio-demographic characteristics of the changemakers that work in each of them. Chapter 5 comprises, in fact, nine annexes: one for each country in the region that we looked at, with both the qualitative findings provided by the experts we consulted, and the results of the network and ecosystem mappings. You will probably enjoy the very insightful nine individual Maps of Changemakers, each with its own shape and specificities.

For us, the journey begins now. We now know who can turn our region into a global frontrunner in climate and sustainability. It is our responsibility, as well as an invitation we would like to address to all institutional actors in the region – from governments to corporations, from funders and business leaders to leading foundations – to nurture this ecosystem, to support its visionary spirit and courageous thinking. The time to act is Now.

Corina Murafa Ashoka Romania Director, Field Leader Next Now: Planet & Climate
Marie Ringler Ashoka Europe and Ashoka CEE Director, **Agata Stafiej-Bartosik** Ashoka Poland Director,
Zsolt Pethe Ashoka Hungary Director, **Pavlina Horejsova** Ashoka Czech Republic Director

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Chapter 1
Rationale and Aim of the Study

In 2019 EIT Climate-KIC and Ashoka joined hands to conduct a study in 9 countries (Romania, Poland, Czech Republic, Hungary, Slovakia, Bulgaria, Latvia, Lithuania and Estonia) with the purpose of identifying the most important players and changemakers in the climate innovation area.

About EIT Climate-KIC

EIT Climate-KIC is a Knowledge and Innovation Community (KIC) working to accelerate the transition to a zero-carbon economy. Supported by the European Institute of Innovation and Technology, EIT Climate-KIC identifies and supports changemakers and their innovations that help society mitigate and adapt to climate change.

About Ashoka

Ashoka is the largest global organization promoting and supporting social entrepreneurship and social innovation, ranked by NGO Advisor in the top 5 NGOs in the world. Ashoka identifies and supports the world's leading social entrepreneurs, learns from the patterns in their innovations and mobilizes a global community to embrace these new frameworks and build an "everyone a changemaker" world.

Both organisations did this inquiry because such changemakers who generate positive change are quite a few, and even fewer in the climate innovation sector. The purpose of the project has been to create a network that will act on maximizing the potential of all members. If you feel we have missed important actors in any of the countries we examined, or if you think we misaddressed one of the prominent trends in any of the countries under scrutiny, please reach out to us. At the same time, the purpose of our endeavour is to design future programmes and strategies that would support these vibrant communities of changemakers and innovators. If you or people you know would like to be part of this ecosystem building movement, please contact us at: romania@ashoka.org.

We looked at **changemakers** in the fields of:

- Energy efficiency in buildings,
- Climate-smart agriculture,
- Socio-economic transformation in post-coal regions
- Air quality / air pollution

Our efforts resulted in nine Climate Changemakers Maps: one for each of the countries we have examined in Central and Eastern Europe (CEE): Romania, Bulgaria, Hungary, Czech Republic, Slovakia, Poland, Lithuania, Latvia, and Estonia. Ashoka's Network Mapping is a process that uses snowball mapping analysis to identify key innovators, influencers and decision makers in a given sector, to visualize patterns and trends, and to identify the potential for subsequent network connections. Our snowball research always involves close collaborations with leading sociological and marketing research companies to ensure the scientific accuracy of the methodology deployed. The most important output is observing the relationships with those willing to co-create, nominations for future opportunities, and insights about the field that will guide upcoming activities. The collected data in this study has been used by EIT Climate-KIC, Ashoka and their partners, with the purpose of creating the Climate Changemakers Maps and to potentially further engage with the nominators and the nominees on these topics. This data was published with the interviewees' consents, but the raw data, including contact information, was only used by the beneficiaries, and will not be publically released.

Chapter 2
Methodology for the Study

1. INTRODUCTION – GOAL OF THE RESEARCH/STUDY

The new EIT Climate-KIC strategy for the CEE Geography for 2019-2021 focuses on expanding thematically and geographically. In 2019, EIT Climate-KIC CEE encompassed not only Hungary and Poland, but also the Czech Republic and Slovakia. The next step was to also include some of the RIS countries from the CEE region, such as Lithuania, Latvia, Estonia, Bulgaria and Romania. The absolute best way to quickly understand a new business environment of the EIT Climate-KIC CEE is the ecosystem map, as it shows all the high-level value exchanges between the client and the groups with which it's interacting.

The CEE climate innovation ecosystem mapping gives EIT Climate-KIC and Ashoka CEE a stronger license to operate in the area of innovation in climate change in the region. The process of calling-up the innovators, supporters and opinion leaders while conducting the survey was also a process of brand awareness building which allowed for a faster entry point for potential future collaboration. The mapping allows to build better and more effective networks through matching planned activities with the right audience. In the area of policy and system change, the mapping will help to convene and match the right partners to achieve the effect of synergy and collective impact. Finally, it will help to better navigate the dense ecosystems and interdependencies between various actors in the field of climate change social innovation, as it gives the audience an in-depth knowledge about the sector.

Thorough **climate innovation ecosystem map** is the exercise that will allow to kick off all the consecutive activities in the EIT Climate-KIC CEE impact goals:

- 1: Promote retrofit and decentralized energy, incl. air pollution,
- 4: Make agriculture climate-smart,
- 9: Reboot regional economies, while co-creating and experimenting with the right stakeholders, who are crucial for achieving systemic and transformational change in the region.

Starting with 2019, for the first time in its 40 year long institutional history, Ashoka – the world's largest network of social entrepreneurs, comprising 3600 leading systems-changing innovators from over 90 countries, is galvanizing the strength of its community on climate action, through a new global initiative – Next Now: Planet & Climate. Of the many global challenges we face today, Ashoka believes few are as wide-reaching as climate change. While humans have enjoyed the convenience and comfort brought about by the Industrial Revolution, many of us have also lost touch with nature, and, as a result, our generation directly and indirectly contributes to global warming and climate change.

Consequently, Next Now: Planet & Climate is working to rebuild our relationship with the planet towards systemically changing the current patterns of disconnection between humans and nature, recalibrate the social and environmental value chain, and reshape societal processes for environmental sustainability and planetary safety. By 2030, Next Now: Planet & Climate will significantly accelerate the processes through which Ashoka searches, identifies, supports and connects innovators (Ashoka Fellows, young changemakers, social entrepreneurs), by tearing down the siloes within and outside our organization, and by engaging key business partners as a force of planetary good. We will nurture collective impact moonshots and enhance

our role as ecosystem builder, convener and trust broker, bringing together changemakers, visionary corporate actors and business entrepreneurs, young people and their educators, as well as policy makers to make a significant dent on global climate action. We will practice bravery, cathedral thinking and open architecture of change.

As Ashoka recently adopted these global sectoral ambitions, we embraced the partnership with EIT Climate-KIC as highly strategic, as it allowed to pilot our global efforts to test novel ways of identifying changemakers and innovators in the field of climate action, with the ultimate goal of supporting their ambitions and the scale-up of their effective solutions to what we view as humanity's greatest problem today.

2. EIT CLIMATE-KIC CEE AND ASHOKA CEE COOPERATION

In its partnership with the EIT Climate-KIC CEE, Ashoka CEE built on several years of experience in mapping Who's Who in the Social Innovation field in the region, engaging with ecosystem players and supporting the advancement of systems-changing social entrepreneurs. Using this expertise, Ashoka was able to dive in the field of social innovation in the climate sector, with a specific focus on energy efficiency in buildings, climate-smart agriculture, socio-economic transformation in post-coal regions, and air quality.

We looked at nine countries in the CEE region (Poland, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Estonia, Lithuania, Latvia) and mapped Who's Who in the aforementioned fields. For these reasons, we conducted structured interviews and, using snowball sampling, produced nine national maps identifying who are both the social innovators in these countries and fields, and who are their best supporters. The maps are social network maps, showing the connections between individuals, who is working with whom and who is also more isolated vis-à-vis the nucleus of these ecosystems. Throughout the interviews, we also wanted to identify barriers to more social innovation in these fields, what are the stakeholders' needs, and so on.

Bearing in mind the differences in population size between the countries in our samples, but also the relative narrow character of this field, we have planned to surface from the interviews approximately 50 names of social innovators in the smaller countries in the sample (e.g.: Latvia, Lithuania, Estonia), 100 names in the mid-size ones (e.g.: Czech Republic, Hungary, Slovakia, Bulgaria), 200 to 300 in the larger ones (e.g.: Poland, Romania). For each country under scrutiny, Ashoka CEE and EIT Climate-KIC CEE nominated a core number of names of local changemakers/ innovators; in the process of nominating the core we took into account several factors such as a balanced distribution by field and gender, a balanced distribution between the type of the institutions the changemakers/ innovators activate in and also the impact/ notoriety of the nominated persons. From very small nuclei of 5 to 10 changemakers in each of the countries sampled, through snowball sampling and 502 conducted interviews we ended up with 105 nominations in Bulgaria, 87 nominations in the Czech Republic, 50 nominations in Estonia, 99 nominations in Hungary, 48 nominations in Lithuania, 29 nominations in Latvia, 172 nominations in Poland, 147 nominations in Romania and 89 nominations in Slovakia. Thus, all nine ecosystem maps comprise, in total, 826 names of changemakers and other significant ecosystem actors.

We partnered with iZi data, a marketing research agency based in Bucharest. Their goal is making market research easy for both established brands, as well as for entrepreneurs, social entrepreneurs, start-ups and NGOs. iZi data best works with intuitive, DIY, agile and applicable marketing research tools.

Izi Data collaborated with over 15 trained interview operators to run phone interviews with the nominated cores in each country. Overall, the purpose of conducting phone interviews has been not only for the changemakers to nominate other changemakers they admire and/ or collaborate with, based on the snowball sampling philosophy, but also to identify key sociodemographic parameters of the communities we researched and also to identify barriers to more changemaking and more innovation, as well as key opportunities for further development of the four fields of climate innovation.

The interviews were conducted by phone in the period October 20th – December 4th 2019, using an Interview Guidebook (see Annex 11). Following up on the phone interviews, the operators and

research partners sent emails to the interviewed changemakers asking them to approve the use of their personal interview data for the research and follow-up events. Some nominees were only contacted by e-mail to answer questions regarding their field of work, name and type of member organization, as well as their consent for participating in the project.

As a general feature, **the snowball analysis process** built on the existing networks to:

1. Identify leaders who can help better understand the field, and be engaged to drive systemic change in follow up activities

2. Find new leading changemakers through the above cohort i.e. each successive leader nominates successive leaders, and helps zoom in on the highest potential ones

3. Identify clusters and gaps in the network, as well as insights about the field to guide upcoming activities

4 . See the connections and interdependencies among the areas of interest such as energy efficiency in buildings, climate-smart agriculture, socio-economic transformation in post-coal regions, and air pollution.

While performing the sociological snowball sampling-based research, we realized we had to surface more qualitative insights on the state of play of the ecosystems of change under scrutiny, so we decided to contract written briefings from sectoral experts in each of the countries we scrutinized. We used an open call for applications to identify these experts (see Terms of Reference attached in Annex 10), and we leveraged on the vast networks of both Ashoka CEE and EIT Climate-KIC CEE to identify the adequate researchers for the job. These experts were asked to use their personal professional expertise in the fields of interest in order to analyze secondary data and adequate literature.

This qualitative expertise complemented the actual changemakers identification, and offered us a more robust picture of the ecosystems of changemaking and innovation in each of the surveyed countries.

3. ECOSYSTEM AND NETWORK MAPPING APPROACH BASED ON A SNOWBALL SAMPLING METHOD

At the global level, Ashoka has a vast experience in running network analyses. Depending on the specific scope of the mapping, interviewees are also asked questions about their professional experience in the sector and insights on the topic. As a result, we identify trends that help us better understand social innovations in the field.

Snowball mapping is a variation of snowball sampling or chain-referral sampling. It is defined as a non-probability sampling technique in which the samples have traits that are rare to find. This is a sampling technique in which existing subjects provide referrals to recruit samples required for a research study.

TYPES OF SNOWBALL SAMPLING

Linear Snowball Sampling: The formation of a sample group starts with one individual subject providing information about just one other subject and then the chain continues with only one referral from one subject. This pattern is continued until a sufficient number of subjects is reached.

Exponential Non-Discriminative Snowball Sampling: In this type, the first subject is recruited and then he/she provides multiple referrals. Each new referral then provides with more data for referral and so on, until a sufficient number of subjects is reached.

Exponential Discriminative Snowball Sampling: In this technique, each subject gives multiple referrals, however, only one subject is recruited from each referral. The choice of a new subject depends on the nature of the research study.

In the study we used a variation of the Exponential Non-Discriminative Snowball Sampling method by limiting the total number of referrals by interviewee to the most important 3. This approach was chosen in order to focus the network around the most important local actors as well as to streamline the data collection process.

In order to reduce inherent starting point biases, the study started with an initial contact list made out of an equal number of interviewees divided by activity sector as well as gender. When deciding on the size of the initial contact list, the size of the country was also taken into consideration. This resulted in initial lists of various sizes (12 contacts for Romania and Poland, 8 contacts for medium countries like Bulgaria, the Czech Republic, Hungary and Slovakia and 6 contacts for small countries like Estonia, Latvia and Lithuania).

Advantages of Snowball Sampling:

1. It's quicker to find samples: Referrals make it easy and quick to indentify subjects as they come from reliable sources. By outsourcing this task, the researcher has more time to focus on conducting the study.

2. Cost-effective: This method is cost-effective as the referrals are obtained from a primary data source. It is convenient and not so expensive as compared to other methods.

3. Sample hesitant subjects: Some people do not want to come forward and participate in research studies, because they don't want their identity to be exposed.

Snowball sampling helps in the case if they ask for a reference from people who know each other. There are some sections of the target population that are hard to contact. For example, if a researcher intends to understand the difficulties faced by HIV patients, other sampling methods will not be able to provide these sensitive samples. In snowball sampling, researchers can closely examine and filter members of a population infected by HIV and conduct their research by talking to them, making them understand the objective of the research and eventually, analyzing the received feedback.

4. THE ROLE OF A RESEARCH PARTNER IN THE MAPPING PROCESS

Ashoka is not a research institute, so we need research partners to conduct certain activities within the projects we undertake. In general, the tasks of our partnering researchers are to:

• Co-design with Ashoka staff the research framework and methodology, including the questionnaires

• Co-train internal and external operators who apply the questionnaire

• Design the interface for coding the answers to the questionnaire (spreadsheet, etc.) to determine "who is connected/ works with whom"

• Data quality assurance

• Designing the maps/ visualizations

• Producing an internal insights report with the main findings of the study (descriptive statistics on the main questions in the questionnaire, conclusions on how the ecosystem works, how the actors are connected, who are the brokers and the mavens, which fields are under-represented in a certain field, or which fields are underrepresented in a certain country etc.)

For the purpose of this study, we launched a semi-closed call for proposals from specialized research companies and academia in the region. We chose to partner with a Romanian company, iziData, based on their field expertise in network mappings and their capacity to conduct large scale interviews.

Chapter 3
Insights of the Network Mapping Analysis
How Does the Network of Climate Innovators in Central and Eastern Europe Look Like? General Trends and Patterns at Regional Level

GENERAL STATE OF PLAY IN THE REGION

Climate and environment occupy lower positions as priorities on the citizens' agenda in Central and Eastern Europe than in Western Europe; however, they are gradually gaining more saliency. Even in coal-dependent countries, for instance, citizens say the share of renewables must be increased (e.g.: Poland, with 94% of the citizens holding this belief). In general, there are few publics in the region that are climate change deniers, with the notable exception of Hungary, where a climate change denial current is currently being nurtured by mainstream politicians.

Research and non-profit groups play the most important role in influencing the public opinion in regards to climate matters. In all the thematic areas we looked at, there is ample climate and sustainability-focused EU funding, despite the general ecosystems' assessment that access to funding is the most important barrier they face when it comes to accelerating climate innovation.

The region is not homogenous when it comes to innovation. Romania and Bulgaria occupy notoriously low places in the European Innovation Scoreboard, followed by the cluster of Visegrad countries (Czech Republic, Poland, Slovakia, Hungary). On the other hand, the Baltics are frontrunners when it comes to overall innovation capacity and R&D spending. This trend, while not filed-specific, obviously permeates the state of play in climate innovation.

According to the hundreds of phone interviews we conducted for this study, the sense of emergency for climate action is felt and seen as an opportunity in the entire region, which leads to a lot of diverse initiatives in the 4 fields analysed in the study. While we tried to identify and scout for changemakers, innovators and leaders in only four fields of action that touch on climate – energy efficiency in buildings, climate-smart agriculture, socio-economic transformation in post-coal regions, and air pollution – one key finding of the Ecosystem and Network Mappings was that a very large portion of changemakers in the region (34,26% of all changemakers identified) work transversally on several of these topics and on other cross-cutting ones (e.g: education, activism, energy business, generalist think-tanks etc.). This presents a great opportunity for identifying synergies and breaking the siloes between different fields in the climate area. On the other hand, this means that many regional changemakers, innovators and leaders do not have precise specializations, but are rather generalists, which could be an obstacle when it comes to rolling out innovations that can serve the key areas we investigated.

Most of the changemakers we identified are work on climate-smart agriculture, with a total of 21,19% of changemakers from the whole regional network being active in this field, followed by energy efficiency in buildings (19,6%) and air quality / air pollution (15,64%). Unfortunately, the least represented subdomain is socio-economic transformation in post-coal regions (9,31%). We identified very few technical or social innovations in post-coal regions throughout CEE.

DEMOGRAPHIC CHARACTERISTICS OF CHANGEMAKERS IN THE REGION

Climate-smart agriculture is also the field where changemakers display, on average, the highest number of years of work experience across the whole region (13,73 years on average of specific work experience), followed by energy efficiency in buildings (13,08 years on average of specific work experience). The "least experienced" field is the one with the least identified changemakers: socio-economic transformation in post-coal regions, with an average of 6,58 years of work experience. The countries with an experience above average are: Czech Republic (16 years), Hungary (15 years) and Slovakia (13 years), while Bulgaria is the least experienced (8 years), followed by the Baltics with only 10 years of experience. Romania and Poland showcase about 11 years of experience in climate innovation. On average, the male changemakers in the region are 43 years old, while women changemakers are about 40. This difference stays the same in all countries, except of Estonia, where men are the younger (34 years old on average).

Regarding the age split by sub-domains, the lowest age average is in socio-economic transformation in post-coal regions (38 years old) and the highest average is in climate-smart agriculture (45 years old). For a breakdown of the average age by the primary activity sector, see Figure 1 below:

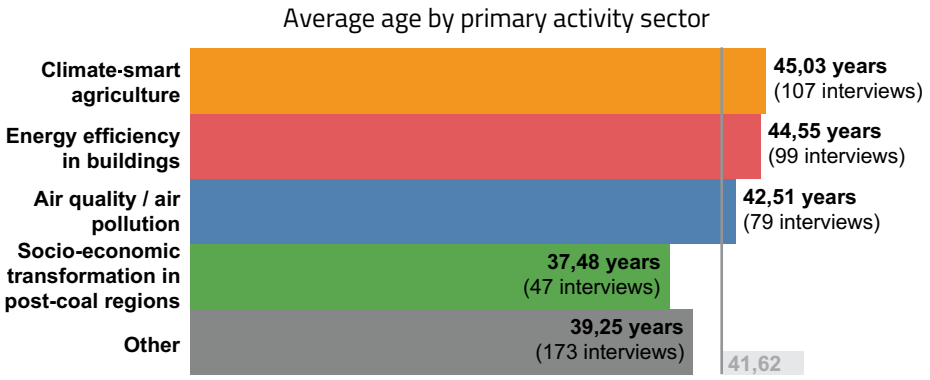


Figure 1

On average, men are better represented in all the sub-fields and countries we examined, with 58% of the total number of changemakers we interviewed being men. The only country where women have a larger share is Latvia, with 62,5% women. Hungary has the most balanced gender distribution (51% men and 49% women), followed closely by Romania (52% men and 48% women). The country with the most unequal gender distribution is Czech Republic, with 75% of the changemakers active in the field of climate action being men and only 26% women. The research showed that men are better represented in the specialized fields (agriculture, air pollution, energy efficiency) – with over 60% of the total number of interviews, compared with the non-specialized fields (coded with "other") – which were better represented by women (57%). In the socio-economic transformation in post-coal regions, the gender balance is higher than in the other fields (57% vs. 43%). See Figure 2 below:

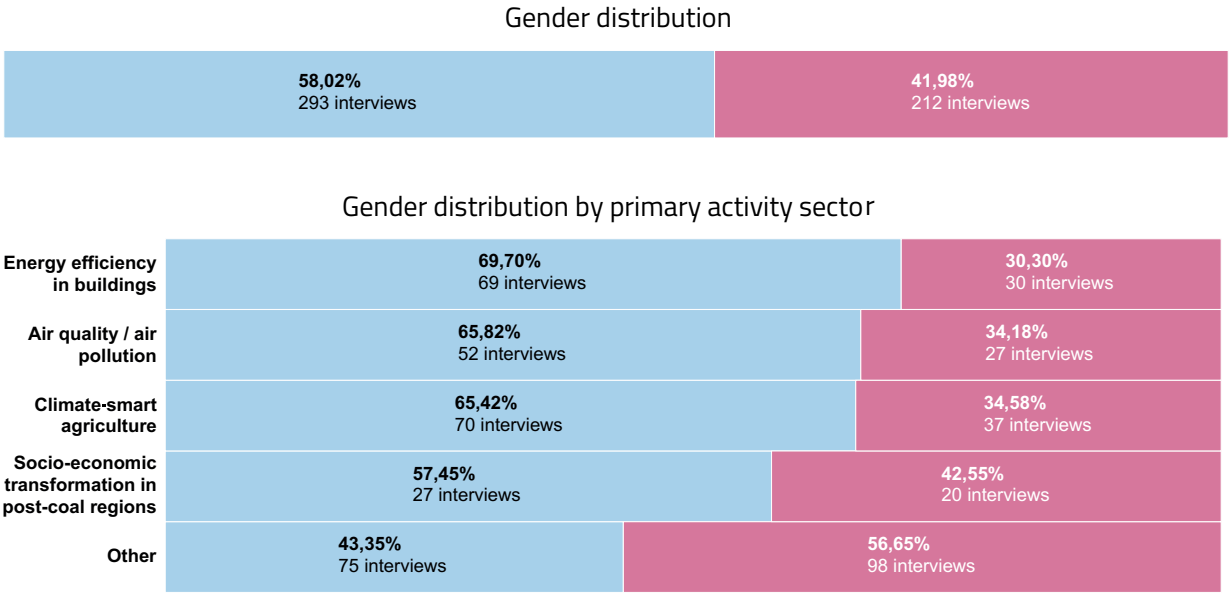


Figure 2

Institutional characteristics of the Changemakers' Networks in the region

As expected, most actors are implementing projects (42%), followed by a share of 34% who are activating in fields related to public education and awareness (such as journalists, educators, researchers).

People working in managing the climate field have a share of 11% of all the changemakers we identified through the interviewing and mapping process. The institutional distribution of the roles of the climates actors remain the same in all subdomains. Most changemakers that act in the financial sector/ funding sector have been identified in the Baltics, while most regulators are based in Slovakia (23%), Poland (18%) and Latvia (16%). Hungary, Bulgaria and Romania are the countries where network members identified the fewest policymakers as part of the network. Not surprisingly, the qualitative experts' assessment also believe policy-making is weakest in these countries. See Figure 3 for a distribution of the changemakers by their type of role in the ecosystem.

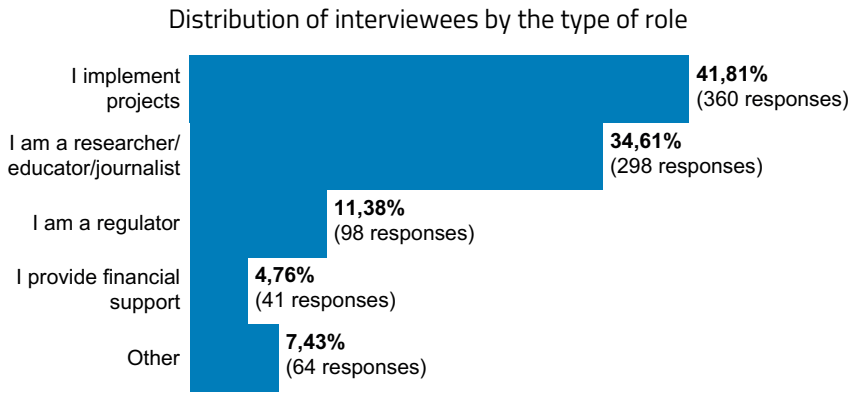


Figure 3

The NGO sector it the most represented as an institutional spaceholder for climate innovators in the region, with 47% of all changemakers in the region activating in NGOs, followed by public sector representatives (21%) and private sector representatives (19%). NGOs dominate the legal status in all sub-domains, while the private sector comes second in all sub-domains except for air pollution – where the public sector is better represented.

The public sector (with a regional average of 21%) is better represented in Baltic countries and least represented in Bulgaria (14%). NGOs are the least represented in Lithuania, with only 30% compared with the regional average of 47%;

Access to funding and legislation are seen as the most important barriers to further scaling social and environmental impact in the region. Access to funding is mentioned on average by 25% of the respondents, while 24% of the respondents mentioning legislation. Workforce and access to professional know-how are seen as a barrier by 15% of the respondents, while infrastructure by only 10% of them. The top 2 barriers stay the same in all sub-domains.

The most important opportunity identified by the respondents is the sense of urgency on climate action (22%), followed by positive changes on policy-level (also mentioned as an important barrier) and strong communities to work with (both with 17%). The least mentioned opportunity is access to funding – mentioned by only 13% of the respondents (also seen as the most important barrier). For further details see Figure 4 below.

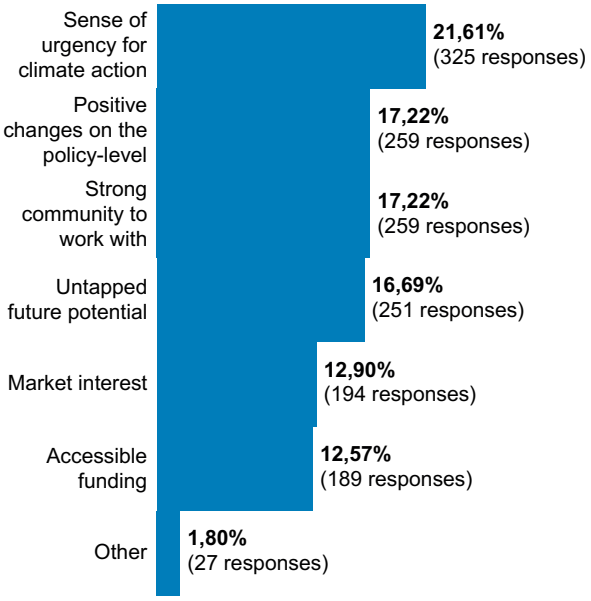


Figure 4
Distribution of interviewees by the opportunities for climate innovation they see in the region

We talked with the changemakers we mapped about the funding opportunities they see for their work. The most mentioned funding opportunity is funding from EU (26%), especially in the Baltics (40%/37%/36%). Corporate private sector funding is seen as an opportunity by 15% of the respondents, close to the funding from local government grants (14%). Individual donors are mentioned on average by 13% of the respondents. On regional average, NGO grants are mentioned by 13% of the respondents. In Bulgaria local government grants are the least mentioned funding opportunity (4%) – similar with crowdfunding (4%); the individual donors stands out in Bulgaria with 24% of the mentions – the same as EU funding (24%). In Poland, NGO grants seem to be seen by more respondents as a funding opportunity (19%), followed by EU funding with 18% and individual donors with 17%.

You may see all maps we built, in each of the countries analyzed, in the Final Annexes of this report. Below, we present some general descriptions of all the 9 networks:

Average degree: Connectivity of the network is the average degree: number of nominations / numbers of unique contacts (1.21);

Slovakia (1.483) and **Romania** (1.33) have the most interconnected people on the map;
Latvia (1) and **Czech Republic** have the least interconnected people on the map;

Weighted degree: The power of the connections between people is the average weighted degree. The weighs were allocated as follows: 4 points for working together, 3 points for interacting regularly, 2 points for interacting occasionally and 1 point for "I heard of him" (the regional average is 3.865)

Romania has the strongest relationships between the people on the map (4.761) followed by **Slovakia** (4.719);
The least powerful connections are in **Latvia** (2.68);

Diameter: the distance between the two furthest points on the map; calculated the greatest number of steps between the furthest points on the map (regional average it's 10.2)

Poland has the widest network with a diameter of 20, followed by Romania with a diameter of 15;
The Baltics are the smallest networks in terms of diameter (4-6 steps between furthest points on the map);

An overview comparison between those countries taking into account the average number of nominations provided by each individual shows that Slovakia nominated the highest number of people (2.44) followed by Estonia and Bulgaria (2.37). The bottom top is Latvia and Lithuania with 1.25 and 1.64. Overall, medium-sized countries have the greatest number of nominations / interviews, while the small countries tend to have the least number of nominations / interviews. Another way to examine the networks we analyzed is the average weighted degree: the power of the relationship (strongest being "working together," interacting constantly, interacting occasionally and the weakest being "I've heard of him/her"). The research showed that the most powerful relationships are in Romania and Slovakia, followed by Poland, Bulgaria and Estonia. The least powerful relationships are in Latvia and Lithuania, where it seems that people have weaker work connections. We also looked a the so-called "average degree": how connected is the network, how often the members of the network repeat when counting nominations (total number of nominations / unique nominations). The most connected network is Slovakia, followed by Romania and Estonia (the members of the network repeat more often). The least connected network is Latvia, followed by the Czech Republic.

Country by country general conclusions

In Bulgaria we can see a great focus in the air pollution field, followed by climate-smart agriculture. The average work experience in Climate Innovation is of only 8.19 years, noticeably lower than the region average of 11.58, making Bulgaria the least experienced country in climate innovation in CEE. Even if climate innovation is a new domain in Bulgaria, the cluster of changemakers seems to be very united and focused, as one of the biggest opportunities in the country is considered to be the entire network of changemakers. Even if the majority of changemakers are from the public sector, access to EU funding is considered a big barrier (29.31% compared to 24.69% in the region).

Bulgaria displays an interesting and diverse mix of private actors (consulting companies, NGOs) mainstreaming climate-smart agriculture in Bulgaria (e.g.: Greenpeace Bulgaria, Ecological Farming Unit, AgroHub.BG, Cleantech Bulgaria), in contrast to other countries, where the number of actors and the amplitude of their intervention is considerably lower. In Bulgaria, where both citizens and local authorities have been more involved, there is also high awareness on the consequences of air pollution.

General description of the network in Bulgaria

After conducting 54 telephone interviews in Bulgaria, we identified 105 unique nominations from 128 total nominations (mentioned names).

• Average number of nominations provided by each individual: Bulgaria has 2.37 nomination on average (on the third place after Slovakia 2.44 and Estonia 2.38);

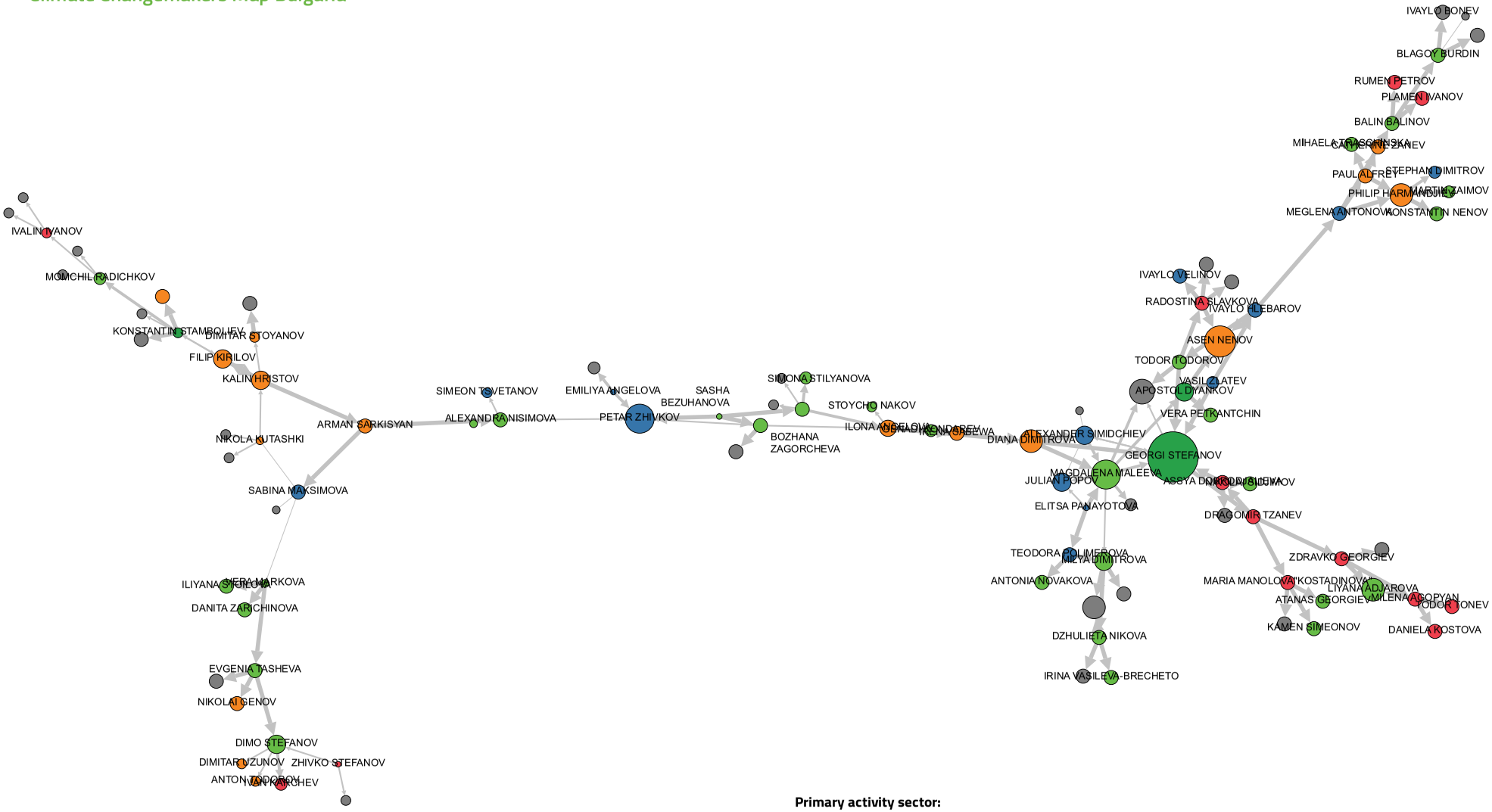
• Average degree: Bulgaria is averagely connected in terms of network connectivity. In comparison, Slovakia is the most connected (nominations repeat most often), while the Czech Republic is the least connected (nominations repeat least);

• Average weighted degree: Bulgaria is in the upper half of this indicator which measures the power of relationships between the network's members, showing if they have consolidated working relationships, working or constantly interacting with each other;

• Subdomains interconnectivity: in Bulgaria, the interconnectivity of the subdomains differs from one domain to the other. Thus, in air pollution and in socio-economic transformation in post-coal regions, Bulgaria has significantly over the average scores, while in climate-smart agriculture and in energy efficiency in buildings, Bulgaria is under the regional average. We can interpret the data as such: agriculture and energy efficiency are more "close networks" – people recommend each other more often.

• Subgroups: In Bulgaria, there is one single network, no subgroups have been formed, meaning that actors are connected in a single cluster;

Climate Changemakers Map Bulgaria



The study shows that Romania is similar to Bulgaria when it comes to the distribution of changemakers: most changemakers are distributed equally among the four fields, but a high percentage of the interviewees activates in the 5th transversal field, which integrates education, climate activism, policies and so on.

The work experience in climate innovation is still lower than the regional average. The field which displays the highest level of experience is Climate-smart agriculture (17y), which is a lot higher than the regional average (13.73y). Most experienced changemakers activate in the public field with almost 22y experience (compared to 16.49y in the region). Even if the most experienced changemakers are from the public field, the current legislation & access to funding are seen as the highest barriers.

General description of the network in Romania

In Romania, 105 telephone interviews were made, which led to 147 unique nominations and 189 total nominations (mentioned names);

• Average number of nominations provided by each individual: 1.8 nominations on average (on the fifth place, while on top is Slovakia with 2,44 and at the bottom is Latvia with 1.25);

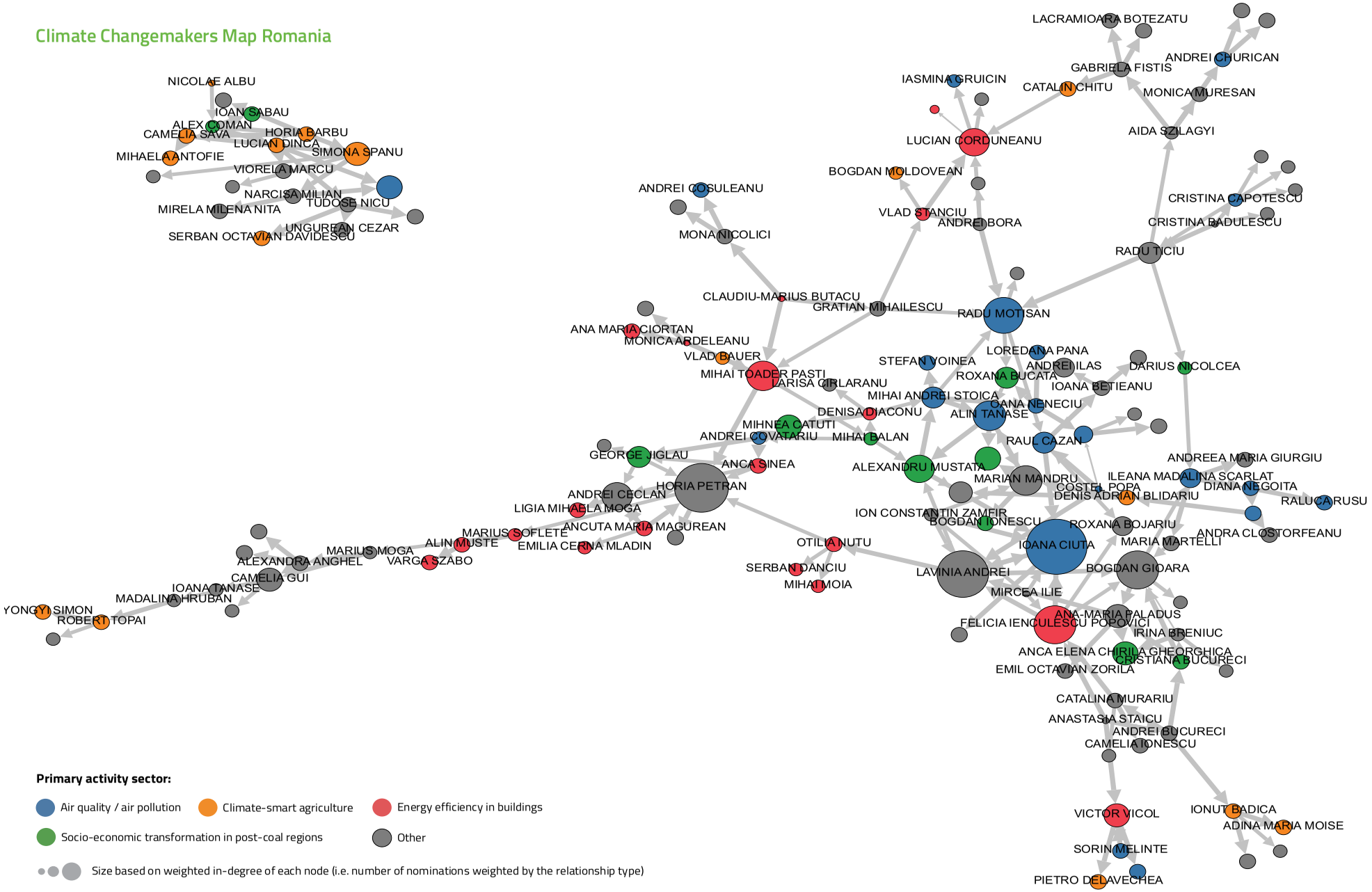
• Average degree and diameter: Compared with Poland, where we had the same number of interviews (105), Romania is a more "closed" / congested network, meaning people know each other better and the network diameter is shorter than in Poland (distance between the furthest points on the map); however, Romania has a smaller network compared with Poland, with a total number of 147 nominations vs. 172 members in Poland;

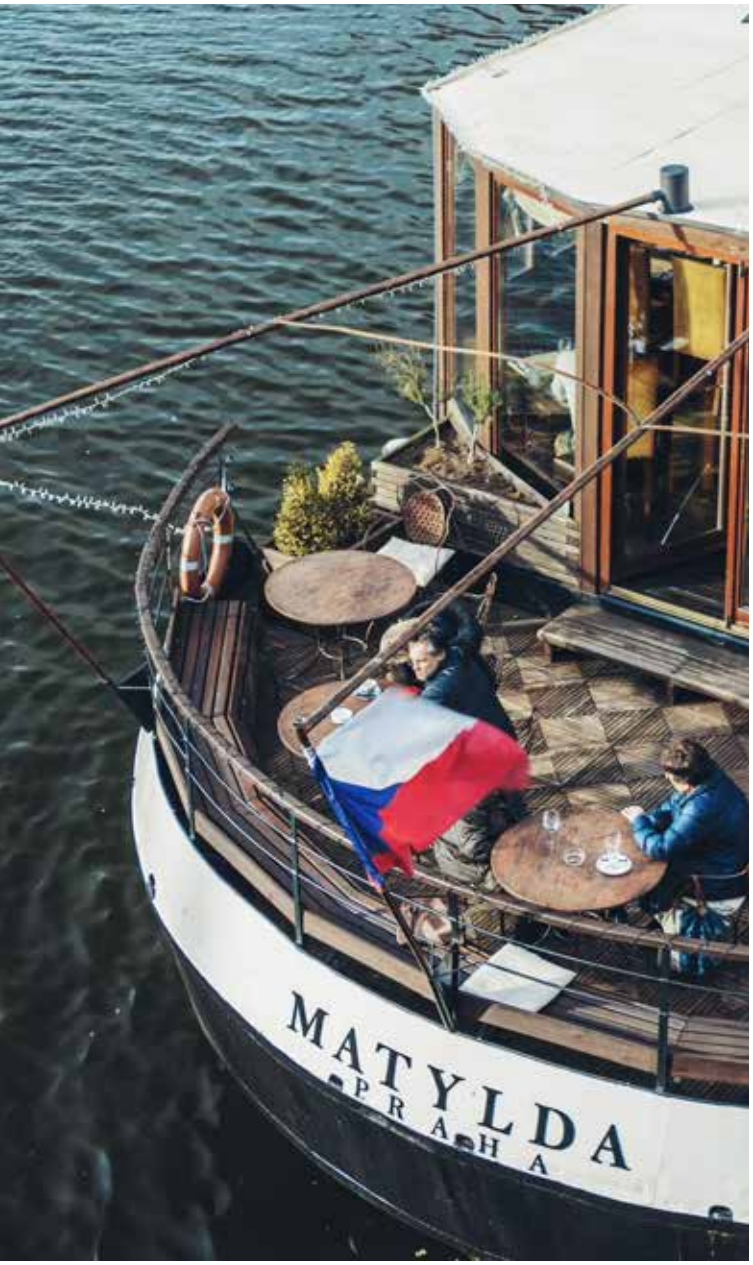
• Average weighted degree: Romania has the strongest type of relationships between the members of the network, with 4.761 (compared with Poland that has 4.175 - and the weakest which is Latvia at 2.679); this indicator shows healthy and strong work relations, and that members frequently work together and interact with each other;

• Subdomains interconnectivity: in Romania, the subdomains are over the average interconnected, meaning people are recommending other actors from different domains. Except for air pollution – slightly under the regional average;

• Subgroups: In Romania, one small sub-network (18 individuals) can be noted, meaning there is no connection between the main network and this subnetwork, except Ashoka Romania (who made the initial nominations)

Climate Changemakers Map Romania





The Czech Republic is the country with most years of experience (15y) compared to the regional average (12y). Because the Czech Republic has such a long experience in the climate innovation field, access to professional know-how is seen as the highest opportunity in the country and is strongly backed up by the sense of emergency for climate action and positive changes in legislation which are also regarded as high opportunities.

In the air quality field, changemakers from the Czech Republic have most years of experience (22.6y) compared to the regional average (12.26). These years of experience are clearly backed up by a lot of innovative projects that the country implemented, such as CLAIRO in Ostrava, Dustee and World from Space.

The second most experienced field in Czech Republic is represented by energy efficiency in buildings with 18.5y compared to the regional average of 12.08y: a quarter of single-family houses and 55% of apartment buildings underwent renovations. Under these circumstances, the Czech Republic has imposed that all new buildings will have to meet the near-zero energy efficiency as of 2020, translated in practice through heating consumption in the range of 30-70 kWh/ m2/ year.

General description of the network in the Czech Republic

In the Czech Republic, 55 telephone interviews were made, which led to 87 unique nominations and 91 total nominations (mentioned names);

• Average number of nominations provided by each individual: the Czech Republic has 1,7 nomination on average (in the middle, with Slovakia 2.44 and Estonia 2.38 having the highest number);

• Average degree: the Czech Republic is the second least connected country (slightly above Latvia, the least connected), which means that the nominations rarely repeated. Correlated with the average weighted degree (power and type of the relationships), which obtained a medium score and also with the high number of subnetworks (4 sub-networks) – indicates a fragmented map for this country.

• Subdomains interconnectivity: in the Czech Republic, the interconnectivity of the subdomains is quite low, meaning people are nominating inside the sub-domain they activate in. Except for socio-economic transformation, where the Czech Republic is significantly over the regional average – people from this field know and nominate people from all sub-domains. We can interpret the data in the Czech Republic as having quite specialized actors interlocked within their field of activity, however a strongly connected community of socio-economical "transformers";

• Subgroups: The Czech Republic has the highest number of subnetworks, four, which means that the four clusters are not communicating with one another – or at least not enough to be visible on the map;

Climate Changemakers Map Czech-Republic

Poland has a very interesting mix of changemakers, with the majority being active in a 5th transversal field that incapsulates education, activism, etc. From the 4 fields of the study, Poland is most experienced in the field of energy efficiency in buildings (14.62y) compared to the region (13.08y). Even so, in Poland the situation is direr than the regional average, with over half of the building stock exceeding 50 years of age.

In Poland, the population is in climate denial to some extent, although declaratively they support the diversification of energy sources and the reduction of energy consumption. At the same time, the quantitative study has identified the sense of urgency for climate action as the highest opportunity in the country.

Bulgaria and Poland are most innovative when it comes to citizen participation in air quality monitoring (Polish schools are actively involved in this movement). At the same time, while in Bulgaria citizens' interest on this topic is increasing and expecting to shape the political arena, in Poland, despite the fact that the country is worst hit by air pollution (with detrimental health consequences), one out of three Poles do not see the issue as relevant.

General description of the network in Poland

In Poland, 105 telephone interviews were made, which led to 172 unique nominations and 199 total nominations (mentioned names);

• Average number of nominations provided by each individual: on average, people made 1.8 nomination – placing Poland in the middle (with Slovakia having the highest number of nomination 2.44 and Latvia the lowest 1.25);

• Average Degree and diameter: Compared to Romania, where we had the same number of interviews (105), Poland has a wider network, meaning that people know each other less, the diameter is wider, and the distance between the furthest points on the map is longer;

• In Poland, 105 telephone interviews were made, which led to 172 unique nominations and 199 total nominations (mentioned names);

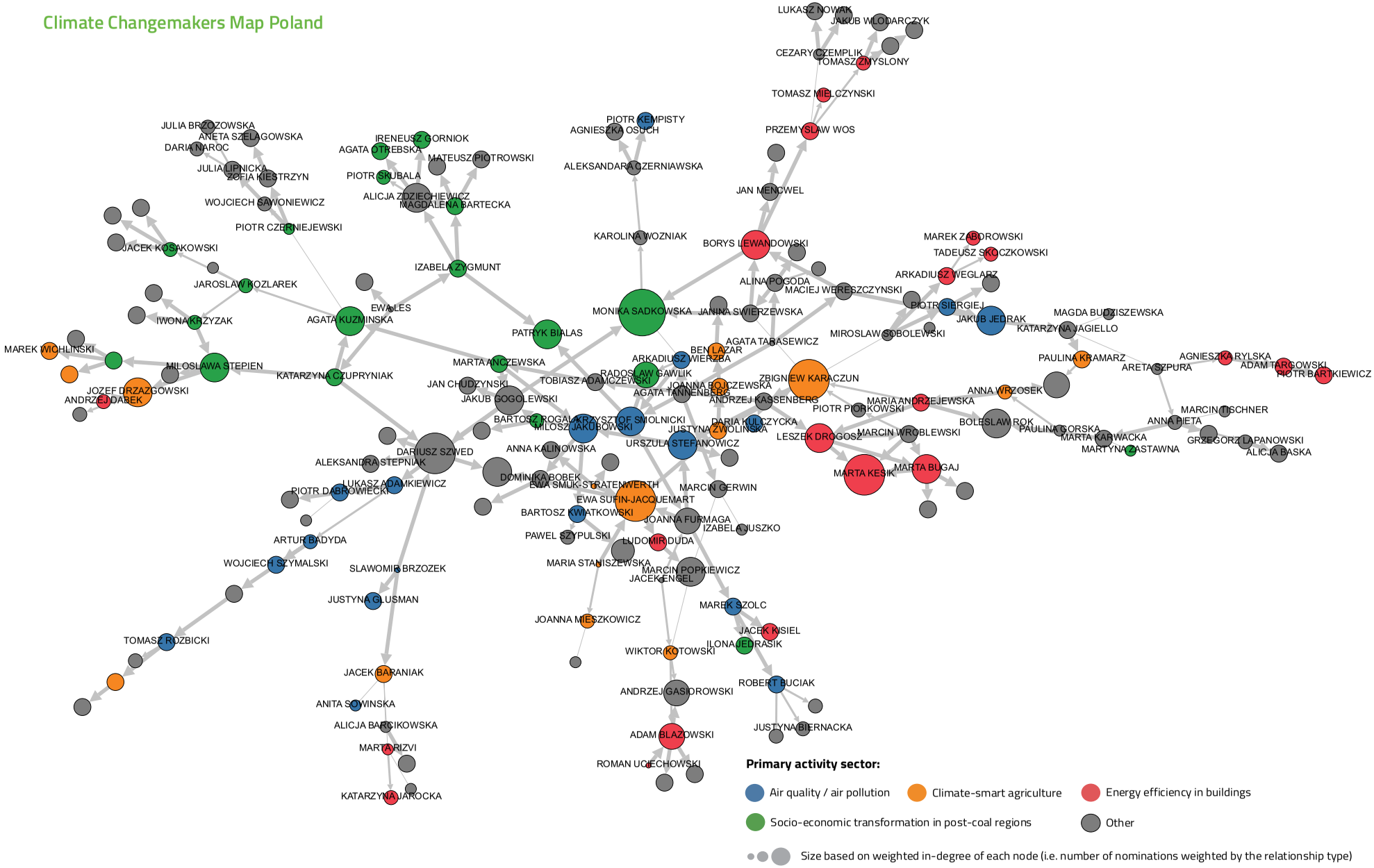
• Average number of nominations provided by each individual: on average, people made 1.8 nomination – placing Poland in the middle (with Slovakia having the highest number of nomination 2.44 and Latvia the lowest 1.25);

• Average weighted degree: Poland is the third country when it comes to "the power" of the relationships, after Romania after Romania, at 4.17;

• Subdomains interconnectivity: in Poland, the subdomains are less interconnected than in Romania, with an under the regional average, meaning people are recommending more actors from the same domains – compared with the average. Except for climate-smart agriculture and socio-economic transformation in post-coal regions – which are slightly above the regional average;

• Subgroups: In Poland, there is one single network, no subgroups had been formed, meaning that actors are connected in a single cluster;

Climate Changemakers Map Poland



Latvia is the least experienced country from the region in climate innovation, with only 5.67y compared to the regional average. This leads to a lack of changemakers, with most of interviewees being active in other transversal fields, not in the 4 fields analysed in the study. The most active field is climate-smart agriculture with more than 20y of experience, which makes the country to rank a lot higher than the regional average of 13.73y. Even so, Latvia has a reduced number of institutions working in the innovation field, and research activity is still slow due to low investment in R&D.

In Lithuania, most of the changemakers activate in energy efficiency, which makes the country the leader in innovation in this field, with innovations such as "The Green Office", constructed by Eika in Lithuania, which encourages the rational use of energy in companies. Even though Lithuania has less than 10 years experience in climate innovation, it has highest share of specialists (37%), out of which more than 55.26% implement projects. Also, the country is the most affected by drought, which makes climate emergency to be seen as the highest opportunity by most of interviewes from the study (23.08%). Lithuania is among the leaders in the development of renewable energy in the EU: together with Denmark, Estonia, Spain and Portugal, it is among the five most ambitious countries in the EU when it comes to renewable energy targets for 2030.

Like in Latvia, most Estonian changemakers are active in other fields, not in the 4 analyzed in the study. From the main fields, the most experienced one is represented by changemakers acting in the "socio-economic transformation in post-coal regions" (23.08%). This finding emphasise the fact that in Estonia solar energy is booming and is expected to intensify after 2020 due to the requirements for nearly zero-energy buildings.

Even if most of the changemakers are in the post-coal field, the air quality field has 17.67y of experience, which makes the country rank a lot higher than the regions' average. Because of this, Estonia displays an abundance of government-owned and privately-owned sensors that are monitoring air quality both in urban and in rural areas.

General description of the network in the Baltics

In Estonia and Lithuania 26 interviews were made, and in Latvia only 24 interviews, which let to:

- 50 unique nominations and 62 total nominations (mentioned names) in Estonia;
- 48 unique nominations and 50 total nominations (mentioned names) in Lithuania;
- 29 unique nominations and 30 total nominations (mentioned names) in Latvia;

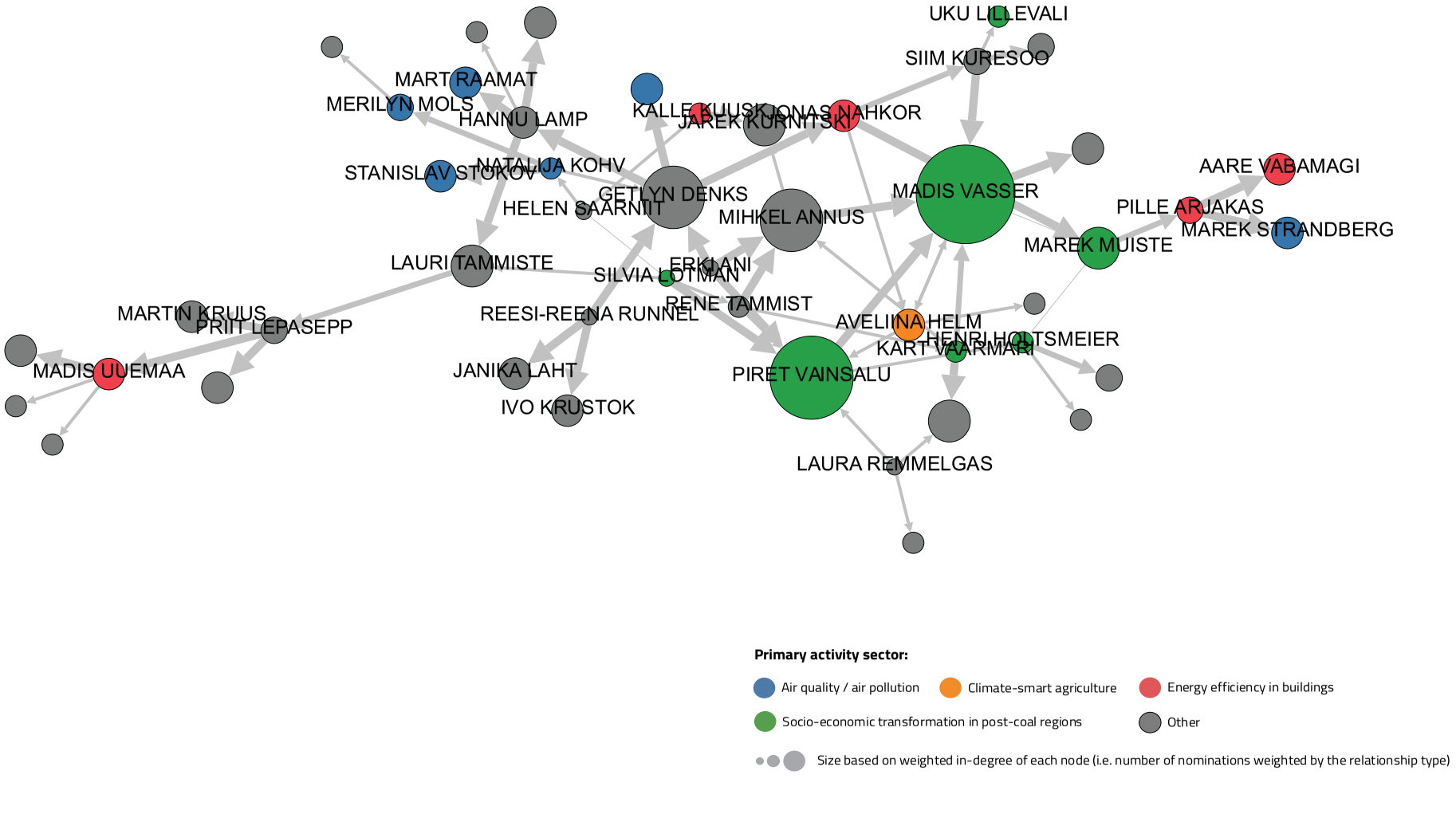
• Average number of nominations provided by each individual: in terms of average number of nominations made by each Baltic country, Estonia (2.38) has a significantly higher number of nominations, compared to Lithuania (1.64), Latvia (1.25); the regional average is of 1.95;

• Average degree: Estonia is more experienced than the average, while Lithuania is below the average and Latvia is the least connected country (EE is 1.292, LT is 1.136 and LV is 1.036 versus 1.21, the regional average);

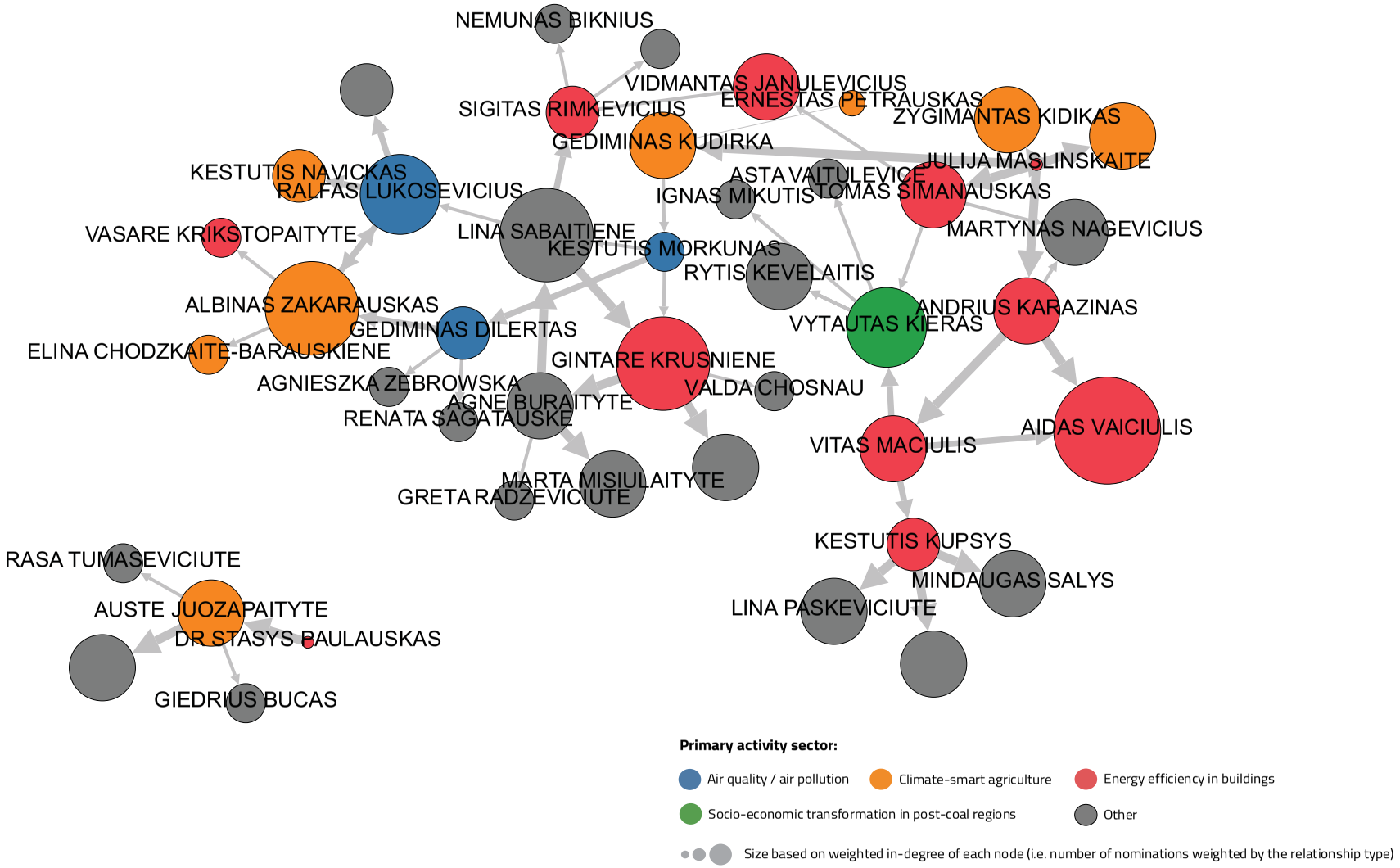
• Average weighted degree: Estonia is slightly below the regional average in terms of the power of the relationships between members, while Lithuania and Latvia are the last two countries in terms of "relationships power" – showing that the people in the network do not know each other so well;

• Subdomains interconnectivity: the interconnectivity of the subdomains in the Baltics cannot be accurately interpreted because of the small number of nominations per domain; however, having a casual look over the data we can see that the domains are less interconnected compared to the medium and large countries;

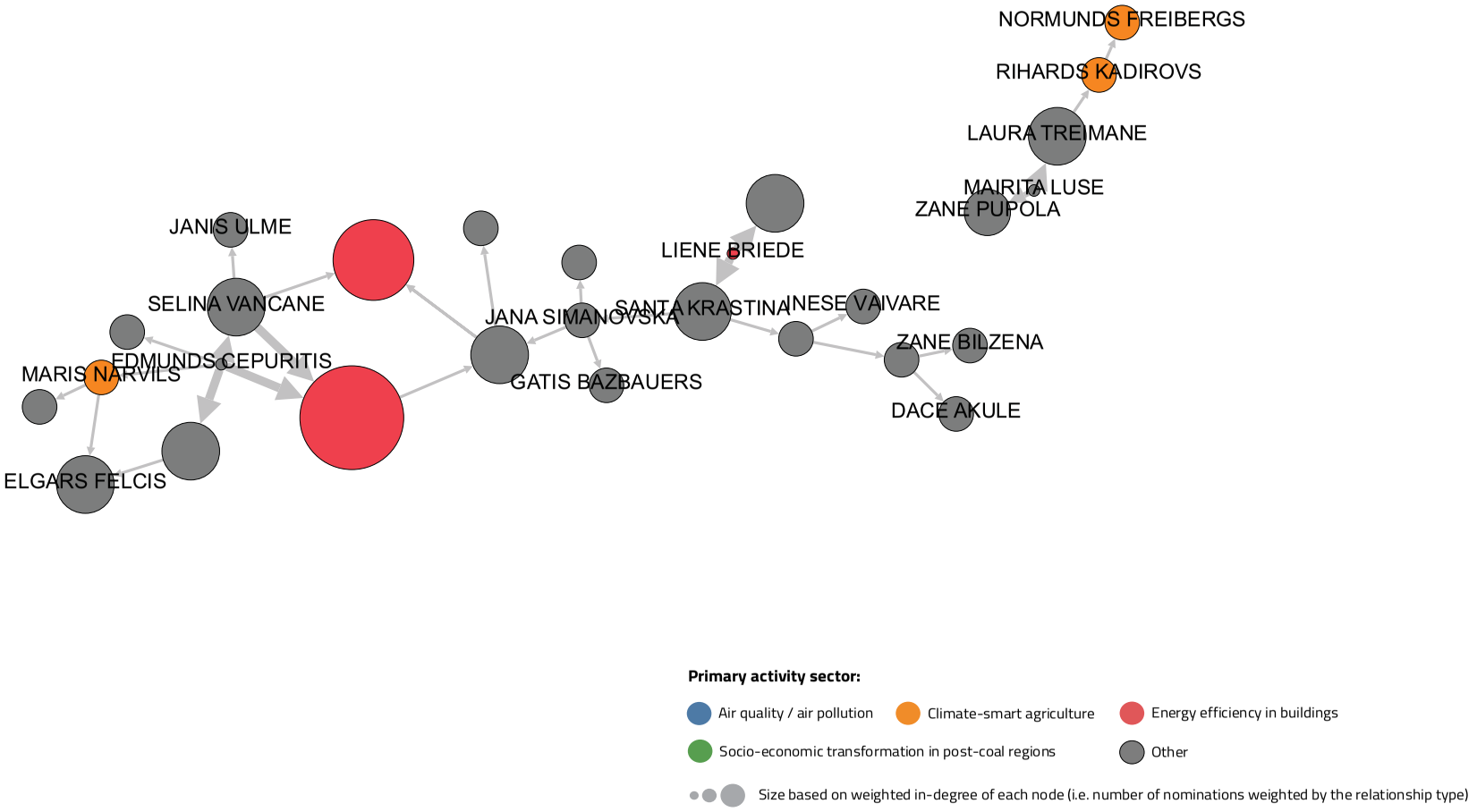
• Subgroups: Estonia has a single network, while Lithuania and Latvia form two clusters;


UKU LILLEVALI
SIIM KURESOO
MART RAAMAT
MERILYN MOLS
HANNU LAMP
KALLE KUUSKJONAS
JAREK KURNITSKI
NAHKOR
STANISLAV STOKOV
NATALIJA KOHV
GETLYN DENKS
HELEN SAARNIIT
MIHKEL ANNUS
MADIS VASSER
AARE VABAMAGI
PILLE ARJAKAS
MAREK STRANDBERG
MAREK MUISTE
LAURI TAMMISTE
SILVIA LOTMAN
ERKJANI
RENE TAMMIST
MARTIN KRUUS
PRIIT LEPASEPP
REESI-REENA RUNNEL
AVELIINA HELM
HENRI HOLTSMEIER
KART VAARMARI
MADIS UUEMAA
JANIKA LAHT
PIRET VAINSALU
IVO KRUSTOK
LAURA REMMELGAS
Primary activity sector:
Air quality / air pollution
Climate-smart agriculture
Energy efficiency in buildings
Socio-economic transformation in post-coal regions
Other
Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)

Climate Changemakers Map Lithuania



Climate Changemakers Map Latvia



In Hungary, most of the changemakers are active in the energy efficiency field with an average of 18.82y of activity. A very interesting fact is that the general population is also rather skeptical when it comes to energy efficiency measures and 90% of Hungarians believe that such investments are the state's responsibility and not the responsibility of private owners. However, over 15 innovative initiatives, all of them private, are active in the market. Hungary is the second most experienced country in the region in climate innovation, which is highlighted by the fact that the strongest opportunity seen by the intervieews is the highly skilled network of changemakers.

General description of the network in Hungary

• In Hungary, 53 telephone interviews were made, which led to 99 unique nominations and 113 total nominations (mentioned names);

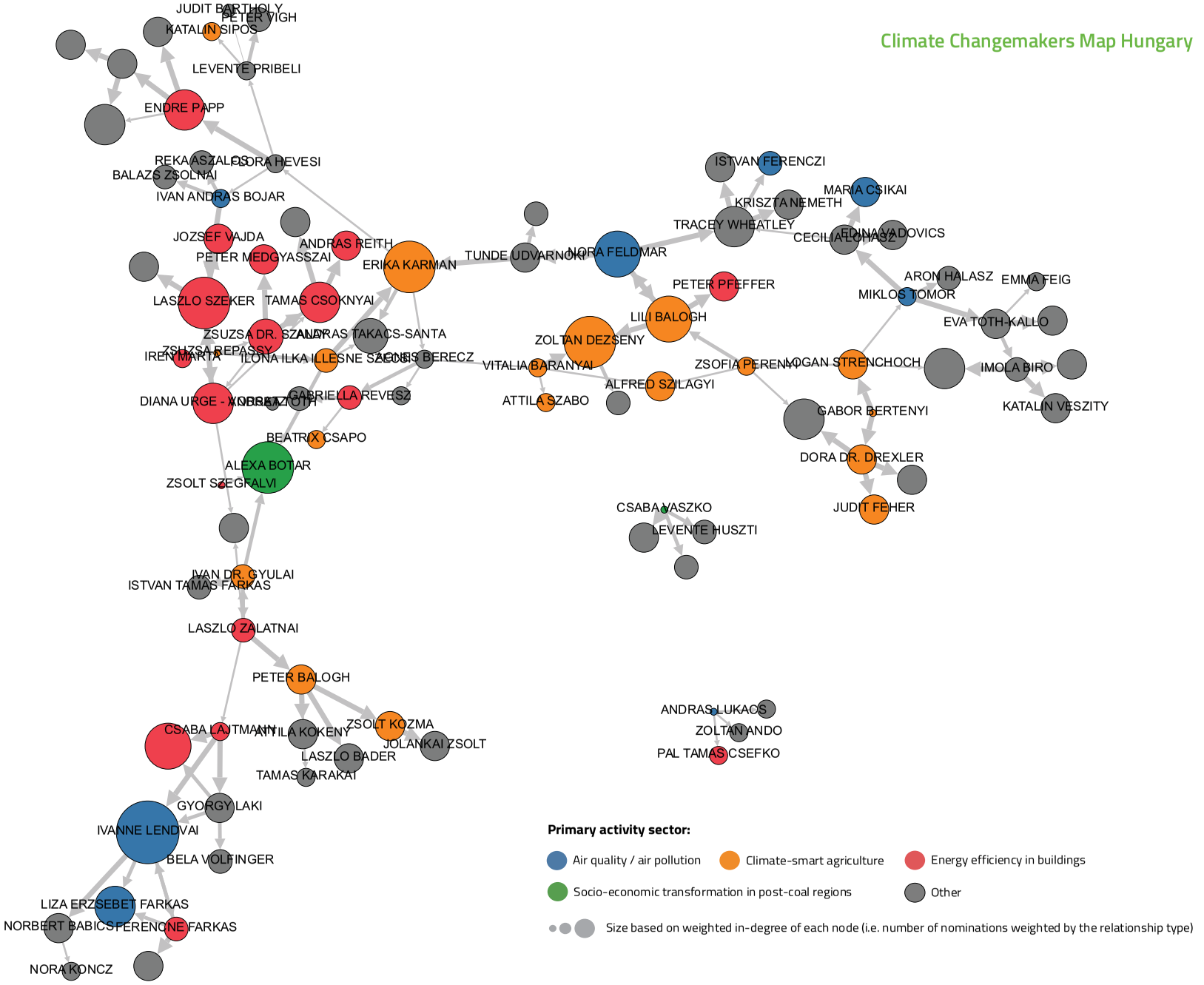
• Average number of nominations provided by each individual: Hungary has an over the average number of nominations 2.13;

• Average degree: Hungary is averagely connected compared with the regional average (HU is 1.177 vs. 1.21 regional average); In terms of the power and type of the relationships (average weighted degree) – Hungary is also near the regional average. People are averagely connected with each other. The Hungarian network looks balanced;

• Subdomains interconnectivity: the interconnectivity of the subdomains differs from one domain to the other. Thus, in air quality / air pollution and in climate-smart agriculture, Hungary has signifyingly over the average scores, while the actors in energy efficiency in buildings and socio-economic transformation in post-coal regions tend to recommend people from the same field;

• Subgroups: In Hungary, three subnetworks had formed, the second most fragmented network. However, two of the subnetworks in Hungary are smaller than in the Czech Republic - where the 4 subnetworks have similar sizes;

Climate Changemakers Map Hungary



In Slovakia, climate-smart agriculture is the leading field with 38% of changemakers active, followed by air pollution with only 13% of changemakers active. The country is the 3rd most experienced country in climate innovation after Czech Republic and Hungary. Compared to other countries from the region where access to EU funds is seen as the highest barrier, in Slovakia the highest barrier is represented by the legislative ground, especially in the field of energy efficiency. Even though the current legislation seems to be seen as a barrier, the opportunity that ranked 2nd is the positive change at policy-level.

General description of the network in Slovakia

In Slovakia, 54 telephone interviews were made, which led to 89 unique nominations and 132 total nominations (mentioned names);

- Average number of nominations provided by each individual: Slovakia has the highest number of nominations made by each individual, 2.44; compared with the regional average of 1.95;

- Average weighed degree: Slovakia is second most connected network, after Romania, in term of the power of the members' relationships; The indicator shows that they have strong working relationships, constantly interacting with each other;

- Subdomains interconnectivity: the interconnectivity of the subdomains in Slovakia is significantly higher than the average, the highest out of all on three of the four subdomains. Only the socio-economic transformation group is less connected in Slovakia;

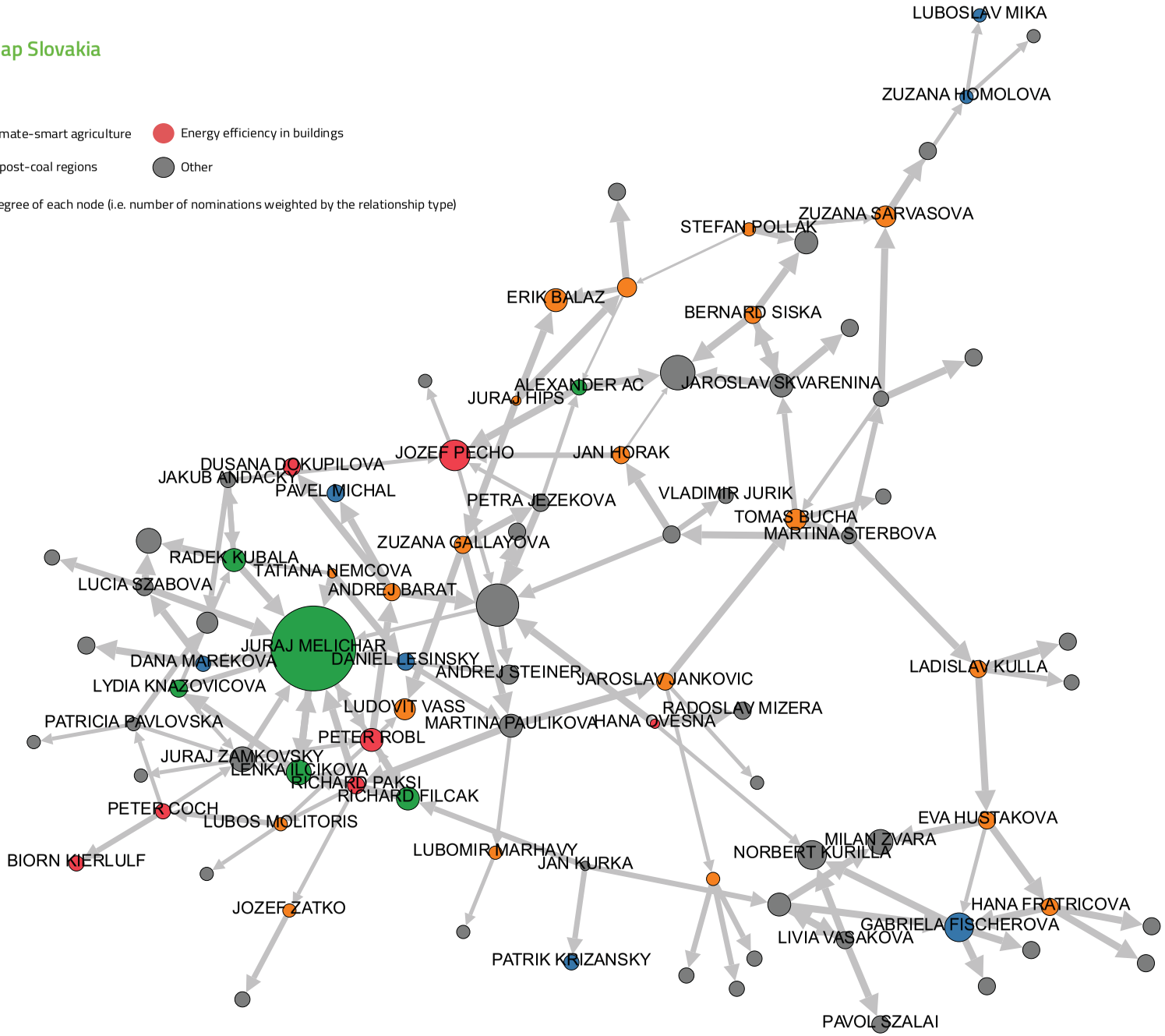
- Subgroups: In Slovakia, there is one single network, no subgroups had been formed, meaning the actors are connected in a single cluster;

Climate Changemakers Map Slovakia

Primary activity sector:

- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)



Chapter 4

Main Findings in the Four Sub-Areas Under Consideration

1. Energy efficiency in buildings

GENERAL CONTEXT

Most CEE countries lag behind the EU average in terms of residential energy efficiency, with the notable exception of some Baltic States. The residential sector accounts for a large part of each country's energy consumption, approximately a third of it. While all the countries have national strategies for energy efficiency, they are generally not properly implemented and monitored, despite the fact that various funding bodies such as European institutions or other international organizations support CEE countries with numerous funding and innovation schemes to achieve higher efficiency in buildings.

When analyzing the overall picture in the sector of Energy Efficiency in Buildings in CEE we observe that most countries have a very old infrastructure which leads to significant energy losses and high greenhouse gas emissions. We can observe that most of the buildings are between 30-40 years old in all countries (in Poland the situation is even more dire than the regional average, with over half of the building stock exceeding 50 years of age). Even though in all countries there are initiatives to insulate and make the buildings more energy efficient, the pace is quite slow, and it would take more than 30 years to fully refurbish all buildings. Statistics might be skewed, in some countries, by the high percentage of uninhabited building stock (e.g.: up to 20% of houses in Bulgaria). Demographic decline and the resulting decline in the heated living space in some countries in the region (e.g.: Bulgaria, Romania) have been responsible for the reduction of greenhouse gas emissions, and not good policy making or good governance.

The outlier in terms of the percentage of building retrofits achieved is Latvia, with almost a quarter of the residential building stock refurbished. In addition to focusing on existing buildings, in all countries there is a focus on the necessity to limit the energy consumption in newly constructed buildings, especially thermal energy, primarily through building norms and regulations. The Czech Republic also displays good scores when it comes to the percentage of the building stock that underwent renovations (a quarter of single-family houses and 55% of apartment buildings). In contrast, contrary to the general progressive state of the Baltic region, very few residential buildings have been renovated to date in Lithuania. Buildings with low energy demands are becoming cheaper (but statistics might be skewed due to the fact that, in some countries, the zero emissions building movement has been subsidized in recent years – e.g.: Slovakia) while providing high living comfort and contributing not only to the implementation of environmental policy, but also to reducing low emissions. Unfortunately, everywhere in the region there is a shortage of specialists who can design and construct buildings to such standards. The construction of nearly zero-energy buildings requires improved awareness and the development of skills of both customers, project designers, consultants and everyone else participating in the construction process.

The mapping exercise revealed that the highest share of specialists working in energy efficiency in buildings can be found in Lithuania, followed by Hungary and the Czech Republic. Also, in this field, the majority of changemakers works in project implementation, followed by researchers and journalists (Figure 5 & 6).

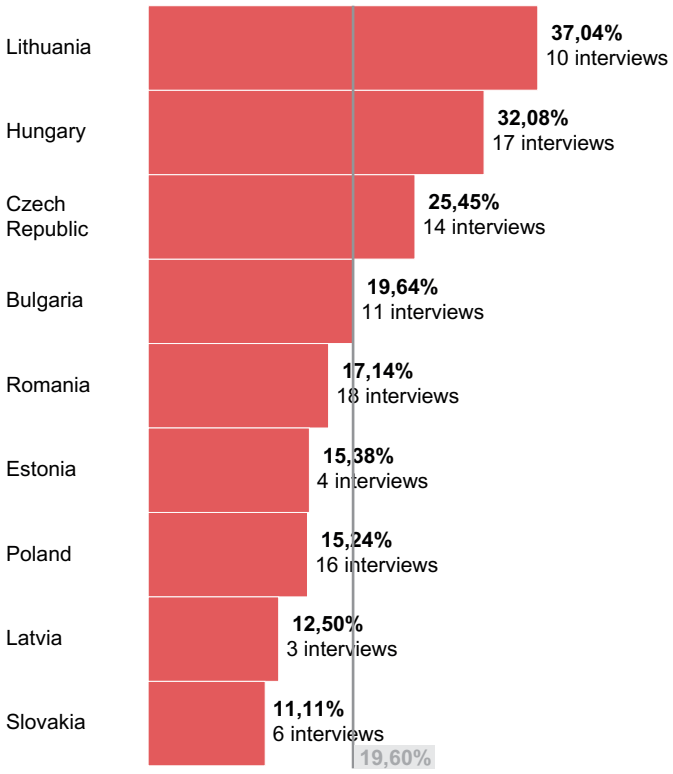


Figure 5
Energy efficiency in buildings: Distribution by country

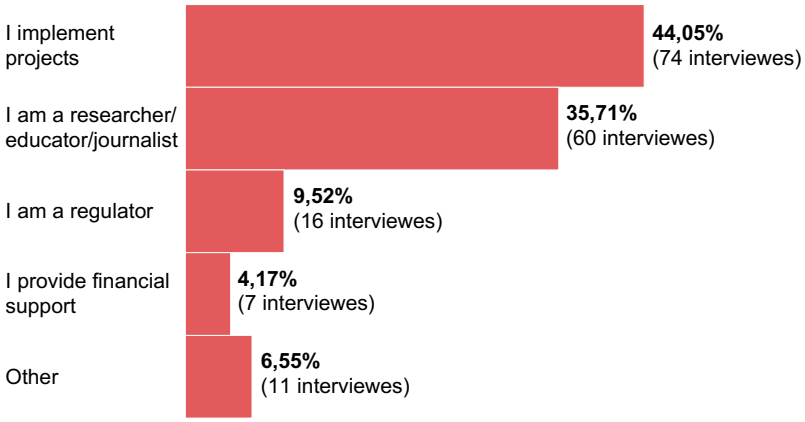


Figure 6
Energy efficiency in buildings: Distribution by role of actors in the ecosystem

This sector is the most male-dominated – close to 70% of changemakers in the region are men, while only 30% are women. The highest male domination is in the Czech Repulic, where 92% of the changemakers in this field are men and only 8% are women, while the most gender balanced pictures can be encountered in Romania (50% men, 50% women) and in Latvia (67% women, 33% men – with the caveat of Latvia's small sample size in this particular field).

The sector is also among the more senior ones in terms of demographics: the average age of all the changemakers we interviewed is 44,5 years old, while the average for all the fields we examined, including the transversal one, is 41,5 years old. The "youngest" countries in terms of the changemakers active in this field are Latvia, Estonia and Romania, while the "most senior" ones are Czech Republic and Hungary (Figure 7).

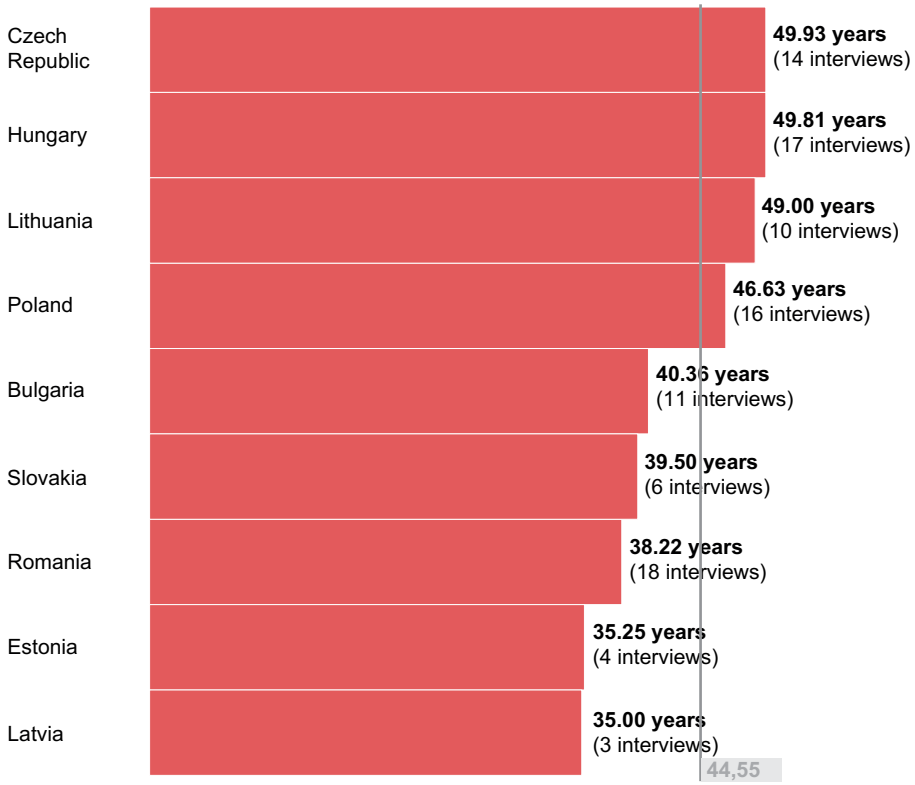


Figure 7
Energy efficiency in buildings: Distribution by age

The relative seniority of the sector is confirmed by the average number of years of work experience in the field - 13 across the region, with higher averages in Czech Republic (19 years) and in Hungay (18,5 years), while Romania and Latvia have changemakers with lower numbers of years of work experience in the field – 6 in Latvia and 8 in Romania.

INNOVATION

Considering the high energy consumption, low energy efficiency, and the energy losses due to old infrastructure, the residential sector has a high potential for energy savings and greenhouse gas emissions reduction in all countries. In general, as with the other fields scrutinized, the private sector plays a central role in implementing environment related innovations in the buildings retrofitting sector as well. In most of the countries from the region, the private sector is driving the public agenda when it comes to more ambition in the field of energy efficiency in buildings (promoting standards, financing schemes, organizing awareness raising events, etc.). This qualitative assessment drawn by the experts we consulted for this study has been confirmed by the network mapping we did in the region, as can be seen in Figure 8 below.

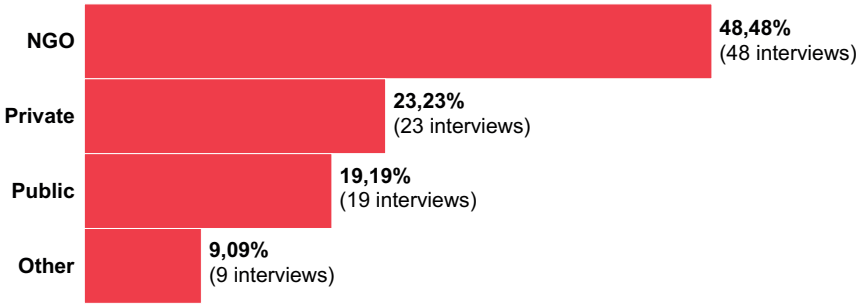


Figure 8
Energy efficiency in buildings: Distribution by type of institution the changemakers are active in

When it comes to innovation, Bulgaria, Romania and Poland rank their overall performance in terms of innovation and R&D being well below the EU average. In comparison, we can see a lot of green initiatives in Lithuania and Latvia, where energy efficiency in buildings can be regarded as the most prominent area of attention. New products are being developed in areas such as building materials and technologies for isolation of existing buildings. In order to tackle the issue of energy loss in buildings older than 30 years, Lithuania stands out with an initiative named the Public House Energy Saving Agency. The program's main mission is to assist all those involved in the apartment renovation process: program administrators by developing technical tools and providing methodological materials; as well as residents by providing guidance and advisory services. Lithuania's general frontrunner position when it comes to energy efficiency in buildings has been confirmed by the network mapping analysis, which showed the field as having the highest number of changemakers in the country (see Figure 9 below).

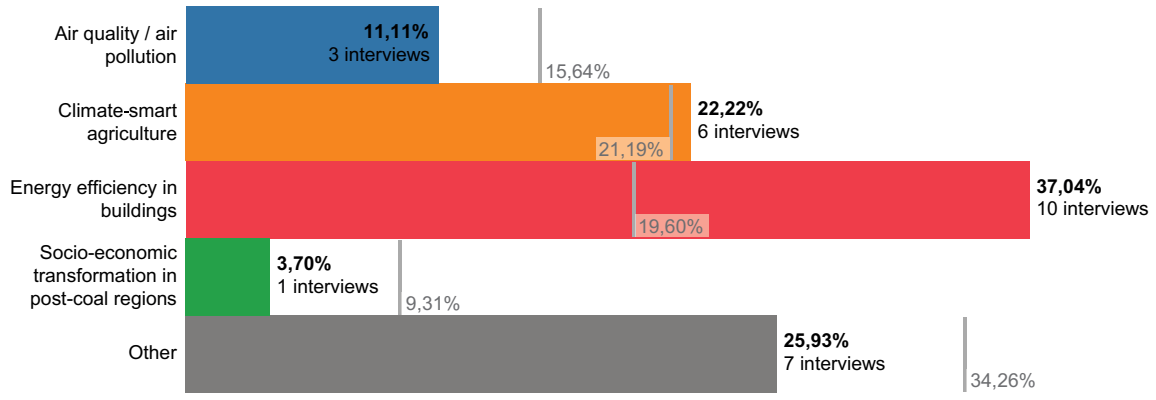


Figure 9
Lithuania - Distribution of interviewees by primary activity sector

Accounting for the sample examined (a larger one in more populous countries and a smaller one in countries with less inhabitants), Lithuania is quite remarkable, with close to 40% of the climate innovation changemakers in the country contributing towards energy efficiency in buildings. The laggards, on the other hand, are Slovakia and Latvia, where less than 15% of the changemakers interviewed work in this sector – see Figure 5 above.

Two other innovative initiatives worth mentioning are from Slovakia and Estonia. The national project of the Slovak Innovation and Energy Agency (SIEA), called Green to Households, enables single-family and multi-dwelling buildings to apply for support in the forms of vouchers for the installation of small systems for the use of renewable energy sources. This program has also led to interesting horizontal economic effects; now, there are over 1000 authorized contractors for performing such energy savings/ renewable energy works, which is notable for a small country like Slovakia. The Interreg Project EFFECT4buildings from Estonia is currently developing, in collaboration with public building managers, a comprehensive decision-making support toolbox with a set of financial instruments to unlock investments and lower the risks of implementing energy efficiency measures (retrofitting, upgrading and deep renovation) in buildings owned by public stakeholders.

Other examples of private innovations can be found all throughout the region, from passive houses (e.g.: in Zielonki-Wies, Stare Babice municipality in Poland; Green Mogo – Energy Training and Advice Center in Romania; EFdeN in Romania – the two Romanian cases being complemented by a learning approach to energy efficiency) to agritourism facilities equipped at the highest technical standards globally when it comes to energy efficiency and renewable energy (e.g.: "Dom nad Wierzbami" in Poland), to applied research private institutions and start-ups (e.g.: Center of Energy Efficient Buildings, the micro-power plant Wave, the startup OIG Power, LIKO-S (the first "living hall" in the region) – all of these in the Czech Republic; Teacher's Home, Seaplane Harbor, and several other demonstrative projects in Estonia). The hospitality industry, however, despite the positive agritourism example flagged above, is not raising up to its true potential when it comes to energy savings, innovation being generally driven by large hotel chains by group policy (e.g.: the Radisson group).

An interesting social innovation in the business sector is "The Green Office", constructed by Eika in Lithuania, which encourages the rational use of energy in companies. Companies are invited to join the initiative and compete on a voluntary basis to save electricity each month and consume least on a yearly basis (accounting for office size and headcount). In Bulgaria, "green office" initiatives and certifications are also gaining popularity.

Overall, in terms of numbers of changemakers in the region, out of the four fields we examined, energy efficiency in buildings is the second most represented sector, with 99 interviewees identifying themselves as changemakers in the energy efficiency field. Presumably, many of the largest category – the so-called "transversal" one – also touch on energy efficiency, but also on other fields.

PUBLIC OPINION

Public discussions on energy efficiency are still rarely connected with climate (despite the fact that, on average, buildings in the region account for a third of the countries' carbon emissions, with worst averages for countries that still use significant amounts of coal for heating – e.g.: Poland, Czech Republic, Bulgaria, etc.) and mainly driven by presumed financial benefits for households, in all countries surveyed. In most of the countries in the region there is a clear lack of knowledge when it comes to energy efficiency improvements after retrofitting. Inhabitants are not aware of the energy they've saved after retrofits, neither on the cost-benefit balance of retrofits. In general, the public opinion in the majority of countries lacks confidence in the specialized stakeholders involved in building retrofits - builders, quality of reconstruction, funders, etc. People do not realize that a house is a single engineering unit, the information how much energy can be saved by installing one or another energy saving device is not accessible to the end user. In the case of savings, no clear information is provided as to what savings have been made through the implementation of one or another measure. Distrust, according to experts, is more prevalent in Poland, Latvia, and Lithuania, while in Slovakia, for instance, the overall feeling is that EU funds dedicated to building retrofits have had very good results both in terms of savings and emissions reductions (i.e. in Slovakia estimates show that all residential buildings will

be retrofitted by 2043, assuming the current rate of renovation is upkept, hence the reported "enthusiasm" of the population when it comes to building retrofits). A key question for the entire region, and in particular for the Baltic States and for Visegrad countries is whether local public authorities or financing institutions will find the effective channels to compensate for the gradual reduction of available EU funds in this area, given the region's overall economic progress. This finding, which was pointed out by the experts we consulted for this study, has been confirmed by the network mapping analysis we performed. A quarter of the changemakers we interviewed pointed out access to financing as a significant barrier to advancing the field of energy efficiency in buildings, as can be seen in Figure 10.

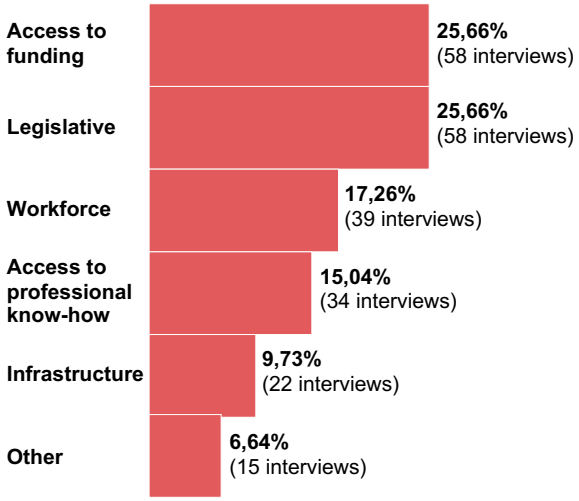


Figure 10
Barriers – Energy Efficiency in Buildings

When it comes to opportunities for greater action in the field of energy efficiency in buildings, the changemakers we mapped point out primarily the sense of urgency over climate action (close to 20%), but also the untapped future potential of the sector (19%).

There is a high contrast between Poland and the Czech Republic. In Poland, the population is to some extent in climate denial, although declaratively they support the diversification of energy sources and the reduction of energy consumption, while in the Czech Republic the population is more aware in regard to the impact of their daily actions. A poll by the Public Opinion Research Center (2017) from the Czech Republic states that 55% of the population conserves energy and water for environmental reasons at all times or often. The general population in Hungary is also rather skeptical when it comes to energy efficiency measures and 90% of them believe such investments are the state's responsibility and not the responsibility of private owners. However, over 15 innovative initiatives, all of them private, are active in the market (see Annex 3 on Hungary).

Also, in Estonia the topic is of great interest to entrepreneurs through conferences and information days, and the movement has reached new heights recently as several illustrative buildings (Teacher's Home, Seaplane Harbour and more) have been built. There is quite a significant difference between public opinion in Estonia – much more progressive – and the one in Latvia, which is reportedly more climate skeptical and quite unsupportive of new technologies (e.g.: wind farms).

PUBLIC POLICIES

Energy efficiency is not a significant issue for state policy in none of the studied countries, especially in terms of real implementation of measures and going beyond "strategy and planning." This happens despite the significant EU support for this topic (over 30% of the changemakers we interviewed in the network analysis identified EU funding as the biggest opportunity they know of in the field of energy efficiency in buildings – see Figure 11 below) and despite the fact that residential buildings have the highest potential

for energy savings all across the region. Corporate funding, not seen in general as an important source of funding for any of the other fields, comes second to EU funding when it comes to energy efficiency in buildings. However, some countries have very ambitious targets when it comes to near-zero energy buildings: for instance, the Czech Republic has imposed that, as of 2020, all new buildings will have to meet the target of heating consumption in the range of 30-70 kWh/ m2/ year.

Policymaking, in addition to not being effective is also sluggish – experts point out to energy efficiency laws being adopted in over two years, with "endless conversations" surrounding the process. There are undergoing initiatives in all countries involved in the report, but unfortunately none of the countries surveyed will reach the committed savings on time, despite the fact they all committed to reducing consumptions under the existing EU policy framework. In general, public authorities in Central and Eastern Europe (with the exception of the Baltics) are not ambitious enough when it comes to energy efficiency policies, experts believe. Among the important initiatives, it is worth mentioning a large scale government initiative recently implemented in Romania: the Green House for PVs is a subsidy program for prosumers who can get funding for installing photovoltaic panels on their homes and can connect to the grid. Until now, almost 30.000 prosumers were approved for funding, but the program is unfolding with major issues on the way: further legislative impediments and even criminal investigations into fraud accusations. Similar subsidy programs, such as New Green Savings from the Czech Republic resulted in even more impressive results: the construction of 1,800 new buildings in a passive energy standard.

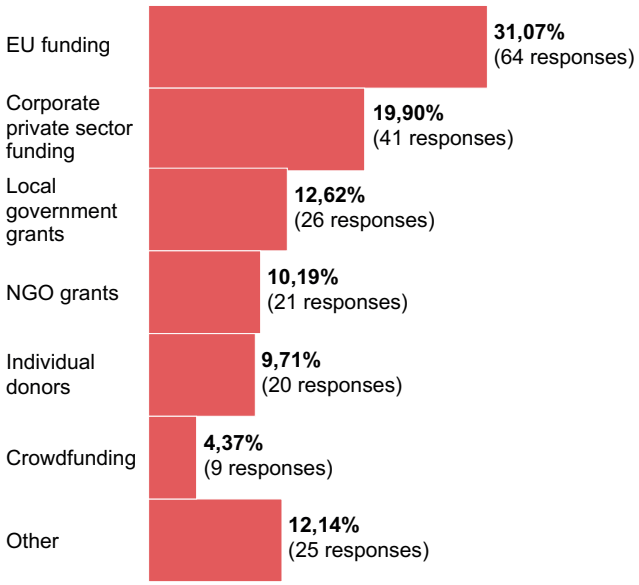


Figure 11
What do changemakers in the energy efficiency in buildings see as funding opportunity

The dire state of energy efficiency in buildings is ultimately responsible for high energy poverty levels in the region (especially in Romania, Bulgaria and the Czech Republic). Public opinion regards energy poverty as important and households report thermal discomfort and high expenditures on heating and cooling, in both rural and urban areas, yet public policy has not kept up with citizens' concern, and energy poverty is addressed primarily with short-term financial remedies and less with structural, building-related measures.

In the Baltics, in contrast to the rest of the region, where private initiatives dominate the discourse and the agenda on energy efficiency in buildings, public authorities are frontrunners in this area. Academic institutions in the region (e.g.: Riga University, Tallin Technical University) in the Baltics are also more intensively involved in this area. Funding is also better organized in the Baltics, with dedicated financial institutions handling the money disbursement for energy efficiency in buildings (e.g.: Altum, in Latvia).

An interesting funding stumbling block is encountered in Lithuania, where, despite effectiveness and cost-benefit balance of partial renovations, the state only supports full renovation works; in other countries, government funding also supports partial renovations (e.g.: Hungary, Romania), but experts maintain that, on the contrary, full renovations should actually receive more support.

An important challenge going forward, in addition to the continuation of financing/ financial mechanism question described above, is whether policies are elaborated and implemented top-down, or bottom-up, and thus owned by local communities and local governments. Wile such an approach is desirable, it has been rarely put in practice in the region until now, bringing even more frustration to the stakeholders involved in this field.

2. Climate-smart agriculture

GENERAL CONTEXT

There is little mainstreaming of climate aspects in agricultural policy; it is by far the least approached field from a climate perspective, despite the sector's contribution to GHG emissions of up to 10% of the countries' overall emissions. In general, the contribution of agriculture to GDP is decreasing in the entire region (even though in some countries, like Lithuania, it still plays a major role), which may explain why it's not at the forefront of innovation. In the entire area, we can clearly spot a division among two types of agriculture. The greatest part of the sector (more than 50% in all countries, with much higher percentages in Romania and Poland) is dominated by large-scale monocultures, mostly for export, while the remaining, a smaller part, is more focused on smallholding farms, unfortunately lacking competitiveness. The presence of smallholding farms is more visible in countries like Bulgaria and Romania (in Romania, despite the fact the overall share of small farms in the farming sector is minuscule, there are several thousands of such farms), while in the rest of the countries surveyed backyard cultivation has strongly declined and almost vanished, with Slovakia being, for example, completely dependent on imports. Nowadays alternatives are springing up in the field, partly driven by climate and sustainability and with the support of targeted EU funding. However, the term „climate-smart agriculture" is very seldomly used in the region (in many countries, even a proper translation of

it is missing). Paradoxically, until now EU funding has contributed negatively to nurturing smaller, climate-friendly initiatives, experts believing that the Common Agricultural Policy (CAP) led to the concentration of farms in a small number of hands, large landowners not being very climate-preoccupied. The recent greening of this policy could have potentially mainstream climate-friendly practices even among large actors, but since it was implemented since around 2013, the current results are not too optimistic.

The Lithuanian agriculture sector seems to be the most affected by climate change in Europe. Lithuanian farmers suffered over €90 million in damages due to extreme weather in 2018 and the country's forestry services were, in 2019, on the highest fire hazard alert recorded in history. Unusual droughts, nonetheless, have significantly affected agriculture in the entire region. The Slovak Republic has been recently successful in organic farming with an average area of 9.6%, compared to the EU28 average of 7.03%, while in the Czech Republic, more than 4,200 farmers farm in organic way, accounting for 12% of the total agricultural land. These percentages are much lower, although steadily growing, in Bulgaria and Romania.

There is a high level of pesticide use and other chemical compounds in all the investigated countries. The use of chemicals is affecting the groundwater and the soil quality, reducing its capacity for organic farming.

Climate-smart agriculture is the field that is best represented according to network analysis we performed, with a total of 21,19% of the changemakers we interviewed, followed by energy efficiency in buildings (19,6%) and air pollution (15,64%).

On a country by country basis, Slovakia has most of its climate changemakers in the field of climate-smart agriculture (37%) and Czech Republic (33%), these countries being followed by Hungary, Bulgaria and Lithuania – all showing shares above the regional average (21%). Climate-smart agriculture is the least represented in Estonia and Latvia. Surprisingly, both Romania and Poland are under-represented with only 15% of the total of the interviews, despite the fact that the rural area it's predominant in both countries. See Figure 12 below.

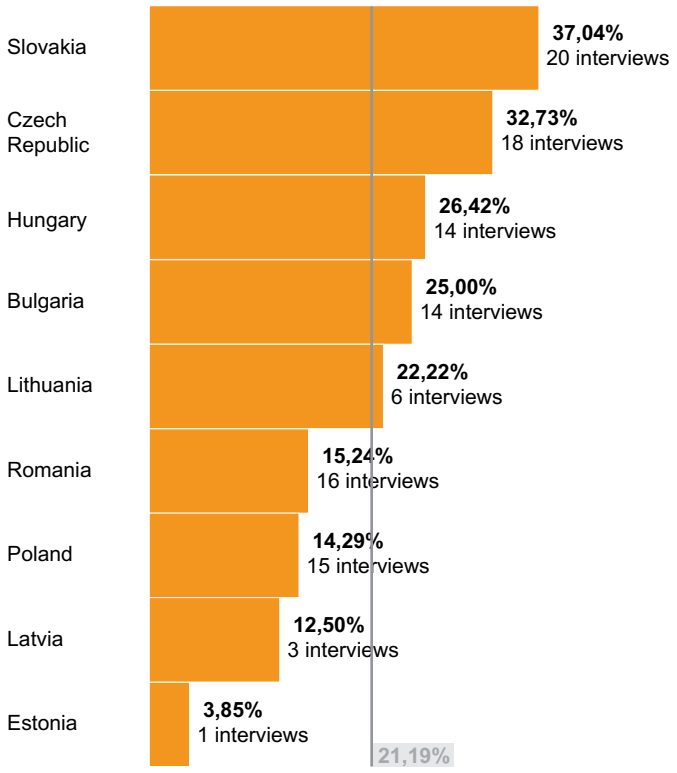


Figure 12
Distribution of changemakers in the climate-smart agriculture sector by country

Also, in the climate-smart agriculture field, we can see the longest work experience in the region, followed by energy efficiency in buildings – see Figure 13 below. Obviously, this correlates with the average age of changemakers in this sector, which is highest from all the sectors (an average of 45 years, compared to a general average all of 41,6 for all the sectors we examined). The two outliers are Poland (with an average age of 52 in the climate-smart agriculture sector) and Lithuania (with an average age of 36).

In the sector, the changemakers with the highest number of work experience are to be found in Latvia, Romania and the Czech Republic, while the ones with the lowest in Lithuania and Estonia (see Figure 14 below).

From a gender-demographic perspective, the field is dominated by men (65,42% of the changemakers identified), while women account for only 65,42%. In Hungary and Poland, in contrast to all other countries in the region, women outnumber men in the field of climate-smart agriculture.

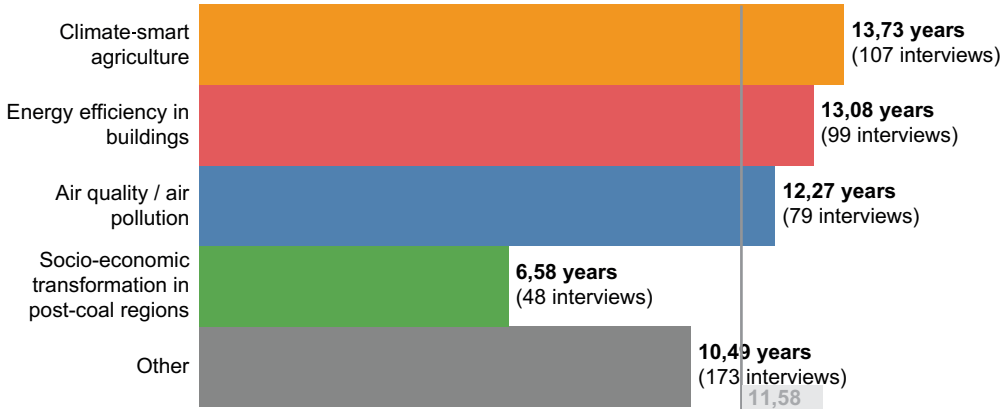


Figure 13
Average number of years of experience by sector

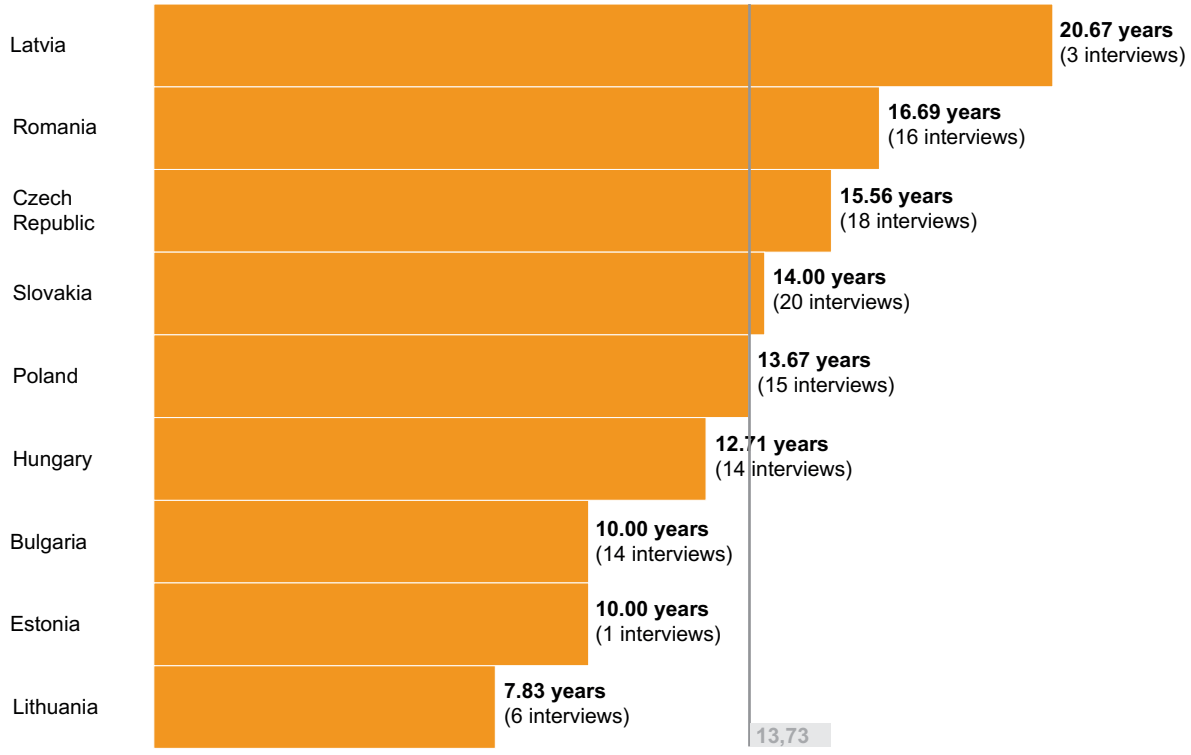


Figure 14
Average number of work experience in the climate-smart agriculture sector

INNOVATION

The impact of climate change is acknowledged by both small farm holders and large commercial farms. In terms of innovation, there are 2 directions: technological innovations (e.g.: drop irrigation, precision agriculture – particularly researched in Lithuania, no-till agriculture, use of effective microorganisms, biochar, aerated compost-tea, agroforestry) and social innovations (community supported agriculture, consumer groups, farmers coops, eco-communities, festivals, incubation farms, etc). Nevertheless, innovation in climate-smart agriculture remains underutilized - for example, Latvia has a small number of institutions working in the innovation field, and research activity is still slow also due to low investment in R&D.

The relatively diverse and high number of social innovations in this sector make for an interesting opportunity for the field's future development. In contrast to the other sectors we examined and identified changemakers in, in the sector of climate-smart agriculture, the reliance on a strong community is seen as the second greatest potential opportunity, after the sense of urgency over climate action which is seen as the number one driver in all the sectors we looked at – see Figure 15 below.

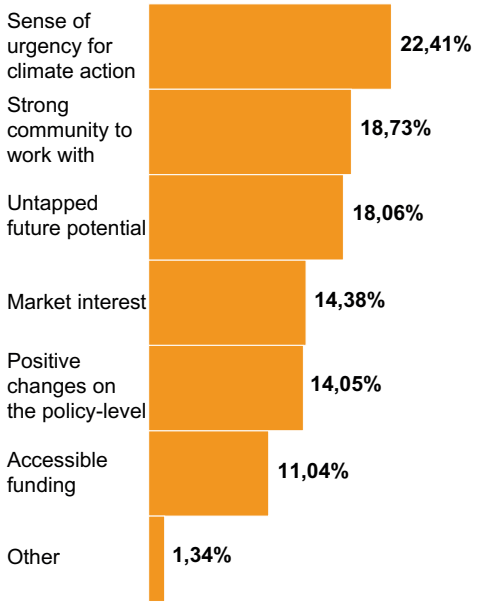


Figure 15
Opportunities Identified by Changemakers in Climate-smart Agriculture

The private sector plays an important role in producing smart agriculture solutions. In Romania there are some worthy initiatives from big players like Bayer, Corteva, KWS that invest in research and development of hybrid seeds tolerant to adverse weather conditions, while in Lithuania scientific work focused on precision fertilization technologies that allow to save fertilizers and to only fertilize the proper amount of substances on the right types of plants. There is a very notable social innovation initiative in Hungary, where a collaboration emerged between national parks stewards and herders in order to maintain biodiversity and eco system balance (e.g.: in the Hortobágy and the Tisza river basins). In Poland, the Stanislaw Karlowski Foundation's Rural Project implements biodynamic practices in agriculture on an impressive size of over 1,900 hectares.

On the other hands, in Czech Republic, Brno's start-up World from Space analyzes current satellite data that can be used to continuously monitor the state of the fields. The results are processed into regular information on vegetation, drought, infrastructure or economic activities, for example, to farmers or cities.

Business start-ups in the field (particularly focusing on IT and agriculture) are more prevalent in the Baltics (e.g.: E-Agronom in Estonia, Agricloud in Latvia), fueled by a dynamic academic environment which focused in this area. In general, across the whole area, academics and

researchers are better represented in the climate-smart agriculture field than in others (37% of all changemakers identified in the sector).

A big question is whether, and to what extent, technological innovations will be made available and affordable to small(er) landowners. Big players are investing already in piloting such technologies and are using specialized consultancies and start-ups to support them, but from a stakeholder constellation and public policy perspectives it will be important to figure out the means for technical innovations to breed even bigger polarization in the field.

PUBLIC OPINION

In general, in the entire region, there is a considerable lack of education on environmental topics - agriculture included. Farmers are even less aware on these issues. Agriculture in general has been on the fringe of public opinion preoccupations for many years, but the trend is general changing starting from young(er) consumers' concern over climate and health. The younger population is in general more inclined to adopt climate-smart solution in any field, including in the agriculture one, while traditional agricultural professionals are excessively targeted by ads and representatives of companies selling agricultural supplies, such as fertilizers, pesticides and machines. Unfortunately, these marketing initiatives do not draw farmers' attention to the negative environmental effects of the improper use of their products. As a result, many farmers do not understand that there is a need to reduce the impact of agricultural production on nature. The public opinion generally believes that the agriculture sector must move towards sustainable environmental management, but the trend is not homogenous in the region and many countries report big polarization (e.g.: Romania, Latvia). This movement generated a higher demand for food products with different levels of added value, such as organic food, regional and local food, food obtained through direct sales (yard sales, farmers' markets) or higher quality food and non-traditional food (quality meat products, steaks, quality cheeses, including goat and sheep, etc.). Bottom up initiatives focusing on food sovereignty, permaculture and general climate awareness are steadily developing in the region. At the same time, in some countries the general public, but also politicians, believe that climate policies will negatively affect the agriculture sector from (e.g.: Latvia). Latvia is nonetheless an outlier; even in more conservative and poor countries in the region (e.g.: Romania, Bulgaria, Hungary) all stakeholders recognize the negative climate-related effects over agriculture.

PUBLIC POLICIES

In Hungary, compared to the rest of the countries there is an expressed willingness to promote progressive climate mitigating practices through EU funded national subsidies, both in terms of technological and social innovations. However, access to these funds is reported to be burdened by bureaucratic and non-transparent procedures applicants face. Unfortunately, this is a common practice which also affects other countries from the region.

Interesting and diverse private actors (consulting companies, NGOs) are mainstreaming climate-smart agriculture in Bulgaria (e.g.: Greenpeace Bulgaria, Ecological Farming Unit, AgroHub.BG, Cleantech Bulgaria), in contrast to other countries, where the number of actors and the amplitude of their intervention is much lower. In Bulgaria, experts maintain that national agencies also play a role at the level of awareness raising on climate-friendly agriculture – e.g.: the National Agricultural Advisory Service (NAAS).

The Czech Republic has created a set of clear policies in order to achieve its climate targets in the agriculture sector in due time: Drought Protection Concept for the Czech Republic, National Drought Coalition, Strategy of the Ministry of Agriculture of the Czech Republic for 2030, Research and Development and Innovation Concept of the Ministry of Agriculture 2016-2022. Unfortunately, on the practical level, however, the fulfillment of these basic strategic documents encounters opposition from large agrarian enterprises. Still, the Czech government is moving ahead, apparently, planning to regulate monocultures heavily – it's planned that the cultivation of an area with one crop will be limited to 30 hectares only from 2021.

Our network analysis showed, very interestingly, that climate-smart agriculture is the field for which, unlike the others, the main obstacle changemakers in the field identify is not access to funding, but a legislative one. (Figure 16)

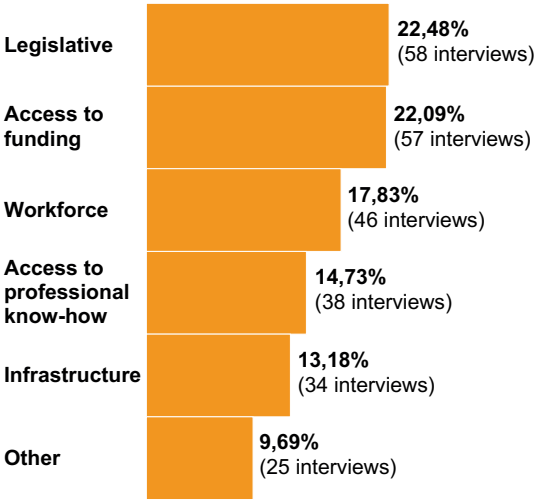


Figure 16
Barriers identified by changemakers from the climate-smart agriculture sector

3. Socio-economic transformation in post-coal regions

GENERAL CONTEXT

Romania and Bulgaria are still coal dependent regions, and the corresponding socio-economic transformation in post-coal regions is something current decision-makers try to neglect or at least to postpone as much as possible, despite the increasingly more clear economic disadvantages of coal. In contrast, in Poland's Lower Silesia the transformation already took place, but new mines are even now being planned. The situation is not too different in other countries of the region. In Hungary, for example, Northern Hungary (NUTS2), is currently considered an industrial crisis region; any coal-adverse discourse is hampered by the climate denial strategy of the national government. Lithuania, on the other hand, is becoming more dependent on energy imports (many based on coal), as the Ignalina nuclear power plant is being decommissioned. Despite this current situation, Lithuania is among the leaders in the development of renewable energy in the EU: together with Denmark, Estonia, Spain and Portugal, it is among the five most ambitious countries in the EU when it comes to renewable energy targets for 2030.

The Czech Republic is the third largest user of coal in the electricity sector in the EU; its 48% share of electricity produced from coal equates to more than double the EU average (20%). The three coal regions of the Czech Republic have historically specialized in traditional industries with an important role for heavy industry, mining and energy. For these reasons, the economic transformation of these regions was more demanding, difficult and only partially successful. In contrast to Slovakia, where unemployment

figures in coal regions are lower than the national average, in Czech Republic (but also in Romania) poverty in these regions is higher than the national average.

In Estonia, over 90% of CO2 emissions come from burning oil shale for electricity. The Estonian electricity grid is well connected with the country's neighbors, and large amounts of oil shale energy are for export, but unfortunately, the oil shale industry seems to provide very little economic benefit compared to the massive pollution toll as the costs of wasted resources, damage to health and environmental destruction stay in Estonia. In addition, oil shale is able to maintain its competitiveness due to subsidies. Most likely, a market-based transformation will take place, with the steady, but intense rise of coal.

Overall, there is obviously a very contrasting state of play between countries in the region with local coal production and countries without; in the later, renewable energy development picked up a lot faster.

Our network analysis showed that this sector exhibits the lowest average number of years of work experience from all the sectors we looked at, with an average that's twice lower than the one encountered in the field of climate-smart agriculture – see Figure 14 below.

Bulgaria has more experienced changemakers, while Slovakia and the Czech Republic have the least experienced ones – see Figure 17 below.

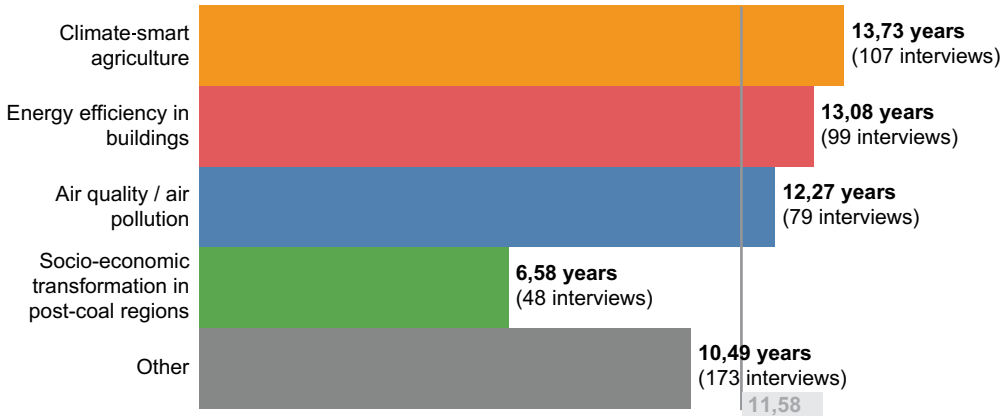


Figure 13
Average number of years of experience by sector

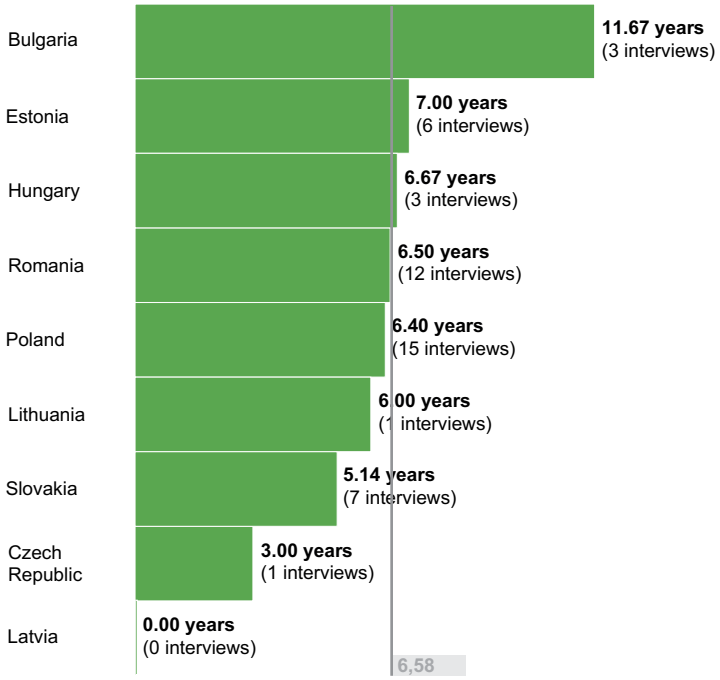


Figure 17
Average number of work experience by country in the post-coal transformation sector

INNOVATION

The lack of open discussion and limited recognizing from the public on the importance of the issue keeps innovation away from coal dependent regions both in terms of industrial transformation and vocational training of people concerned.

Renewable and alternative energy research and development is concentrated in the hands of big corporations, while innovations aiming at a post-coal future have been achieved at a rather small-scale, initiated by small developers/ researcher groups, being seemingly very difficult to implement. A point in case is the difficult process MTVSZ as experienced by Hungary when it implemented the recommendations for post-coal regions.

The Lithuanian "Ignitis," one of the largest energy groups in the Baltic States, has established the Centre for Energy Innovation with the purpose to analyse and utilize data which is expected to lead to new energy innovations and services. Meanwhile, in Estonia, solar energy is booming and is expected to intensify after 2020 due to the requirements for near zero-energy buildings. These transformations have been obviously easier to implement in these countries, where coal plays almost no role in the local economy.

In the Slovak Republic there is a big transition to successful closure of the mines through a gradual process. Even though the regional position of the mining industry has been steadily declining, it is still the economic backbone of the region. The project "Action Plan for Transformation of Coal Mining Region Upper Nitra" consisting of a strategic document guiding the whole coal transition process, is currently under discussion by stakeholders, and it has been supported by activities of NGOs Friends of the Earth and CEPA. These initiatives are positive examples of how to mobilise the local community and key actors (e.g.: SMEs), through presentations and discussions which can lead to achieving systemic change.

Energy cooperatives, prevalent in some countries (e.g.: Czech Republic, Poland) are gradually spreading to other countries in the region (e.g: Romania, where the first renewable energy cooperative has opened in 2019). Unfortunately, very few of these innovations are located in coal regions proper, one reason being the general low education of the population living in these areas.

PUBLIC OPINION

In countries like Romania, Hungary, Bulgaria and Poland, the local public opinion in regards to the transformation towards renewable energy is not very positive, as people are afraid that they might lose their jobs. In comparison, in Slovakia the qualitative evaluation of the public discourse indicates a positive image among the general population in regards with the closure of coal mines. However, Poland seems to be the only country where the public opinion on post-coal transition has been polled, including with a direct sampling of people in coal-affected regions. Very interestingly, 59% of sector employees in Silesia believe that their skills will continue to allow them to be employed even under coal shutdown conditions. Public opinion at local level contrasts heavily with experts' estimates: for example, the World Bank concluded that, in Poland, the coal regions will not suffer at all as heavily in terms of employment should the transition be finalized, as it's been previously thought.

Everywhere in the region, with the notable exception of Slovakia, people living in coal dependent regions strongly oppose the phasing out of coal-related energy and see energy transition as a threat to the way they earn their living. In contrast, in Lithuania and Latvia (which do not have coal mines) the transition is witnessed positively. In Czech Republic there is hardly any discussion about managing the transition to climate-friendly energy or about the real social, economic and environmental costs of continuing in the current direction.

Public opinion in capital cities, away from coal-dependent regions, is often much more favourable of the transition, which is why experts believe that in the absence of proper management of the transition process will lead to dangerous social polarization. Bottom-up approaches are needed everywhere in the region.

PUBLIC POLICY

With increasingly ambitious EU climate targets, the transition to a low carbon economy is likely to accelerate over the coming decades. The EU already offers various sources of funding which coal regions can use to facilitate this energy

transition and mitigate the consequences of the affected workers. Between 2021 and 2027, several sources of funding will continue to be available, ranging from social funding for market reiteration and job search, investment opportunities in the energy and climate adaptation sector, and research into new clean technologies. However, only a small minority of actors on the ground seems to be interested – and capable of accessing them.

Despite the availability of such funding, there is a lack of real projects that aim to facilitate the energy transition in countries like Romania, Bulgaria, Hungary and Poland, where politicians utilize the existing – and considerably strong – "coal-nostalgia" for political gains. This legitimizes the opening of new (lignite) mines, like in Poland, even though no other new openings are foreseen elsewhere. Experts argue that new openings are only beneficial on the short run for the investors, while deteriorating air and water quality in local communities.

Mainstream political parties and decision-makers seems to be on maintaining the dominant position of coal in the power and heat generation, and not on carrying out a just transition. Politicians do not realistically plan any coal phaseout in Romania, yet they are timidly trying to make steps in the right direction, without talking about them too directly – e.g.: the current (yet stalled) plan to retrain 5000 coal workers for jobs in the renewable energy sector. Politicians' discourse is also slowly, slowly changing in Bulgaria, too, in face of coal's imminent decline. The politicians' and actors' perspectives in Romania, Bulgaria, Hungary and Poland contrasts with the approaches in Slovakia, where no relevant political actor is currently questioning the decision to discontinue the coal mining subsidies. As can be seen in Figure 18 below, the overwhelming majority of changemakers active in the field of socio-economic transformations in the post-coal areas are from the NGO sector.

Figure 18
Distribution of interviewees by the legal status of the organization they work for, in the field of socio-economic transformation of post-coal regions

4. Air pollution

GENERAL CONTEXT

The most important sub-area in terms of public traction, related to the wider dimension of climate and environment, seems to be air pollution, in all countries sampled. Bulgaria and Poland are most innovative when it comes to citizen participation in air quality monitoring. In Bulgaria, citizens adopt their own monitoring station via Airbg.info, while in Poland schools are actively involved in this movement. At the same time, while in Bulgaria citizens' interest on this topic is increasing and expecting to shape the political arena, in Poland, despite the fact the country is worst hit by air pollution (with detrimental consequences for healthcare), one out of three Poles does not see the issue as relevant. In Bulgaria, where both citizens and local authorities have been more involved, there is also high awareness on the consequences of air pollution: close to 15,000 premature deaths attributable to air pollution are reported each year. In Poland, the figure is staggering: 45,000 premature deaths per year. In smaller countries (e.g: Slovakia) less deaths are attributable to air pollution (around 3,000), but figures are still worrisome.

In Bulgaria we can also find most specialists in the field even though this field has only 4.8 years of experience in the country. Bulgaria is followed by Czech Republic (18%), Romania (18%) and Poland (17% regional average).

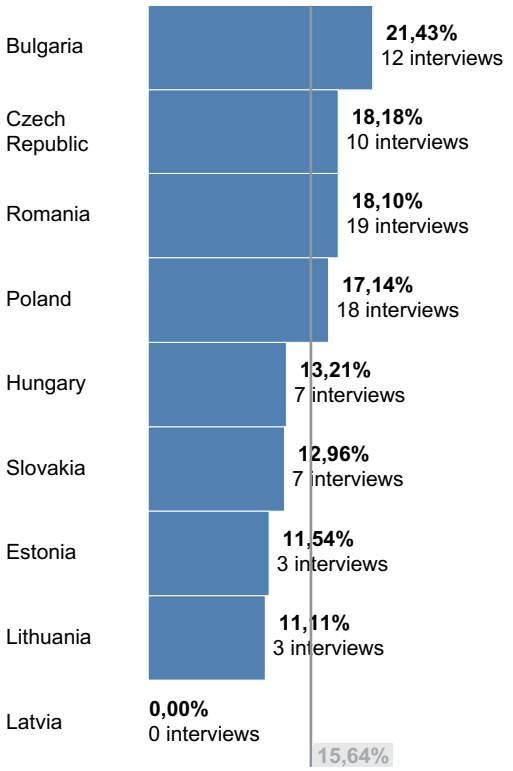


Figure 19
Distribution of interviewees by country in the Air Quality/ Air Pollution field

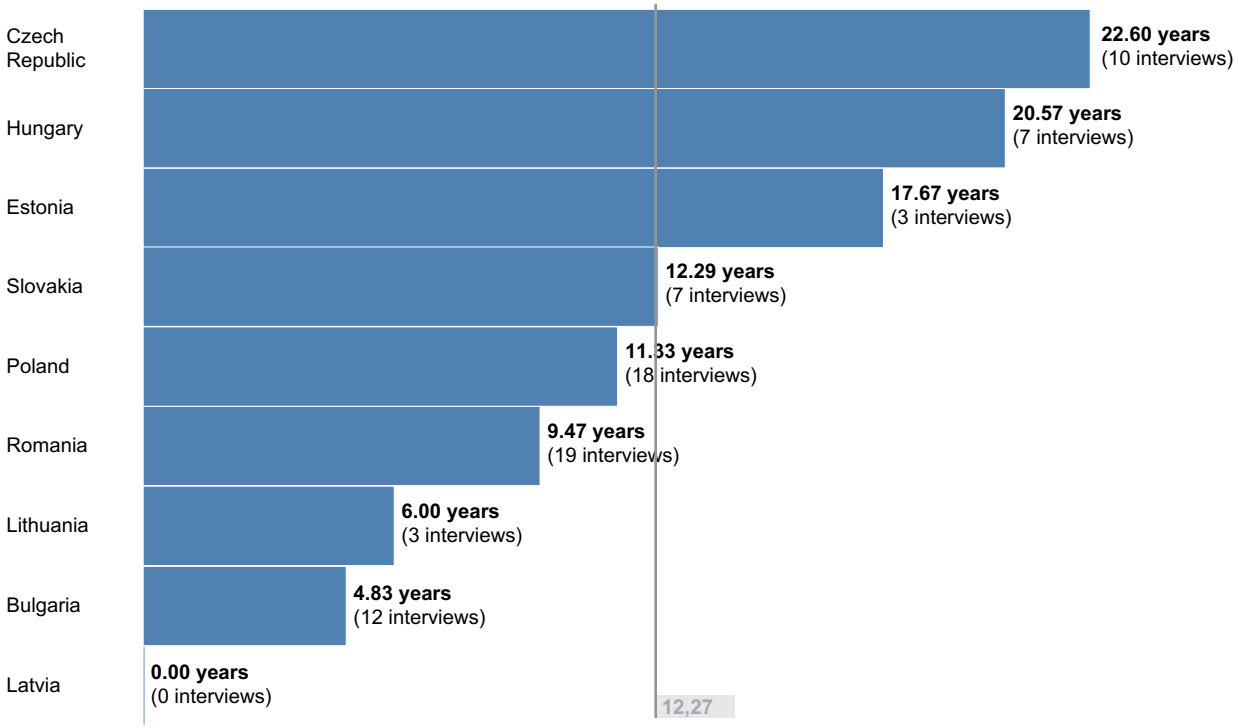


Figure 20
Distribution of interviewees by number of years of work experience in the Air Quality/ Air Pollution field

Low air quality is tightly connected to energy poverty and to the way people heat themselves in wintertime: using coal and wood, or even burning waste (e.g.: Romania, Bulgaria, Poland, Czech Republic, etc.). In Hungary, very worryingly, researchers point out to a big gap in education: Hungarians burn waste for heating irrespective of educational or financial background (only a handful of educational and awareness raising activities over this issue are reported). The second main cause of air pollution is diesel usage outside cities and heavy traffic inside cities.

All countries from the region have very poor air quality with Poland leading the way - the worst air quality in Europe, while Hungary has been estimated, according to some sources, as second worst in terms of air quality in the world after China.

The two least polluted countries are Lithuania and Latvia, but even in these two countries, the air quality is low in big cities. An important reason for this situation is the lack of public awareness of the health effects of waste incineration, low quality fuel or old and broken cars use, as well as the scale of energy poverty in the region. A further important reason is pollution flowing cross border from neighbouring countries, namely Poland; Polish air pollution accounts for half of the air pollution in Czech Republic, too.

INNOVATION

As a result of a growing interest for data on air quality, there have been recent developments on the innovation side. In Romania, for example, URADMonitor develops air monitoring sensors for the general public while in Bulgaria, Airbg.info enables citizens to build or adopt their own sensor station and to connect it to the platform, which provides a real-time data on air quality in Bulgaria and other countries. In Latvia, for example, several CO2 monitoring devices have been developed by at least three independent businesses. One of them had been facilitated by business incubator in Valmiera, others are without identified state support. In Estonia, an abundance of government-owned and privately-owned sensors are monitoring air quality both in urban and in rural areas. See Annex 9 on Estonia for a detailed enumeration of startups and innovative, cleantech actors in the country.

A very interesting initiative is happening in Poland - The Educational Anti-Smog Network project.

Schools participating in the project are equipped with air quality meters, and the measurement results are made available online and presented on school displays. This enables students, teachers and the local community to monitor air quality live and plan activities accordingly.

Also, in Czech Republic we can mention a couple of innovative projects that aim to improve air quality: CLAIRO in Ostrava, which has been planting trees in urban spaces, Dustee, which has developed a device that measures dust levels in the air by Using IoT (it processes sensor data and can recommend where to place air purifiers) and World from Space, which also analyzes the air quality, according to satellite images and has completed a project in the city of Pilsen.

Traditional environmental NGOs in the countries surveyed are significantly shifting their focus towards air pollution, after many years of lack of activism and solutions-driven approached over this topic. While this may pave the way for more activism, a solutions-based approach has originated in the business sector and in business associations, many technical innovations being „imported" from Western Europe. The interventions of the Hungarian Masonry Heater Builders' Association (MACSOI) and of the Environmental Wood Heating are notable and could, hopefully, permeate other countries in the region as well (mainly Romania and Bulgaria).

PUBLIC OPINION

Public authorities have long been blamed for lack of action on this topic and for failing to develop and implement proper strategies to reduce air pollution in all countries. Existing public policy documents are criticized both by experts and the general public for their limited ambitions. In Romania, two NGOs, Optar and 2Celsius, initiated a legal lawsuit against the City Hall of Bucharest for failing to guarantee the right to a clean environment for people living in Bucharest. In Bulgaria, 52% of people consider air quality the most important environmental issue in the country, placing Bulgaria second after Malta in the EU28. On the contrary, in Lithuania and Latvia, where there is a good monitoring of air pollution, a large part of the public is simply not interested in it, while the Czech public has reduced its emissions over the last two years mainly by frequent use of public transport, bicycles or walking instead of cars, and by replacing old energy-intensive equipment with newer ones. Estonians are, very interestingly, the most positive from the entire region when it comes to air quality and are not interesting in tightening air purity standards, according to a Eurobarometer survey (very interestingly, the connection between shale of land air pollution has not penetrated public perception). On the other hand, hard data is showing that indeed air quality is relatively good in Estonia and, in contrast to Poland and Romania for instance, is improving.

Activities of the national government aimed at reducing air pollution in Poland are getting very low marks from almost half of respondents, and in the case of local governments, such opinion Is shared by almost 40%.

Yet, as many air pollution measures requests citizens to directly change their behaviour (e.g.: change heating sources, stop using cars, etc.) ultimately they are met with resistance. A point in case is the Oxygen tax in Bucharest, which the city hall intended to introduce for polluting cars, with obvious regressive side-effects.

PUBLIC POLICY

In almost all of the countries surveyed, national authorities have been referred to the European Court of Justice by the European Commission, over failing to address air quality issues. In some (e.g.: Hungary) infringement cases have epical durations – i.e. over 10 years. Even in the most "diligent" countries with respect to air pollution (e.g.: Latvia) it's still the EU push that is shaping local authorities' reaction (e.g.: in Riga, where the Commission is requesting increased control over fine particles). Sofia Municipality seems to be the most involved from all local public authorities on issues related to air quality, incentivizing public transportation and free parking in public parking lots (to avoid traffic in the city center), while also widely informing the public about the benefits of public transportation and the risks of irresponsible waste disposal. Rising public discontent over this issue, particularly in Bulgaria, Romania and Poland is expected by experts to significantly shape public policy in the future. Various barriers to car traffic have been imposed or will be soon imposed in all the countries in the region, while some authorities are also thinking of alternative investments (e.g.: roadside tree planting in Lithuania).

Final Annexes: Main Findings in Each of the Countries Surveyed

Annex 1: Qualitative and Network Analysis Romania

Authors: **Roxana Bucată, Ștefan Voicu**
For Ashoka

Energy efficiency in buildings

General context

The building sector in Romania is characterized by a high share of residential buildings (99,08%) and a small proportion of non-residential buildings (0,2%), according to the 2011 National Population and Housing Census. Most of the residential buildings in Romania were constructed before 1970, without any energy efficiency requirements. Old infrastructure is responsible for significant energy loss. As a result, the residential sector accounts for 1/3 of the final energy consumption in Romania. The 8% decline in greenhouse gas emissions from buildings in 2016 compared to 1990 was not the result of good governance, but the consequence of demographic decline and reduction of heated living space.[1] However, nowadays it is mandatory for every new or existing building to have an energy performance certificate in order to be the object of a property sale.

Innovation

Considering the high energy consumption, low energy efficiency, and the energy loss due to old infrastructure, the residential sector has a high potential of energy savings and greenhouse gas emissions reduction. Tapping this potential requires a great deal of innovation, but the overall eco-innovation performance of Romania in the construction sector is well below the EU-27 average, consequently belonging to the catching-up countries group[2]. According to the European Innovation Scoreboard 2017, Romania is classified as a Modest Innovator with an overall innovation and R&D expenditure performance well below the EU average. Romania has the lowest classification in the Scoreboard.

Even if the overall innovation in the building sector is not high, there are isolated initiatives that push for a change in the way Romanians build and use buildings. One of the most successful projects is Green Mogo - Energy Training and Advice Center. Located just outside Bucharest, the Centre is a passive house which served also as a learning experience for volunteers, activists, students and general public. Green Mogo demonstrates that sustainable materials, energy efficiency technologies and clean energy sources are available in Romania and can be used to construct a 90% energy self-sufficient house.

Another relevant project in the innovation landscape is EFdeN, an interdisciplinary group of students and professionals who built a solar house for the Solar Decathlon competition in 2014. It became a centre for innovation and debate and attracted thousands of visitors who learned about green building techniques. EFdeN built a second solar house in 2018 for the same international competition. These houses produce more energy than they need and have a minimum impact on the environment. From natural light usage to photovoltaic panels on the roof, these houses optimize all clean energy sources.

Public opinion

Public opinion is more aware of energy related issues in buildings and is in favour of public programs like building retrofitting. Romanians are motivated to support the retrofitting program because of its economic benefits from lower heating and cooling costs after the technological improvements and are less aware or concerned with the environmental benefits. Energy poverty is an important issue in in public opinion because it affects a large number of individuals. In Romania, thermal discomfort and high expenditures on heating and cooling are a reality for most people in urban areas. Despite this, energy poverty is not embedded in national law and the Romanian National Energy and Climate Plan does not stipulate clear measures in this direction.

Public policies

Public policies are focused on energy efficiency, which is one of the three pillars of Romania's European obligations in the energy sector together with reduction of greenhouse gas emissions and renewable energy usage. The existing programmes include the continuation of the National Energy Efficiency Action Plan IV, the Energy Strategy of Romania 2019- 2030 and the Strategy for mobilizing investment in the renovation of residential and commercial buildings fund, both public and private, existing at national level - Version 2/2017.

1 LIFE PlanUp 2019
2 Paraschiv et. al. 2011

The most recent governmental initiative is the Green House for PVs project, a subsidy program for prosumers who can get funding for installing photovoltaic panels on their homes and can connect to the grid. The upgrade of the former Green House program comes after the Romanian Parliament passed a law that recognizes prosumers and allows them to sell the clean energy in the grid. Until now, almost 30.000 prosumers were approved for funding, but the program is unfolding with major issues: further legislative impediments and even criminal investigations into fraud accusations.

The greater majority of Romanian members of the Parliament voted in favour of prosumers, but the negotiations for implementing rules stalled the effects of new legislation. There is resistance to allow major incentives for prosumers.

Climate-smart agriculture

General context

The Romanian agricultural sector is highly polarized. There are over three million smallholding farms utilizing half of the countries agricultural land and little over 12.000 using the other half. While the latter use it as arable land to cultivate crops like wheat, maize, sunflower seeds, rapeseed or rear sheep, all of which are mostly destined for export commerce, the other half practices a more mixed type of agriculture. Smallholding farms are generally oriented towards subsistence and combine arable land, with permanent crop land, kitchen gardens and grasslands, as well as livestock rearing.
The effects of climate change are also polarized. Climate change has increased drought, desertification, flood, blizzard and hail incidence. These have a bigger impact on smallholding farms than on large commercial farms, as is acknowledged even in the National Strategy for Climate Change (2013-2020)[3].

Innovation

The impact of climate change is acknowledged by both smallholders and large commercial farms. The latter are trying to mitigate the effects of drought through irrigation systems. The state irrigation system built during socialism (1945-1989) is still in a derelict state, while recent refurbishments made by the Ministry have not concentrated on the replacement of the high energy consuming pumps. Some large farmers tried to innovate by drilling wells on their fields and pumping water. However, this is not a very widespread practice and it is not clear how this solution actually contributes to climate mitigation instead of creating further problems, like drying the underground water streams.

Seed companies, like Bayer (former De Kalb Monsanto), Corteva (former Pioneer) and KWS, invest in research and development of hybrid seeds tolerant to adverse weather events. Nevertheless, this solution would benefit only large commercial farms, as smallholders are unable to cover the costs of these seeds. Moreover, many researchers have argued that seed companies contribute to a loss of seed diversity and are causes, not solutions, to the problems farmers face.

Ecoruralis, an NGO focusing on peasant rights, is promoting smallholding agroecological practices as solution to climate change. They argue that smallholders have been in symbiosis with the surrounding environment and that their practices are not ecologically harmful. They also established a seed bank, collecting and distributing 'traditional' seed varieties to small farmers across the country in order to conserve and increase seed genetic diversity.

Various NGOs have opened up urban and community gardens experimenting with permaculture techniques. The NGO Institutul de Cercetare în Permacultură din România (ICPR) has created a network of 9 urban gardens in Bucharest under the project Grădinărescu which was financially supported by the German multinational retailer Kaufland.

Agroecological and permaculture practices are also being translated to large scale agriculture. In Romania there are several experts who are consulting large commercial farmers in the adoption of agrotechnologies like the no-till/ minimum till practice and research is being conducted to assess the efficiency of these practices. However, these practices require expensive agricultural machinery and digital equipment that most farmers, and especially the small ones, do not afford. Thus, it is likely that

3 Strategia națională a României privind schimbările climatice. 2013

this kind of solutions will continue to polarize agriculture in the future.

Public opinion

Public opinion is driven by the interests of large farmers' professional associations. The focus is placed on the rehabilitation and extension of the irrigation system as the main method of mitigating the effects of climate change and on subsidies for insurance schemes. During years with severe drought, pressure is put on the government to compensate farmers for crop failures. The eco-conditionality introduced by the EU for receiving the payment schemes have not generated great controversies, although many farmers do not necessarily understand the reasoning behind it.

Public policy

Agriculture features in the Romanian National Climate Change Strategy (2013-2020) as a sector vulnerable to climate change, but also as a source of greenhouse gas emissions. The EU's Common Agricultural Policy (CAP) payment schemes have targeted sustainable land use practices, with 30% of the country's agricultural income supported provided through the CAP being allocated to the "greening" measure since 2013. A recent audit of the greening payment scheme argued that the environmental and climate performance of the CAP has not been enhanced[4]. The other major CAP income support schemes are conditional on compliance with EU standards on good agricultural and environmental practices. Its efficiency has also been questioned.

Since 2008 Romania has developed a national anti-hail and rainmaking system aimed at reducing the effects of hailstorms and prolonged drought. In 2016 an investment program in the rehabilitation and extension of the national irrigation system has begun. However, the government lead by the Social Democrat Party has been ousted in November 2019 by the National Liberal Party. The continuation of the program remains uncertain. In 2019 crop insurance premium subsidies from the rural development fund have been re-introduced. As these are contingent on the national budget, the continuation of the program is uncertain.

4 European Court of Auditors. 2017. Greening: a more complex income support scheme, not yet environmentally effective. Special report no. 21

Socio-economic transformation in post-coal regions

General context

Romania is a coal-dependent country with a fluctuating 25% share of coal in the energy production mix. The country has a balanced energy mix with coal, hydropower, natural gas, nuclear energy and wind power having comparable shares of capacity and power generation. However, despite the diverse mix and the availability of renewable energy, the Ministry of Energy does not have plans for a coal phase-out. Instead, it prioritizes coal, nuclear power and hydro power in its latest 2019-2030 National Energy Strategy.

Despite the state's support for fossil fuels in the form of subsidies and laws biased in favour of coal companies, there are other factors that push the coal into history: coal extraction and exploitation incur high costs, while the price of carbon continues to rise. According to an analysis of the 2019 global coal power trends[5], gas replaced coal in the EU as the carbon price in the EU Emissions Trading System rose above 20 EUR per tonne of CO2. Furthermore, EU climate and energy legislation puts pressure on the Romanian coal industry and coal regions to come up with a phase-out plan. Coal regions in Romania are part of the EU Just Transition Platform that looks into ways for sustainable post-coal development. Nonetheless, climate is an essential factor in the coal phase-out process. As a signatory of the 2030 Agenda for Sustainable Development, Romania has committed itself to a number of ambitious objectives regarding the energy sector, such as 43.9% emission reductions compared to 2005; at least 27.9% renewable energy in total energy consumption; at least 37.5% increase in energy efficiency by 2030.

Innovation

Innovation is necessary to move away from dirty sources of power generation. One of the most recent developments in the private sector is the founding of the first Romanian Energy Cooperative that has the mission to democratize, decentralize and decarbonizing the energy market. Members of the Cooperative invest in solar and wind projects across Romania and consumers have the option

5 Myllyvirta, L., Jones, D., Buckley, T. 2019. Analysis: Global coal power set for record fall in 2019. In Carbon Brief

to choose the Cooperative as an energy provider. The project is an innovative development on an energy market characterized by centralized energy production.

Public opinion

Public opinion is divided on this issue. While a part of the public is aware of the environmental degradation and supports coal phase-out, another part of the population, especially local people, perceives coal phase-out as a threat to their livelihoods. The lack of a long term, comprehensive social and economic strategy from the state will only accentuate the conflict. The CEROPE study[6] commissioned by Bankwatch and Greenpeace shows that, if alternative development scenarios are implemented, thousands of jobs and hundreds of millions of euros can be generated in the region by 2030: 750 jobs and 88 million euros net profits can be created over the next decade in small-scale farming and animal raising; 1520 jobs and 31 million euros in renewables and energy efficiency; and 434 jobs and 38 million euros profits in tourism and other services.

Public policies

The most recent move on the public policy front is the program launched by the Ministry of Energy which aims at re-skilling 5.000 former coal miners to work in wind farms in Romania and Europe. Coal regions in Romania have to deal with great social and environmental issues. In the "golden age" of the coal industry there were around 50.000 people employed in the sector. The state began closing coal mines in the 1990s and reduced the labour force employed in the industry to around 1.000 people. This has had dramatic consequences for the regional economies and the livelihoods of the people in coal mining regions who were left without employment alternatives. Starting in summer 2019, the Ministry reskilling program created in cooperation with the Romanian Association for Wind Energy and the University of Petroșani, is now stalled because of political and financing problems.

The Ministry of Energy has a reputation of being pro-coal. Its long-time position in favour of fossil fuels is still strong and it is visible in the National Energy Strategy. The Romanian actors that are pushing for alternatives are the Members of European Parliament, also members of EU Just Transition Platform, like Adina Vălean or Cristina Prună.

6 Centrul Român de Politici Economice (CEROPE). 2019. Just Transition in Hunedoara. Economic diversification in a fair and sustainable manner

Air pollution

General context

Air pollution is a major problem for Romania. The European Commission (EC) decided to refer Romania to the Court of Justice of the EU for failing to meet air quality standards. According to the EC, air pollution levels with particulate matter in the region of the Romanian capital Bucharest have been persistently exceeded ever since the EU law became applicable to Romania. In 2016, this happened for 38 days. According to the Air Quality Report 2019 released by the European Environment Agency, there were 23.400 premature deaths attributed to PM 2,5, NO2 and O3 exposure in Romania just in 2016.

Innovation

As a result of a growing interest for data on air quality, there has been recent developments on the innovation side. URADMonitor, for exemple, is a Romanian company that develops air monitoring sensors for the general public. The sensors are used by NGOs and citizens and provide with growing data on dangerous emissions in the air.

Public opinion

Public authorities have long been blamed for lack of action on this topic and for failing to develop and implement proper strategies to reduce air pollution. The Romanian National Network for Monitoring Air Quality has over 100 stations, 8 of them being based in Bucharest, the most polluted city in the country. The stations are often non-functional and cannot provide data. Also, there are no information billboards about air pollution in the most polluted cities and the population has very limited or no information about the pollutants it is exposed to. As a result, public opinion has an apathy towards this issue and didn't have major reactions regarding air pollution.

On the other side, nongovernmental organizations are more active in this area. The first report that drew attention to this topic was published by Ecopolis in 2011 and stated that the monitoring

is poorly done, that air pollution has major health effects and that transport is the most important source of air pollution. At the moment, Ecopolis is close to launch a platform that integrates open source air pollution data from citizens. Other NGOs, Optar and 2Celsius, initiated a legal lawsuit against the City Hall of Bucharest for failing to guarantee the right to a clean environment for people living in Bucharest. They demand the revocation of the Integrated Air Quality Plan which is based on an environmental assessment study that is five years old.

Public policies

The most recent development in the air quality area is the Oxygen for Bucharest project, launched by the City Hall of Bucharest. Its main objective is to implement a toll for polluting cars in the centre of the capital. The tax was received with enthusiasm, on the one hand, but with criticism on the other hand, for the burden it puts on low income people who cannot afford a less polluting car or an extra tax.

Different groups that are working for alternative public policies lack the political will that is necessary to address environmental problems related to air pollution. The Ministry of Environment denounces lack of financing to explain the malfunctioning of the National Monitoring Network.

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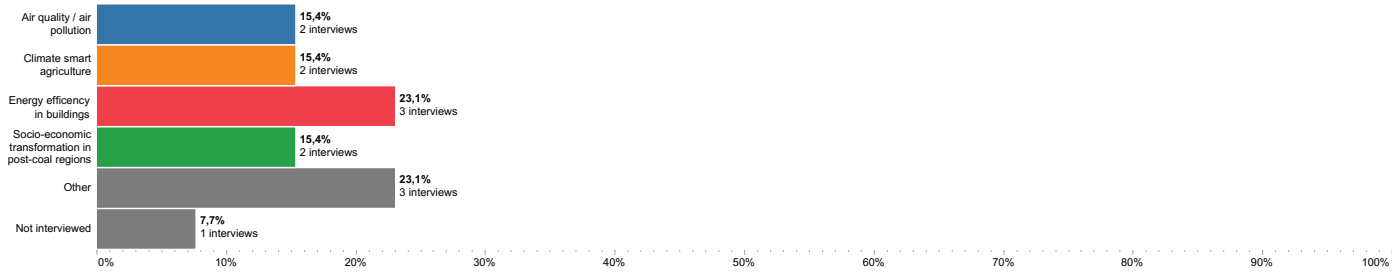
Facts and figures regarding the data collection process

Data collection period: 03/10/2019 - 21/11/2019
Number of initial contacts: 13
Initial distribution of contacts by gender:

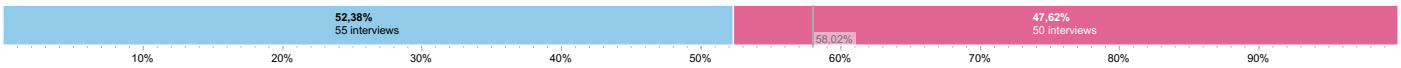
Initial distribution of contacts by thematic sector:



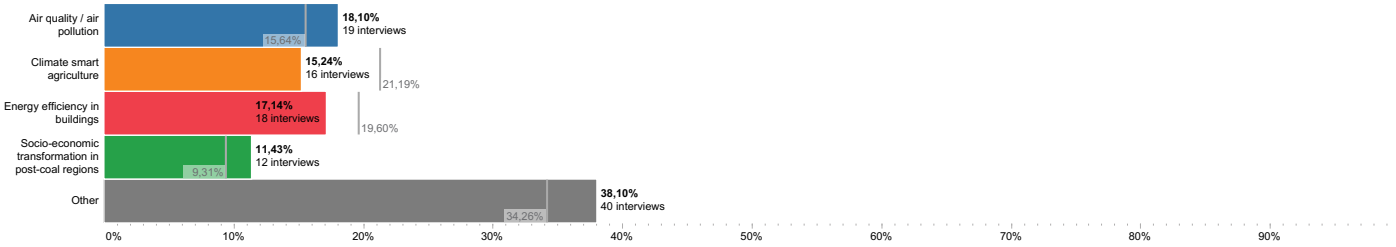
Number of contacted persons: 122
Finalised interviews: 105
Number of people not interested in participating in the study: 11
Response rate: 90.9%
Total number of nominations: 189
Total number of unique nominations: 147
Average amount of nominations by interview: 1.8

Interviewee profiles

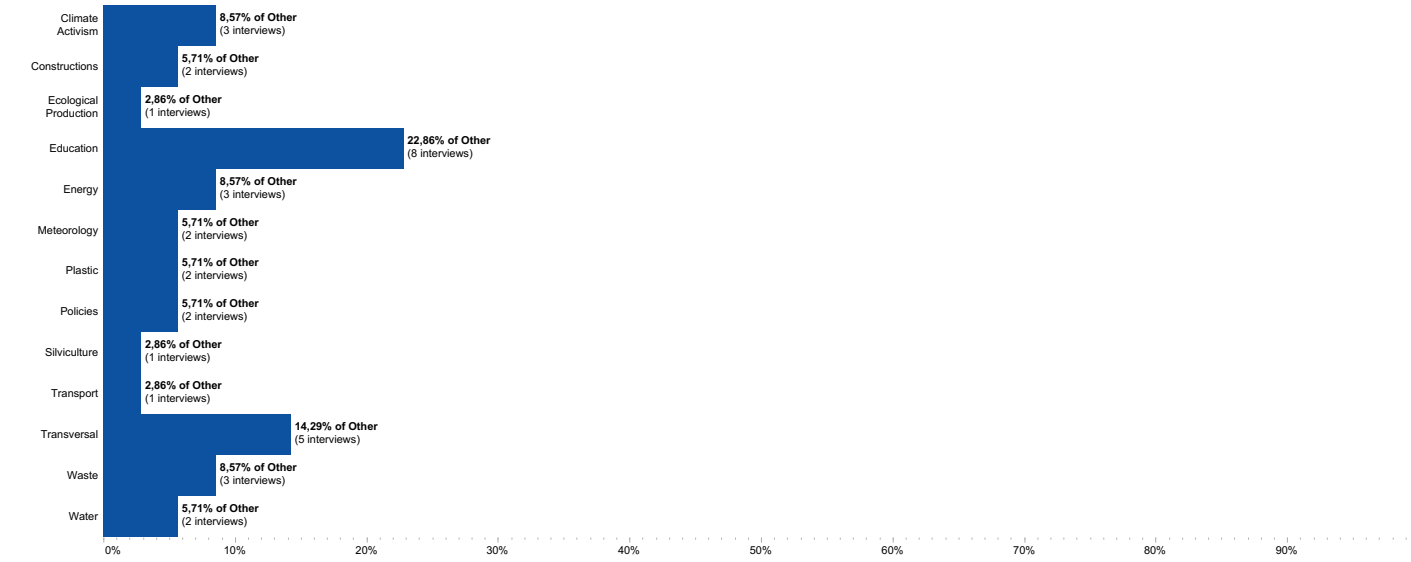
Distribution of interviewees by gender
(* data based on 105 conducted interviews)



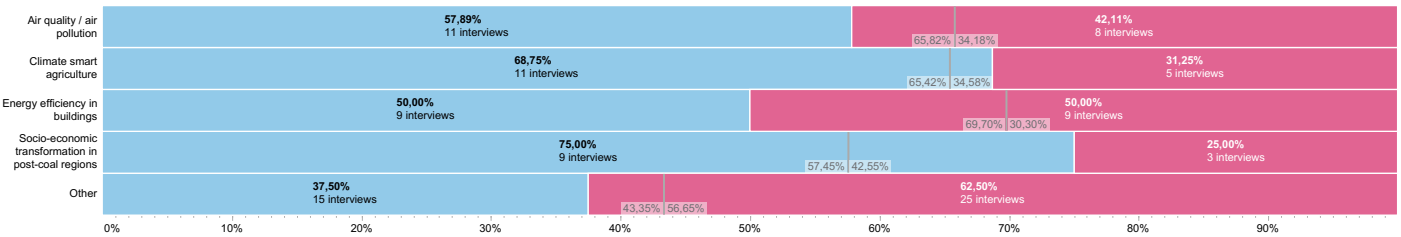
Distribution of interviewees by primary activity sector
(* data based on 105 conducted interviews)



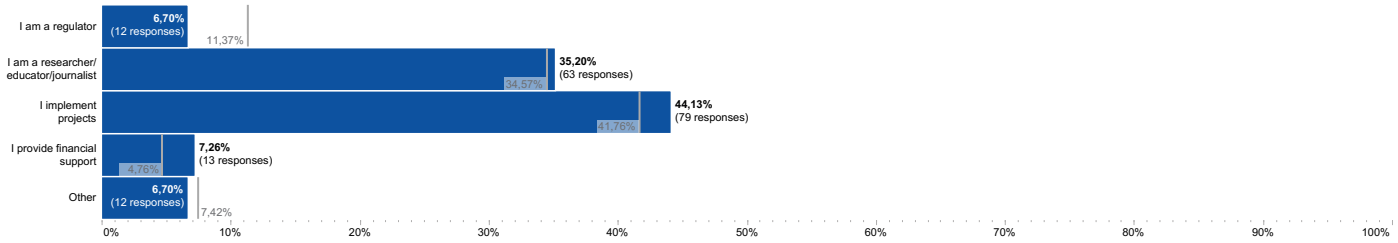
Distribution of interviewees by primary activity sector
(* data based on 105 conducted interviews)



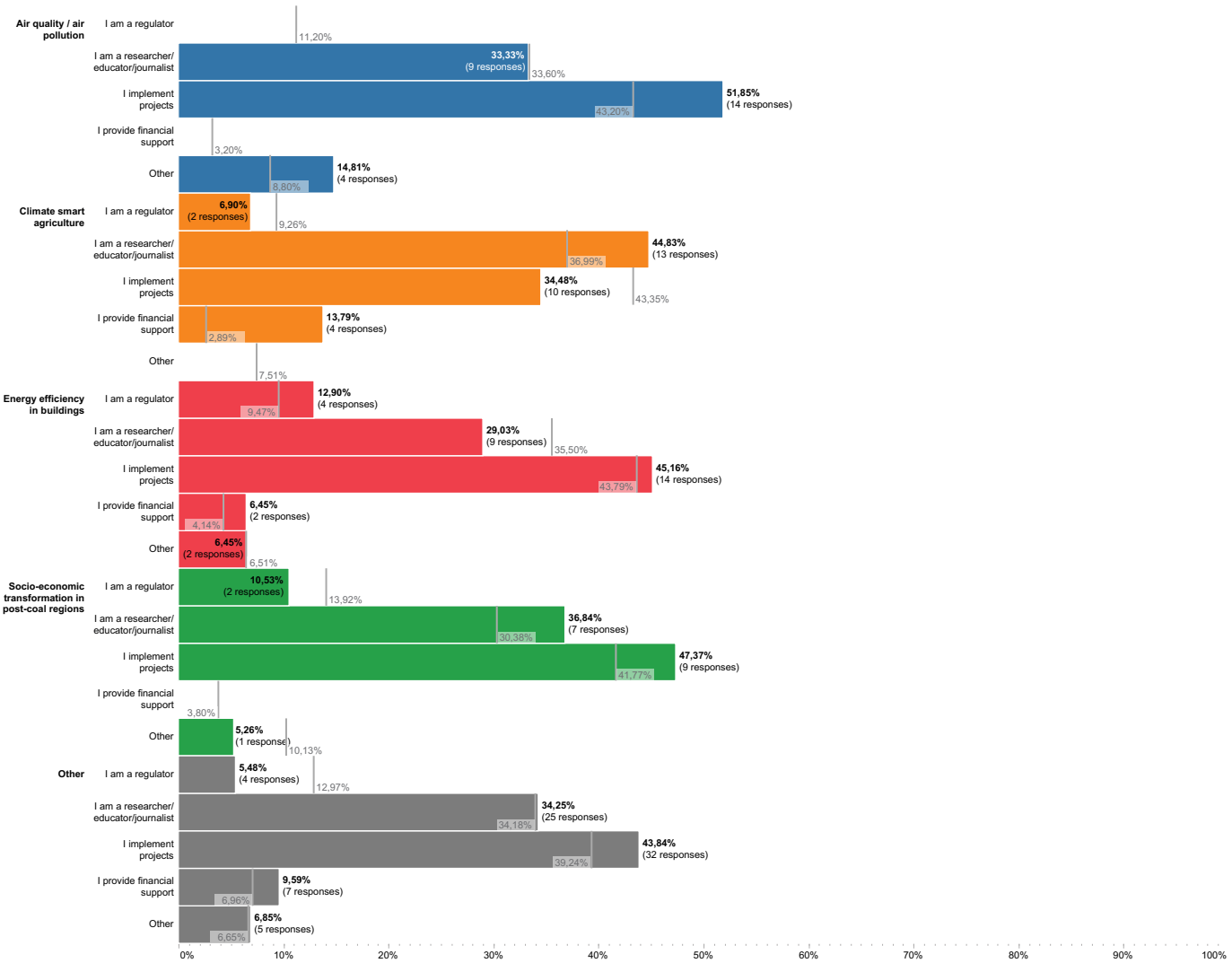
Gender distribution by primary activity sector
(* data based on 105 conducted interviews)



Distribution of interviewees by the type of role
(* data based on 105 conducted interviews)

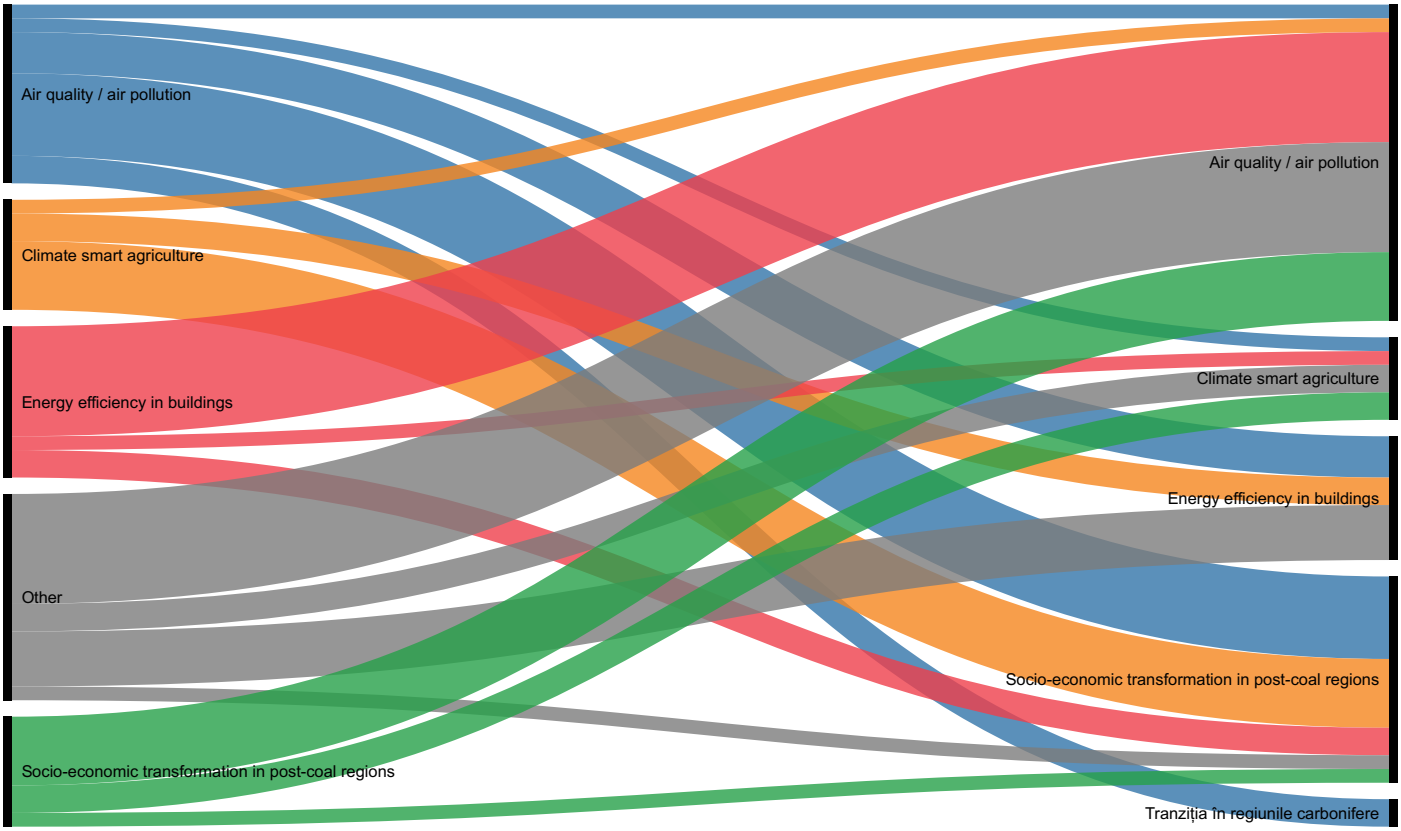


Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 105 conducted interviews)

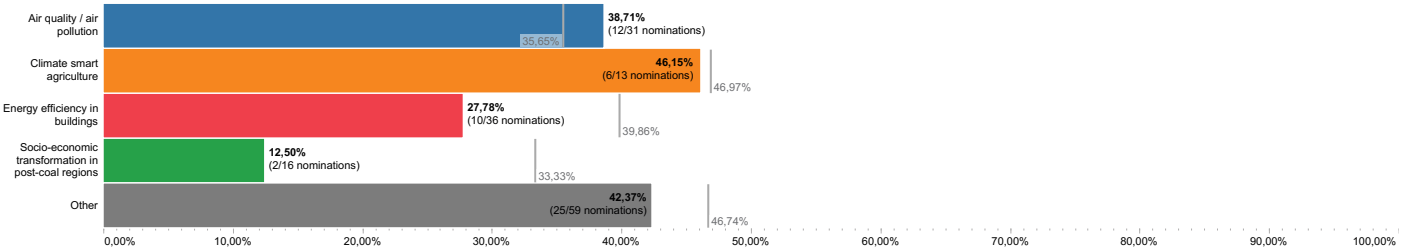


Distribution of interviewees by region
(* data based on 105 conducted interviews / regions with more then 2 interviewed persons)

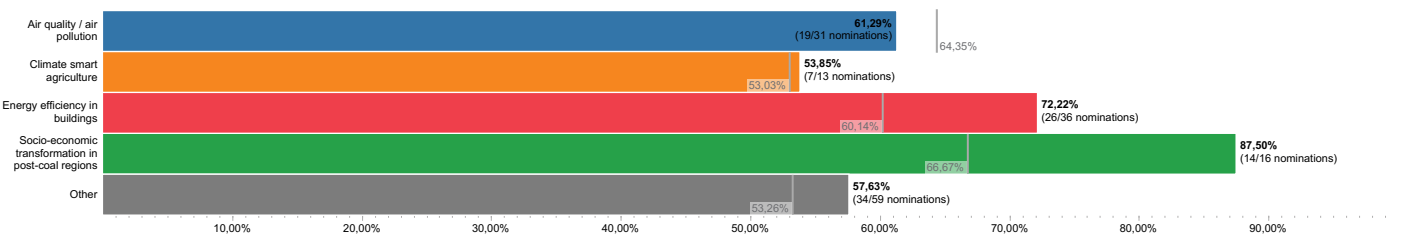
Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 105 conducted interviews)



Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 105 conducted interviews)

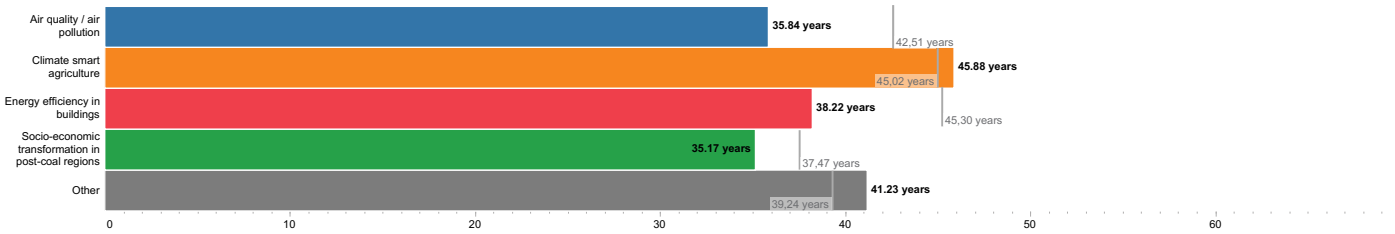


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 105 conducted interviews)

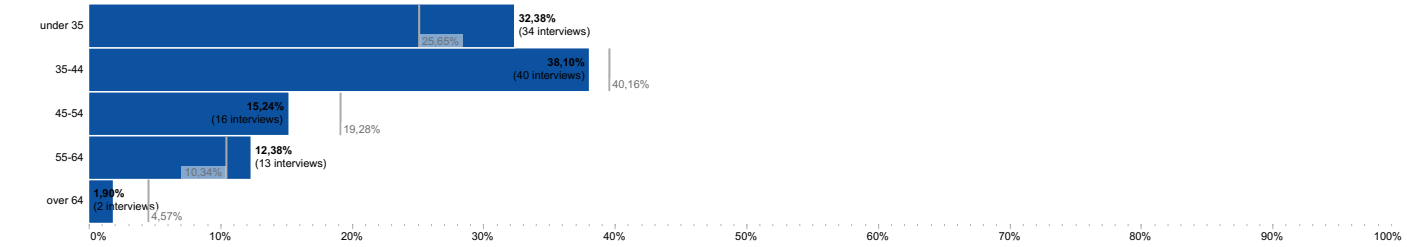


Average age of interviewees: 39.75 years (Regional average: 41.62 years)
(* data based on 105 conducted interviews)

Average age by primary activity sector
(* data based on 105 conducted interviews)



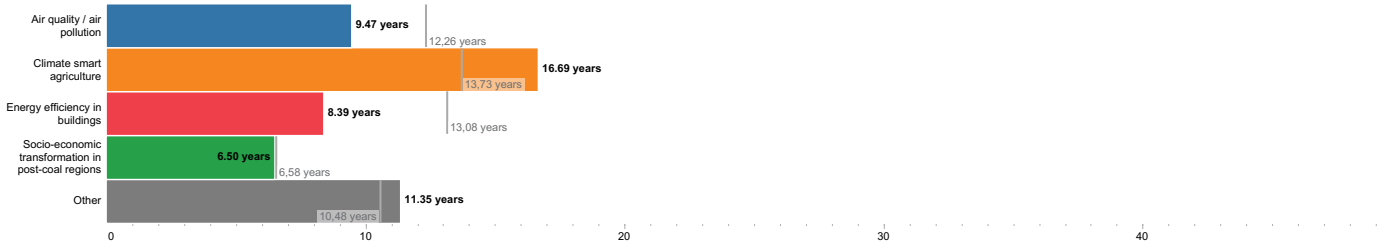
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 105 conducted interviews)



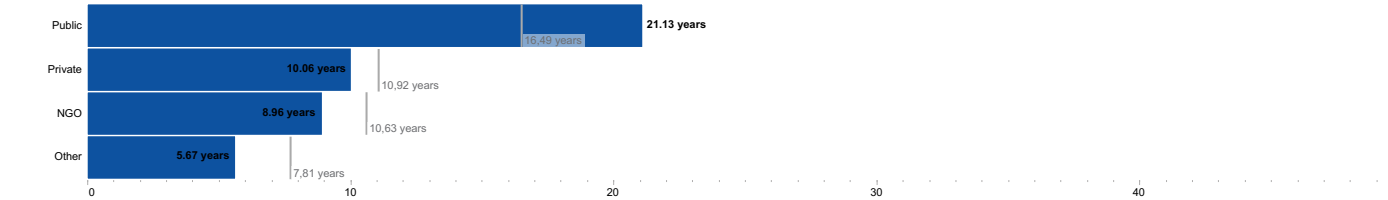
Average number of years of experience: 10.76 years (Reginal average: 11.58 years)
(* data based on 105 conducted interviews)

Average number of years of experience by gender
(* data based on 105 conducted interviews)

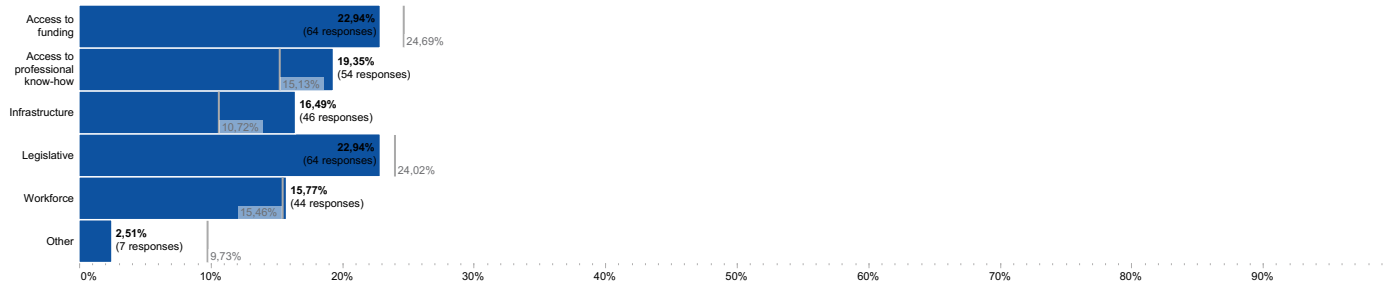
Average number of years of experience by primary activity sector
(* data based on 105 conducted interviews)



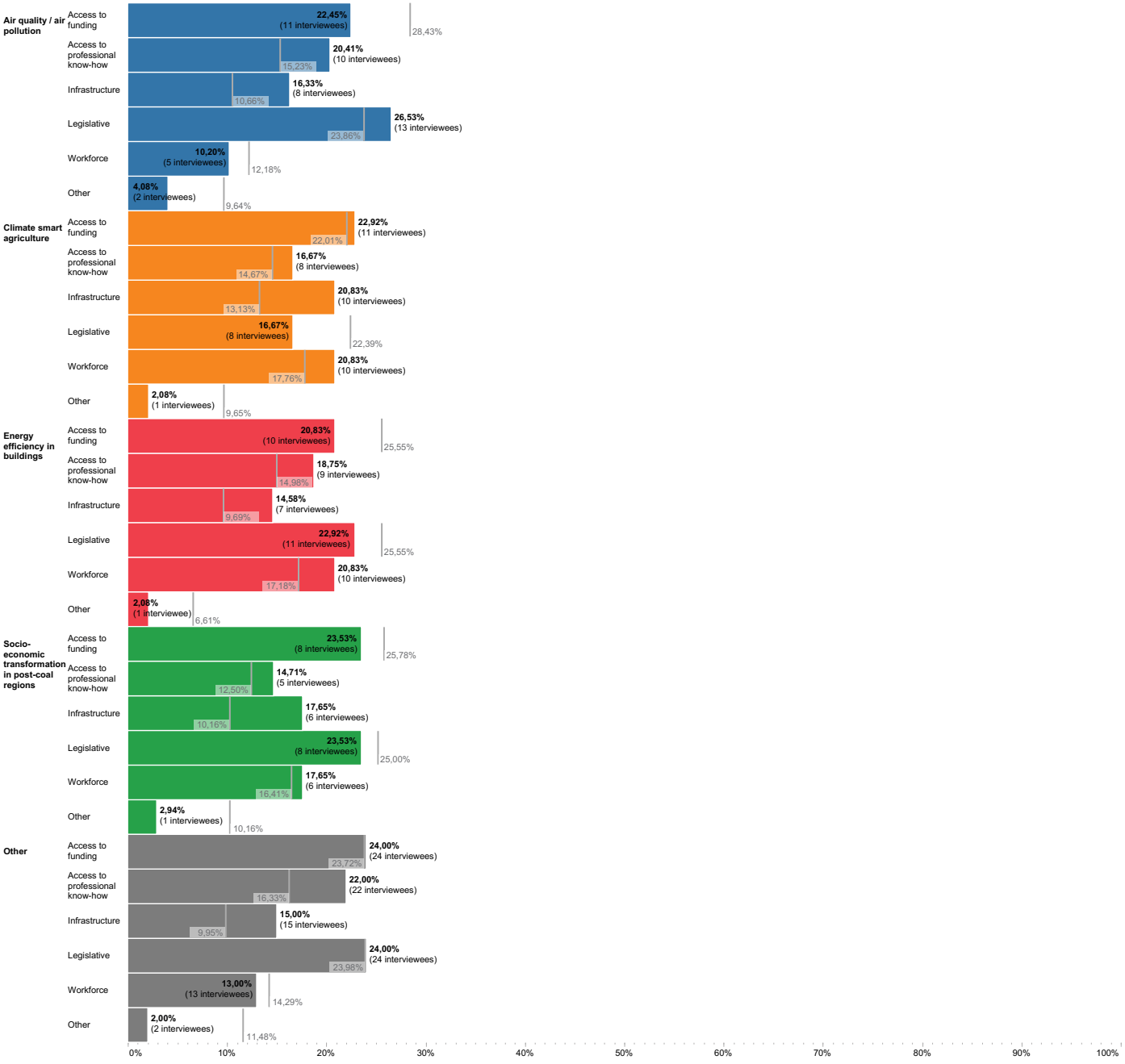
Average number of years of experience by the legal status of their member association
(* data based on 105 conducted interviews)



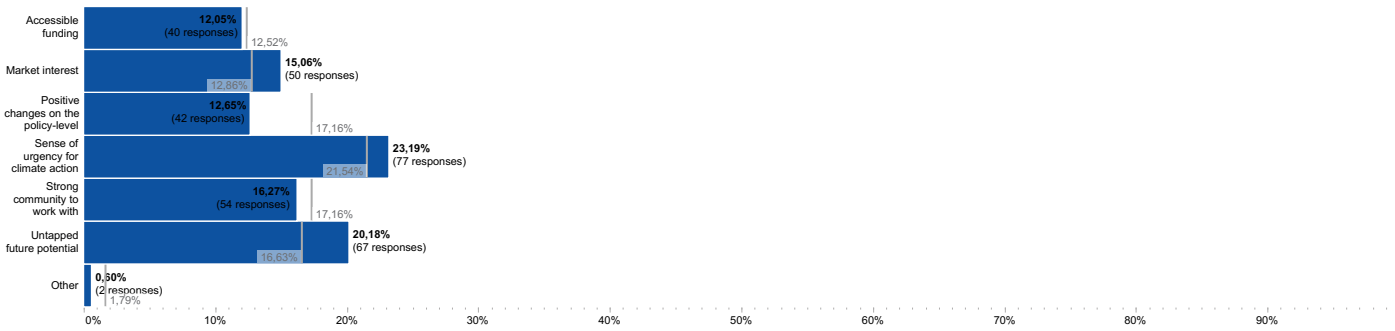
Distribution of interviewees by Barriers/Challenges category
(* data based on 105 conducted interviews)



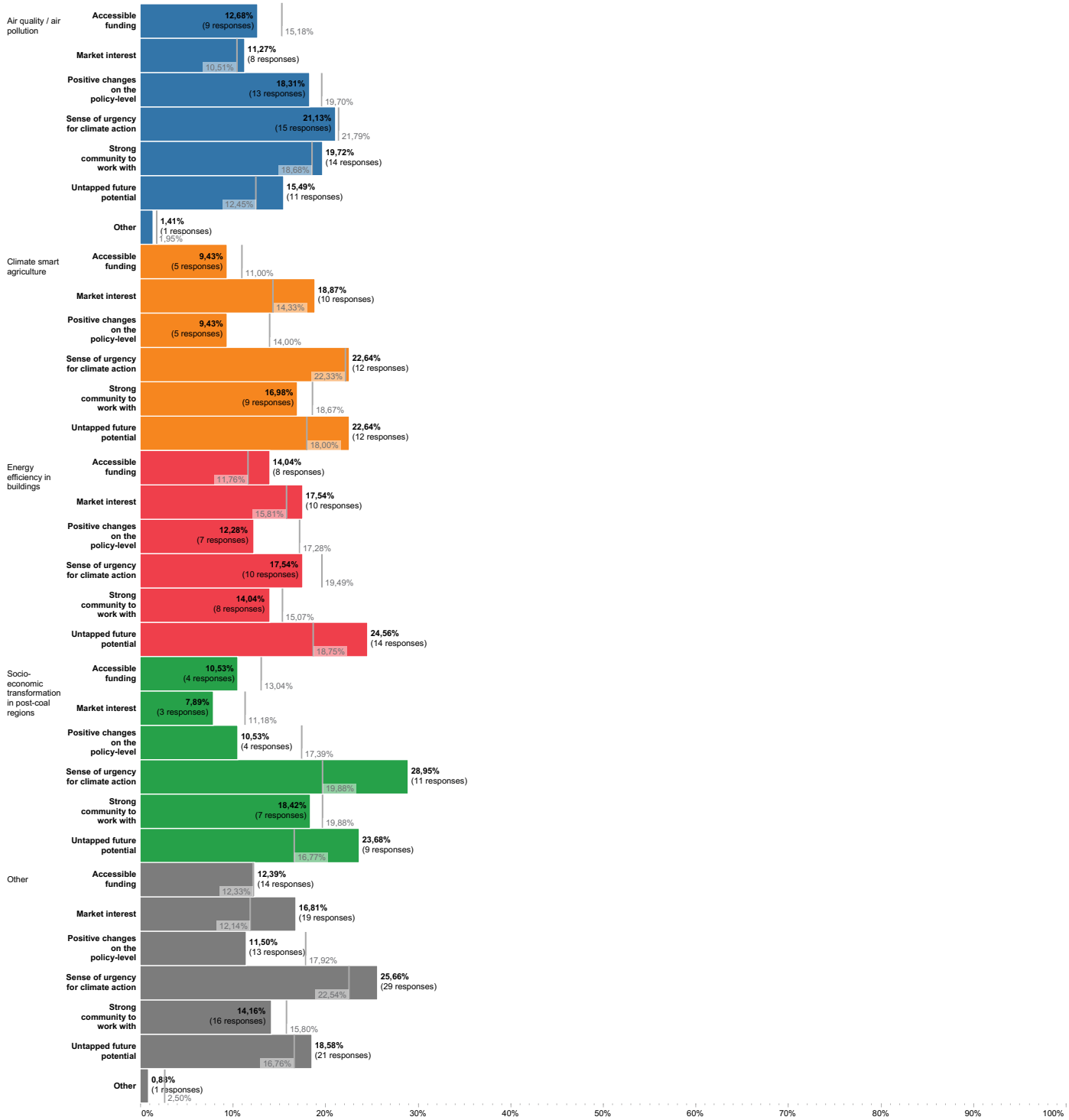
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 105 conducted interviews)



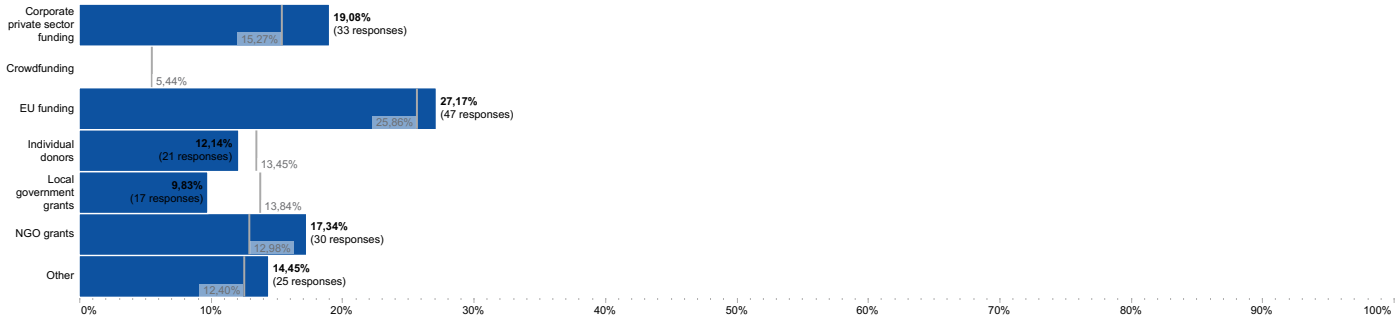
Distribution of interviewees by Opportunities category
(* data based on 105 conducted interviews)



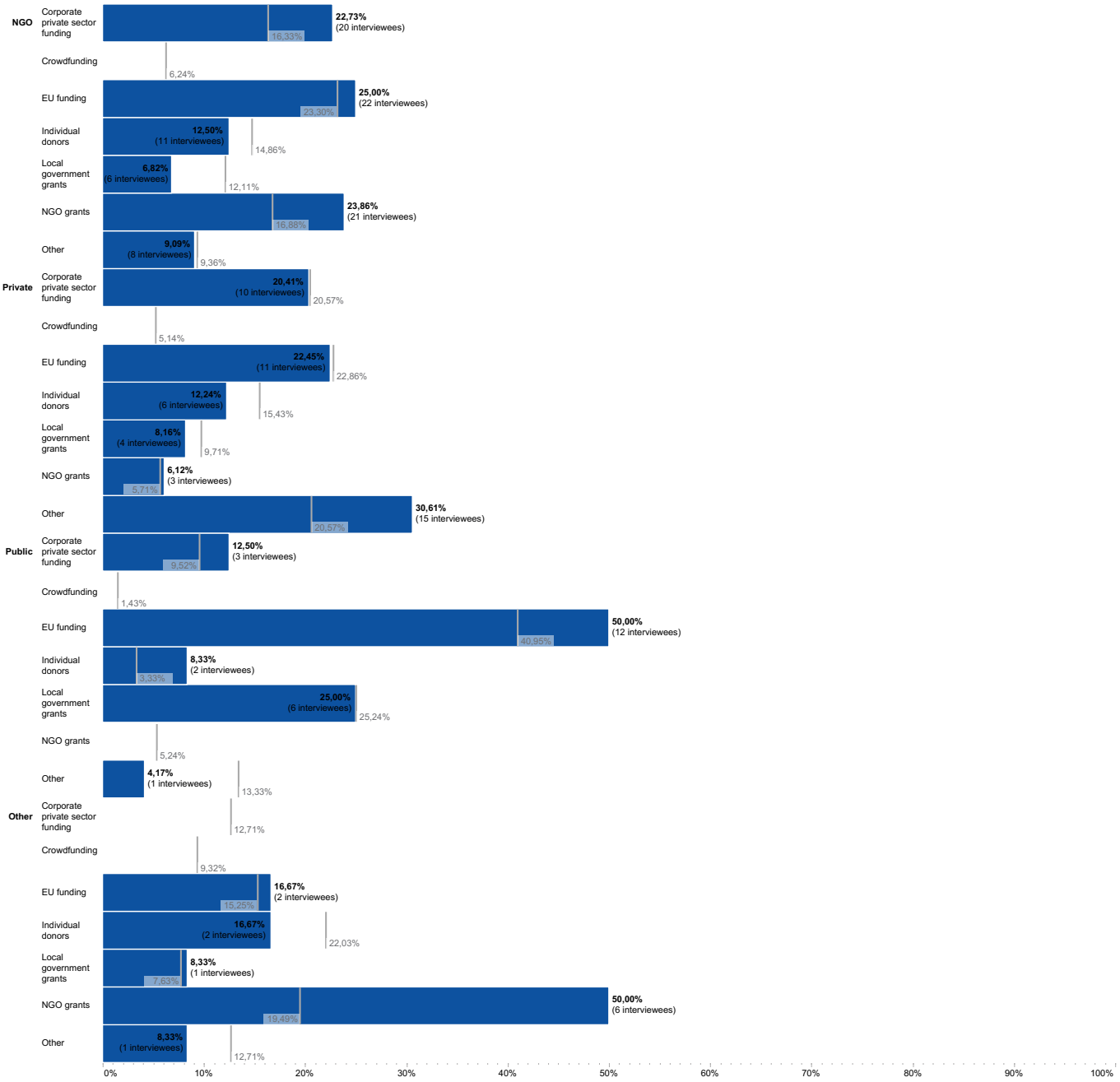
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 105 conducted interviews)



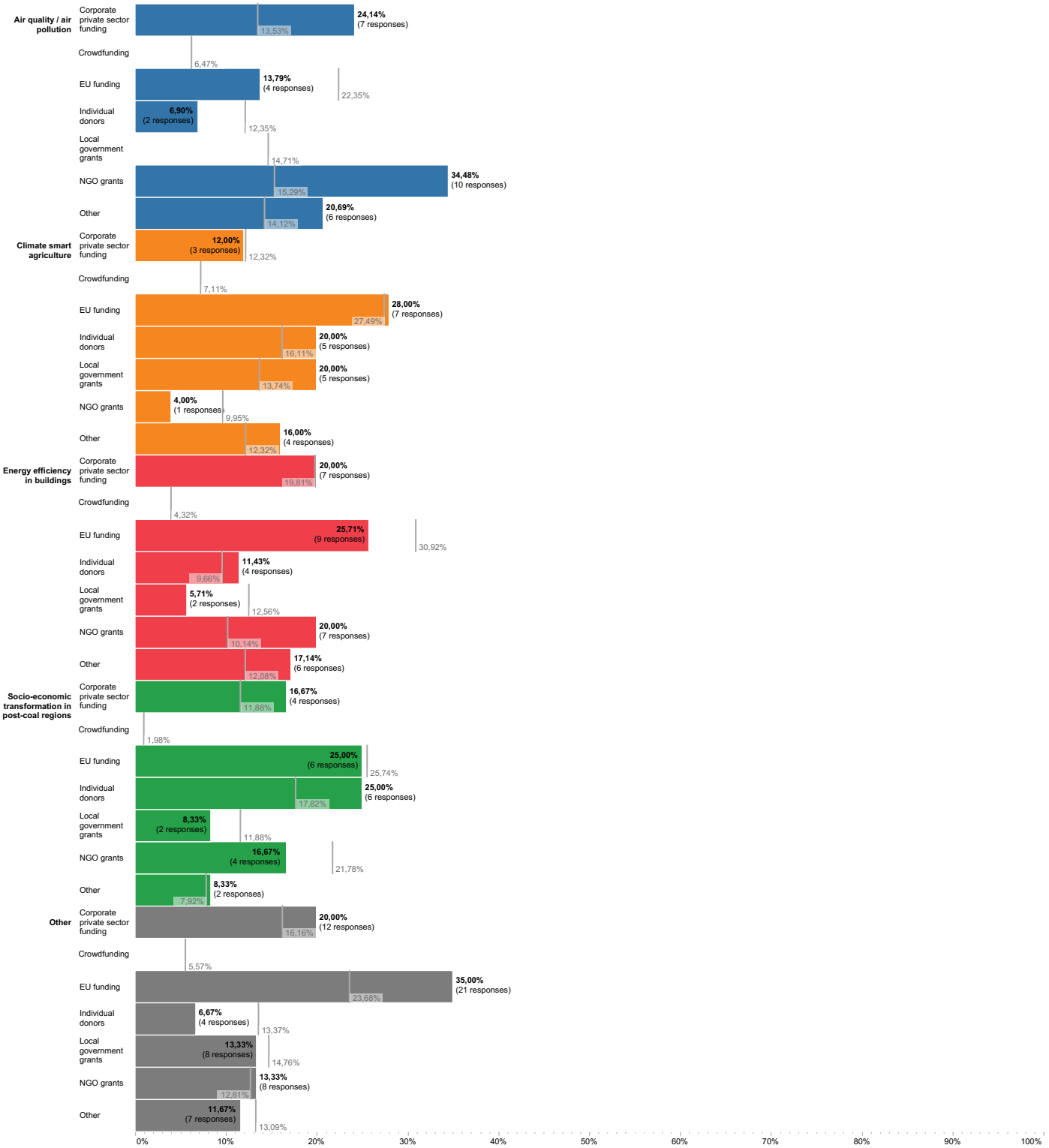
Distribution of interviewees by Funding opportunities category
(* data based on 105 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 105 conducted interviews)

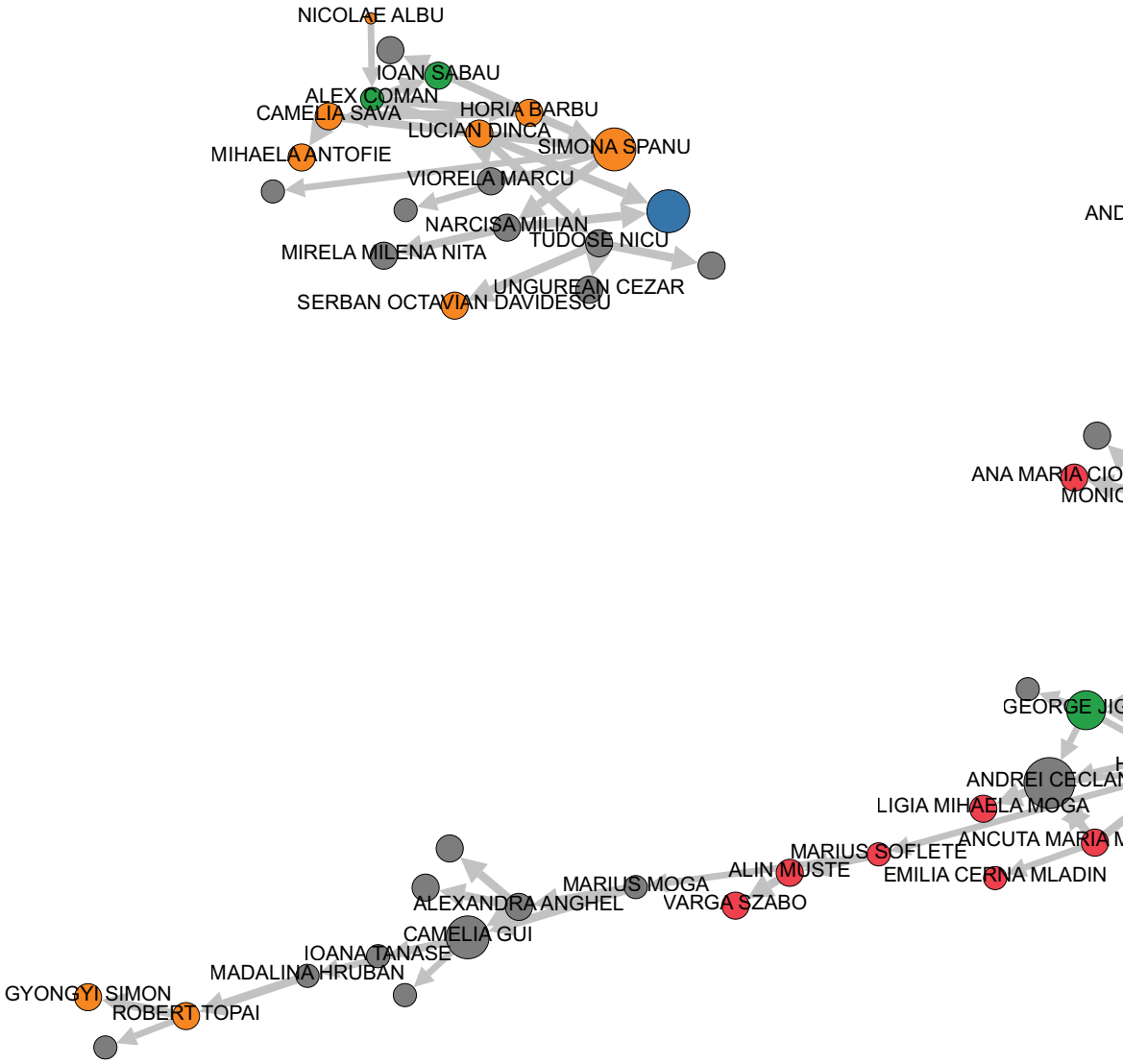


Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 105 conducted interviews)



Social network analysis

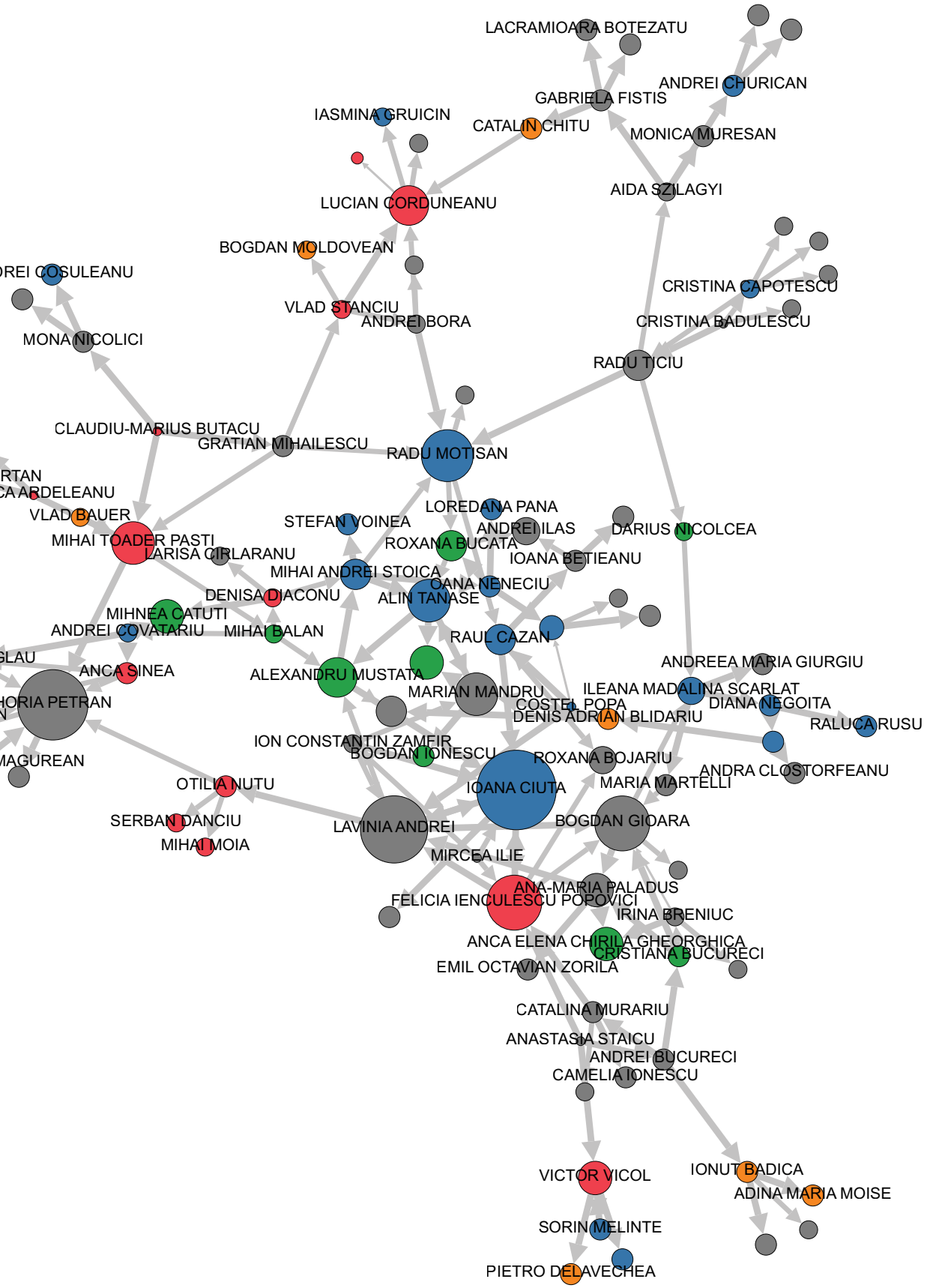
Overall social network map diagram (147 nodes / 189 edges)



Primary activity sector:

- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

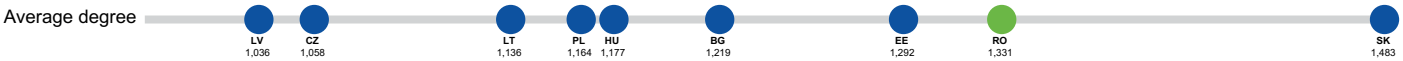
Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)


LACRAMIOARA BOTEZATU
ANDREI CHURICAN
GABRIELA FISTIS
IASMINA GRUICIN
CATALIN CHITU
MONICA MURESAN
AIDA SZILAGYI
LUCIAN CORDUNEANU
BOGDAN MOLDOVEAN
CRISTINA CAPOTESCU
VLAD STANCIU
ANDREI BORA
CRISTINA BADULESCU
MONA NICOLICI
RADU TICIU
CLAUDIU-MARIUS BUTACU
GRATIAN MIHAILESCU
RADU MOTISAN
VLAD BAUER
LOREDANA PANA
STEFAN VOINEA
ANDREI ILAS
DARIUS NICOLCEA
MIHAI TOADER PASTI
ROXANA BUCATA
LARISA CIRLARANU
IOANA BETIEANU
MIHAI ANDREI STOICA
OANA NENECIU
DENISA DIACONU
ALIN TANASE
MIHNEA CATUTI
ANDREI COVATARIU
MIHAI BALAN
RAUL CAZAN
ANDREEA MARIA GIURGIU
ANCA SINEA
ALEXANDRU MUSTATA
ILEANA MADALINA SCARLAT
MARIAN MANDRU
COSTEL POPA
DIANA NEGOITA
DENIS ADRIAN BLIDARIU
RALUCA RUSU
ION CONSTANTIN ZAMFIR
BOGDAN IONESCU
ROXANA BOJARIU
ANDRA CLOSTORFEANU
OTILIA NUTU
IOANA CIUTA
MARIA MARTELLI
SERBAN DANCIU
LAVINIA ANDREI
BOGDAN GIOARA
MIHAI MOIA
MIRCEA ILIE
ANA-MARIA PALADUS
FELICIA IENCULESCU POPOVICI
IRINA BRENIUC
ANCA ELENA CHIRILA GHEORGHICA
CRISTIANA BUCURECI
EMIL OCTAVIAN ZORILA
CATALINA MURARIU
ANASTASIA STAICU
ANDREI BUCURECI
CAMELIA IONESCU
VICTOR VICOL
IONUT BADICA
ADINA MARIA MOISE
SORIN MELINTE
PIETRO DELAVECHEA

Social network statistics

Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals

Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

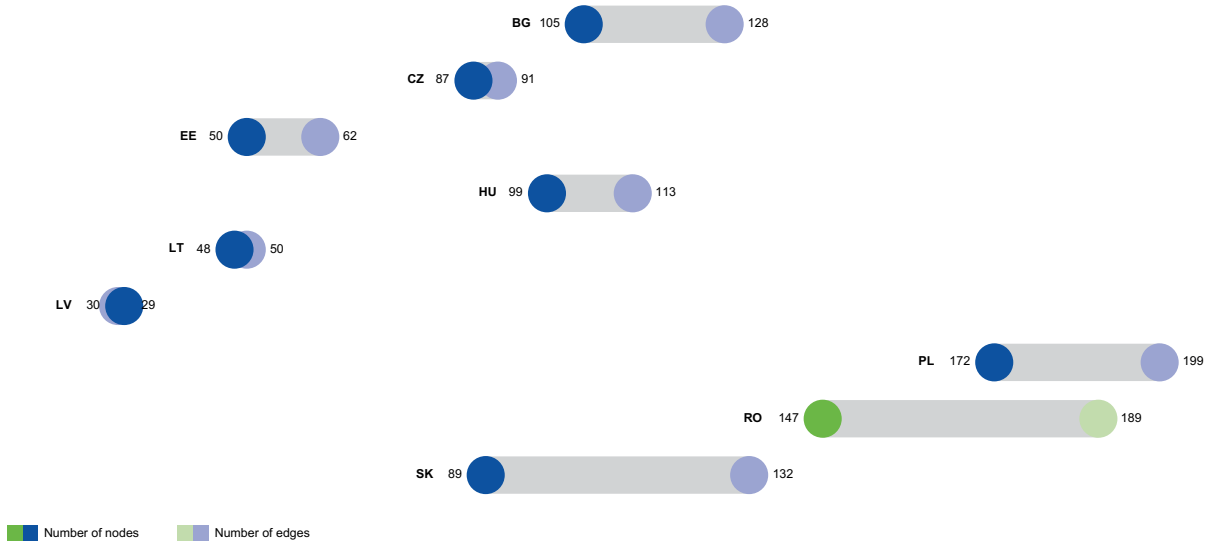
Number of discrete groups in the network

Number of nodes

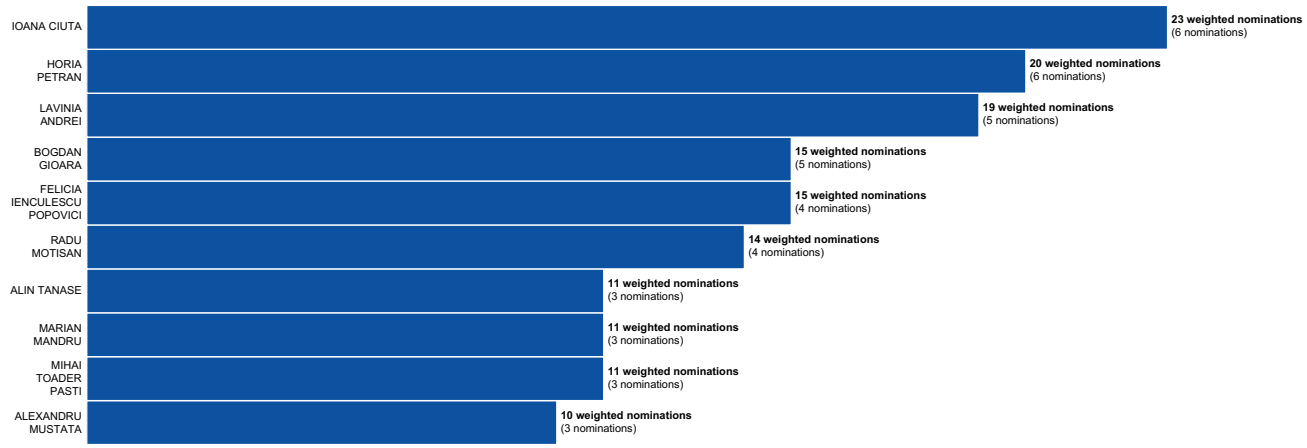
Number of individuals in the network

Number of edges (links)

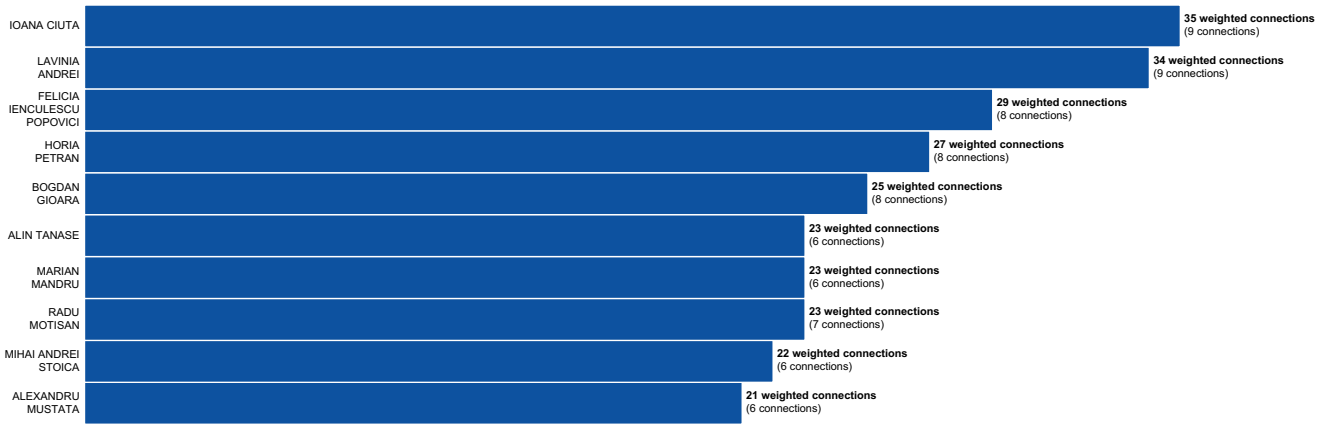
Number of relationships between individual in the network (in total)



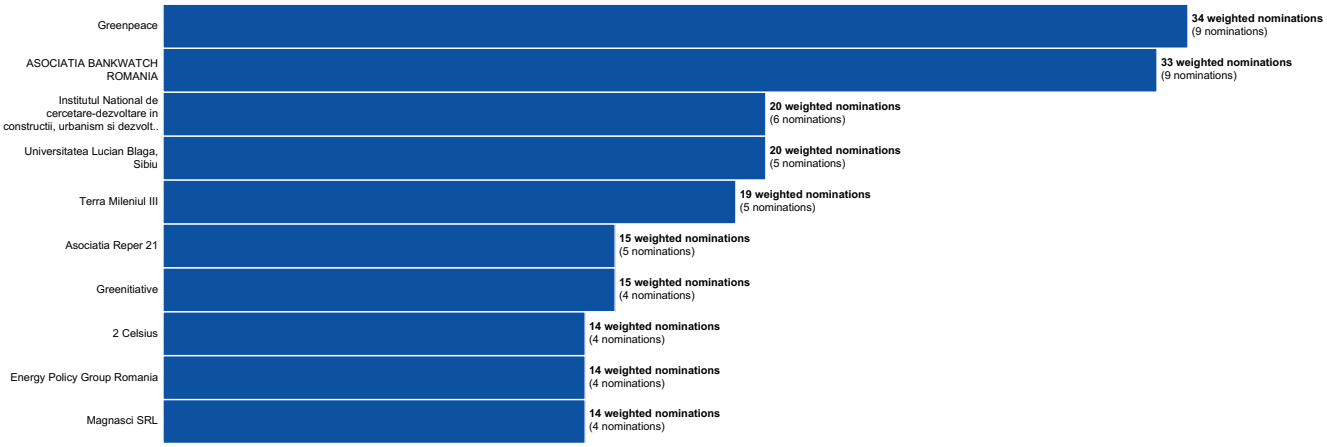
Top interviewees by the number of nominations (weighted in-degree) (* 2 or more nominations)



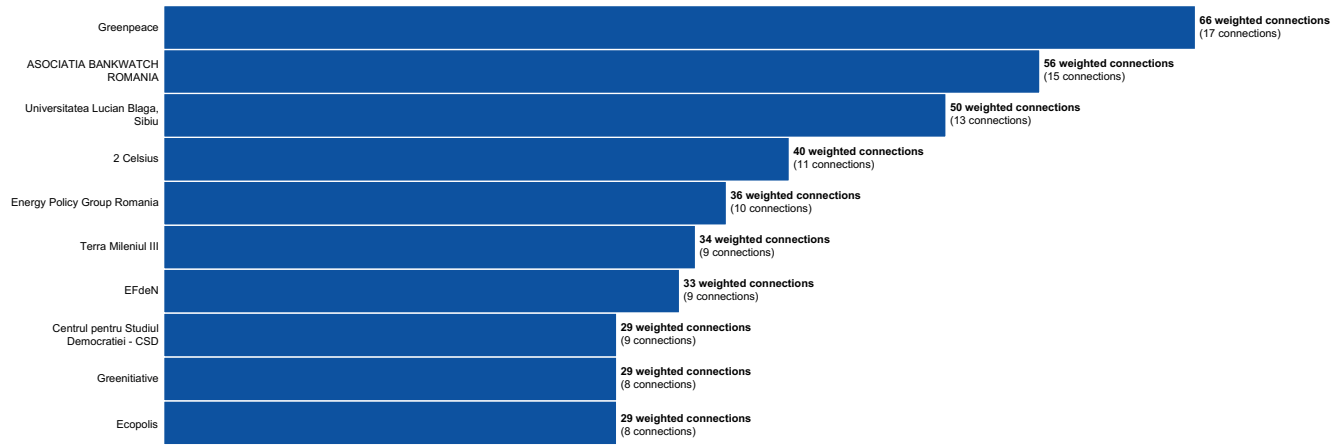
Top interviewees by the overall degree (in-degree and out-degree) (* 2 or more connections)



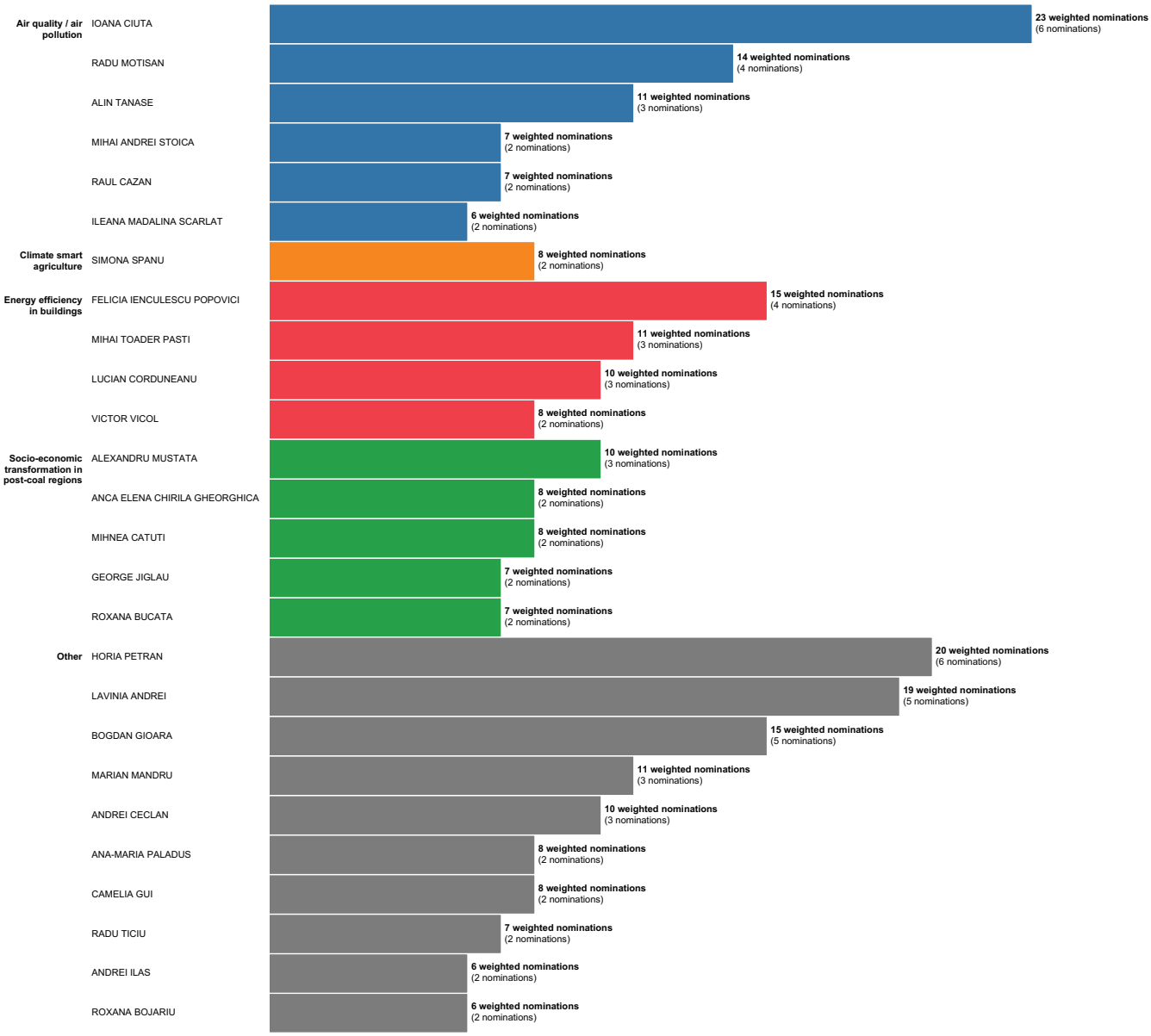
Top organisations by the number of nominations (in-degree) (* 2 or more nominations)



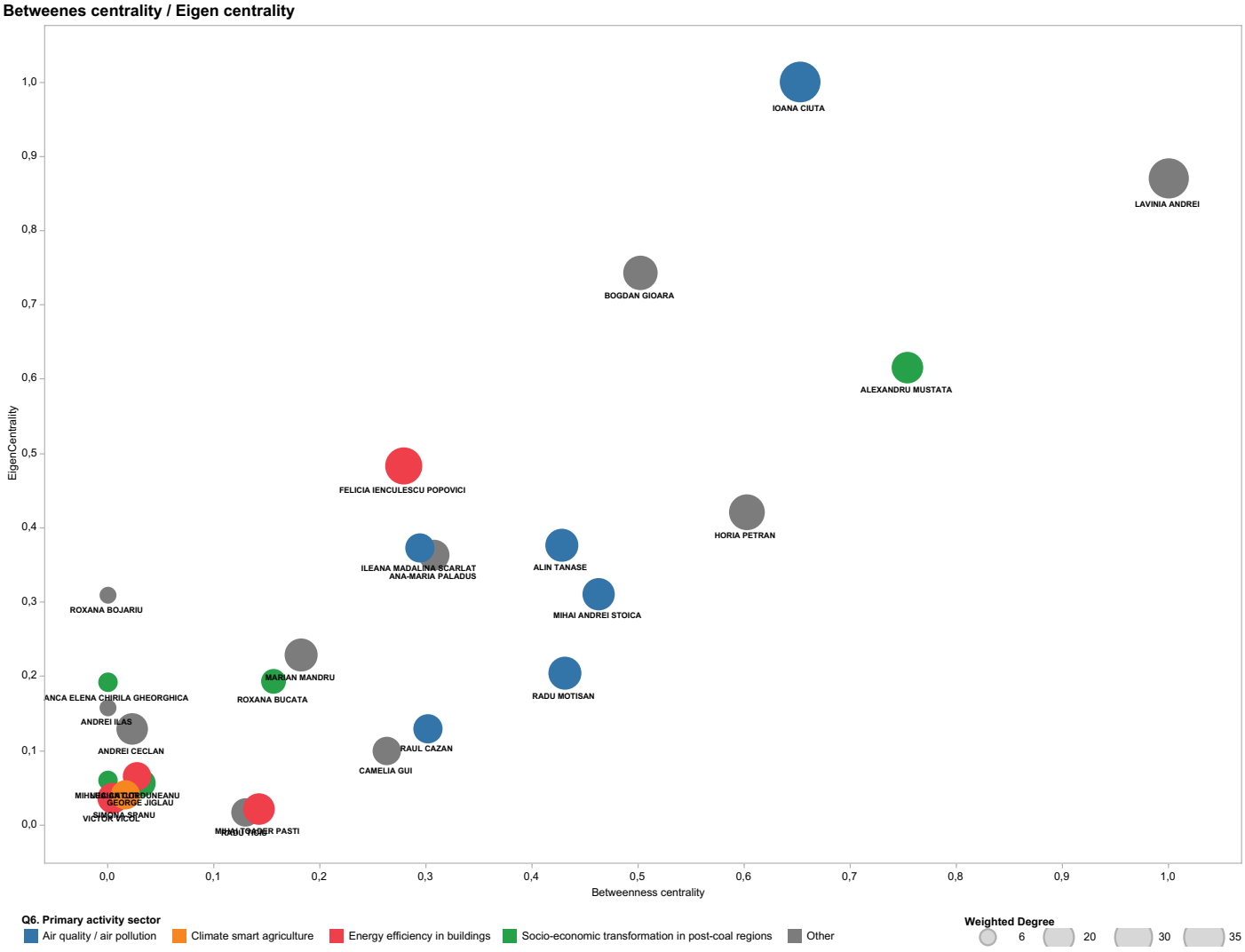
Top organisations by the overall degree (in-degree and out-degree) (* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector (* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with 2 or more nominations)



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 2: Qualitative and Network Analysis Bulgaria

Author: **Yasen Georgiev**
For Ashoka

While climate change and environmental issues are very important for most EU citizens, they do not represent such a major concern for Bulgarians. 22% of Europeans see climate change as the most important issue facing the EU, and it ranks second at European level as of mid-2019[1]. The environment ranks sixth, being mentioned by 13% of EU citizens. However, only 10% of Bulgarian citizens rank climate change as the most pressing issue, coming in the fifth/sixth position, while the environment only ranks on the eighth/night place (6%). 20% of the EU citizens consider the environment, climate and energy issues as one of the two most important issues at national level, occupying the fourth position. At the same time, these issues do not rank among the two most important issues facing Bulgaria – they only come in ninth (6%). For various reasons, climate and environment issues are not widely recognized as a major concern in Bulgaria. Nonetheless, even though local climate innovation is still nascent, there is increasing bottom-up awareness on climate and environment issues that impacts businesses and involves a growing number of stakeholders. Such innovations tackle issues ranging from energy efficiency and energy poverty to air quality and shared transportation.
Even though Bulgaria has its own Climate Change Mitigation Act, climate action is not recognized as an important issue. This legislation is implemented as part of the National Climate Change Adaptation Strategy and Action Plan. However, sufficient efforts on how to mitigate climate change impacts on the Bulgarian economy and particularly on the agriculture are still missing. Climate change can play a significant role for Bulgaria and if no action is taken more seriously, climate change impacts might reduce economic growth close to zero by 2050[2].

Energy efficiency in buildings

General context

Currently, there are 3 million households and 3.9 million housing units in Bulgaria, which may look like an oversupply. In fact, almost one-third of these homes are uninhabited, suggesting that about 3 million Bulgarian households live in less than 3 million housing units[3]. This is not only observed in small settlements, but also in big cities. In the two largest cities of Bulgaria, Sofia and Plovdiv, 24% and respectively 26% of all dwellings are uninhabited. Uninhabited housing hampers maintenance and accelerates deterioration since unoccupied properties located in multi-family buildings impede the implementation of energy efficiency programs and construction reinforcement. At the same time, 75% of the apartments in Bulgaria are in buildings that are more than 30 years old[4]. Currently, 44.000 buildings need renovation, especially in the field of energy efficiency.

Innovation

All these figures pave the way for extensive energy efficiency measures both in residential and non-residential buildings. Understandably, the construction of new buildings by private investors is usually oriented towards achieving more energy efficiency and reducing environmental impact. This is illustrated by the increasingly popularity of certifications such as BREEAM and LEED, which give new office and retail buildings a competitive advantage for seizing environmentally-friendly tenants.

When it comes to innovation, Bulgaria ranks as a Modest Innovator, with its overall performance in terms of innovation and R&D being well below the EU average and overall stable since 2010[5]. However, business enterprise R&D expenditure[6] in the construction sector displayed a positive trend: it grew significantly by almost 49% from EUR 683,000 in 2009 to EUR 1,017,000 in 2015[7]. In general, the Bulgarian construction sector has committed important investments to R&D, which also explains why the productivity of the industry increased between 2010 and 2017. These investments mostly come from large companies (250+ employees).

The academic R&D on the topic is locally driven by the Central Laboratory of Solar Energy and New Energy Sources, which is part of the Bulgarian Academy of Sciences. It is currently implementing a project funded under Horizon 2020, called

1 Standard Eurobarometer 91, Spring 2019
2 World Bank, Bulgarian Ministry of Environment and Water
3 World Bank, "Bulgaria housing stock overview" 2017
4 National Housing Strategy 2030
5 Innovation Union Scoreboard 2017
6 BERD
7 European Construction Sector Observatory, Country Fact Sheet Bulgaria, 2019

Industrial Development of Water Flow Glazing Systems (InDeWaG). Together with ETEM, Bulgaria it is responsible for the construction and maintenance of a Zero Energy Building (ZEB), which uses Fluid Flow Glazing facades (FFG) and Radiant Interior Walls (RIW). The project focuses on the industrial production of standardized building components, which can be used for multiple types of ZEBs in different climate zones. It also focuses on the development of a simulation tool for precise early stage planning of buildings which use these innovative glazing building envelope and interior elements.

Energy Poverty in Bulgaria

Bulgaria has the highest domestic energy poverty in the EU[8]. Bulgaria is the EU Member State with the highest share of the lowest income quintile citizens living in dwellings not comfortably cool in summer (71%) and not being able to keep their homes warm in winter (64%). For example, more than 250.000 people were eligible for heating allowances from the State in 2019. At the same time, the lowest income level population in Bulgaria suffers heavily from the weight of their energy expenditures, which represents more than 14% of their disposable income. As energy poverty is an issue of significant social importance for Bulgaria, important progresses are needed to alleviate both summer and winter domestic energy poverty.

Public policies

The "National Program for Energy Efficiency" 2017-2019 was a major program designed to tackle energy efficiency shortcomings with a total budget of EUR 1 billion. The program covered full renovation costs for 2022 buildings. As the continuation of the program is not envisaged past 2020, it has a fading effect. Another source for financing energy efficiency in buildings is the operational programme "Regions in Growth" 2014-2020. It supports energy efficiency projects in small municipalities with a budget of EUR 104million, of which 67% is already paid to contractors.

The Sustainable Energy Development Agency (SEDA) is the legal successor of the executive Energy Efficiency Agency (EEA) and directly acts according to the Energy Efficiency Act, Energy from Renewable Sources Act and the Energy Act. Its mission is to contribute to the implementation of state policy aiming at increasing energy efficiency in terms of consumption and production. The National Trust EcoFund (NTEF), established in October 1995, manages assets from the state budget to run several programs including energy efficiency for municipalities and public awareness campaigns. Other relevant ecosystem actors MOVE.BG, a local platform and a think-and-do tank for innovative solutions, partnered in 2019 with the Social Innovation to Tackle Energy Poverty Accelerator, an initiative co-created by Ashoka and the Schneider Electric Foundation, under the aegis of Fondation de France. The outcome of this partnership was a pilot participation of Bulgarian projects in a fuel poverty solutions competition and an acceleration programme for innovators.

The Buildings Performance Institute Europe (BPIE) is dedicated to improving the energy performance of buildings across Europe, and thereby helping to reduce CO2 emissions from the energy used by buildings. BPIE elaborated in 2012 a study proposing nearly Zero-Energy Buildings (nZEBs) definitions and policy implementation roadmaps for Bulgaria by 2020. This study is based on an in-depth analysis of the local conditions, building stock data, and policy and regulatory contexts. Eneffect Center for Energy Efficiency is a non-profit non-governmental organization that seeks to support the efforts towards sustainable development at all governance levels in the country through more efficient use of energy, including in the field of construction of nZEBs in Bulgaria.

Climate-smart agriculture

General context

Agriculture's share in Bulgaria's economy is on a constant decline – from almost 10% in 2000 to slightly above 4% in 2018. The single payment schemes embedded in the concept behind the EU's Common Agricultural Policy (CAP) led to a high level of concentration of land property in the hands of a very limited number of owners. According to a study from the European Parliament, more than 82% of the agricultural land belongs to less than 1.5% of the owners.

8 European Energy Poverty Index 2019

Innovation

Most innovation in the sector is predominantly driven by the National Agricultural Advisory Service (NAAS), which aims at providing farmers with information, specialized consulting, and expert assistance for the implementation of efficient and competitive agriculture in accordance with the EU standards.

Up to 20 operational groups are to be supported by 2020 with a budget of EUR 10millionwithin an innovation-supporting scheme belonging to the EU-funded "Rural Development" Program 2014-2020. Overall, it is meant to support revitalizing rural areas, which goes hand in hand with providing incentives for innovations. Nevertheless, innovation in climate-smart agriculture remains underutilized and mainly driven by non-state actors.

The younger segment of the population is generally more inclined to adopting smart climate-smart solution in any field, including the agriculture one. Even though there are no official statistics, there is reportedly a growing group of young farmers and city farming supporters with high educational profile and ICT skills that apply innovative and climate-smart solutions in agriculture.

Even though Bulgaria has its own Climate Change Mitigation Act, climate action is not recognized as an important issue. This legislation is implemented as part of the National Climate Change Adaptation Strategy and Action Plan. However, sufficient efforts on how to mitigate climate change impacts on the Bulgarian economy and particularly on the agriculture are still missing. Climate change can play a significant role for Bulgaria and if no action is taken more seriously, climate change impacts might reduce economic growth close to zero by 2050[9].

Other relevant ecosystem actors

Climate-smart agriculture and innovations are driven by private companies, start-ups, NGOs (Greenpeace Bulgaria, Ecological Farming Unit), private institutes and consulting companies (Institute for Agrostrategies and Innovations, InteliAgro). For example, AgroHub.BG – a Digital Innovation Hub (DIH) for agriculture aims to bring together knowledge and resources for the agrarian industry in order to generate solutions for its problems and to meet its needs. It functions as a portal that allows different agribusiness units linked to agribusiness and technology (farmers, machinery, equipment and software manufacturers, organizations, institutions and all other stakeholders) to communicate and interact with each other. Another important actor is Cleantech Bulgaria, a business network focused on clean technologies, innovation and sustainable development. Cleantech Bulgaria is the Bulgaria partner of EIT Climate-KIC Accelerator, which is Europe's largest green tech accelerator for early stage start-ups. The Accelerator offers a unique program suitable for young companies, spin offs and even non-incorporated teams of entrepreneurs who want to deliver sustainable business solutions, clean technologies and climate innovation in priority sectors such as biotech, foodtech, precise agriculture and sustainable land use, etc.

Socio-economic transformation in post-coal regions

General context

Two of the 41 regions in the EU that dependent on coal are in Bulgaria where a substantial part (48%) of the electricity in the country is produced by coal power plants[10]. This contributes to air quality challenges even outside big cities.

Innovation

Energy transition and the corresponding socio-economic transformation in post-coal regions is something current decision-makers try to neglect or at least postpone as much as possible. The lack of open discussions and public recognition of the issue keeps innovation away from coal dependent regions both in terms of industrial transformation and vocational training of the people concerned.

Public opinion

Even though no specific opinion polls cover the public sentiment towards the coal-powered mining industry and electricity production, it is fair to assumed that especially those people living in coal dependent region would strongly oppose

9 World Bank, Bulgarian Ministry of Environment and Water

10 Ministry of Energy of Bulgaria, 2019

phasing out the coal-related energy and see energy transition as a threat to the way they earn their living. Needless to say, a broad information campaign including the constant monitorization of public opinion would be much needed.

Public policies

There is a lack of real projects aimed at facilitating the energy transition in Bulgaria. At present, the two coal-dependent regions in Bulgaria do not participate in EU's transition initiative included as a non-legislative element of the "Clean energy for all Europeans" package.

During the 2018 United Nations Climate Change Conference in Katowice, the President of Bulgaria officially declared the country's support and commitment to the Paris Agreement objectives, but at the same time mentioned that it should not be at the expense of jobs and local industry. Within the 2019 United Nations Climate Change Conference in Madrid, Bulgaria's Prime Minister confirmed a similar position defending coal power plants in the country. Surprisingly, during a site visit to one of the coal regions in Bulgaria in October 2019, he mentioned that energy from coal power plants will be a "very expensive luxury" in 10 to 15 years due to the rising cost of emissions.
Other relevant ecosystem actors
The Bulgarian power market is dominated by state owned producers. Bulgarian Energy Holding (BEH) manages the most important companies in the energy sector, such as Kozloduy nuclear power plant (NPP), TPP Maritsa Iztok 2, the National Electric Company (NEK), Electric System Operator (ESO), Bulgargaz, Bulgartransgaz and Bulgartel. Relevant actors from the non-government side are WWF Bulgaria and Bankwatch.

Air pollution

General context

Air quality and air pollution are one of the environmental issues that increasingly attract public attention in Bulgaria. According to the latest estimations, there were 14.480 premature deaths in 2016 that are attributable to PM2.5, NO2 and O3 exposure[11]. 77.2% of the urban population was exposed to concentrations above the PM2.5 EU standards in 2015. Therefore, in July 2019 the European Commission decided to refer Bulgaria to the Court of Justice of the EU over poor air quality (failing to respect limit values of sulphur dioxide (SO2).

Innovation

Air quality innovations are pushed by the people who participate in air quality measurement. The web-based Airbg.info enables citizens to build or adopt their own sensor station and to connect it to the platform, which provides a real-time data on air quality in Bulgaria and other countries.

Public opinion

Beyond any doubt, there is a rising public discontent with air quality in Bulgaria. Air quality has been one of the most pressing issues in Sofia and other big cities in recent years, which was raised loudly during the local elections in October 2019. Understandably, 52% of the people in Bulgaria consider air quality the most important environmental issue in the country, placing Bulgaria second after Malta in the EU28. Beyond any doubt, there is a rising public discontent with air quality.

Public policies

The highest level of air pollution is detected in winter time as 60% of the eligible heating allowances are used for the purchase of solid fuel. Energy subsidies do not always reach low-income families who burn different kind of waste in order to heat their homes. Even though doing so is illegal, there is practically no mechanism for the authorities to prosecute such activities and collect fines.

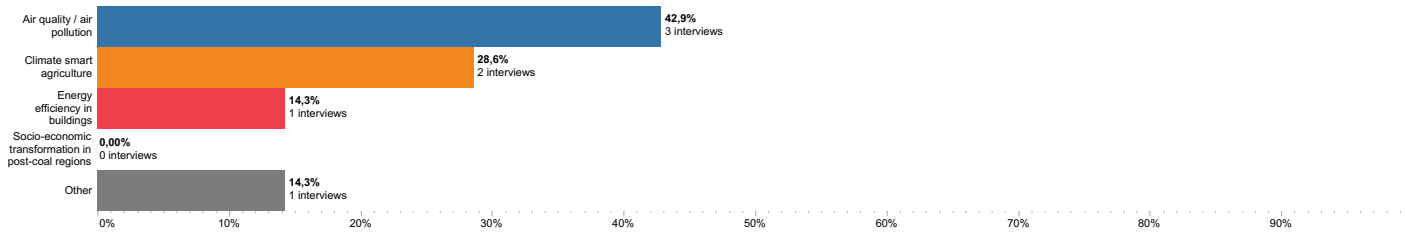
During the 2018/2019 winter the Sofia Municipality introduced several measures to reduce heavy traffic in days of enormous air pollution, including the "Green ticket", a reduced daily ticket for the public transportation network, options for free of charge parking on five public parking lots which have a very limited capacity. There are also ongoing information campaigns on mass-media which militate for the use of public transportation and against irresponsible waste disposing. Other ecosystem actors include NGOs like the Bulgarian Environmental Partnership Foundation, Greenpeace Bulgaria and the "Za Zemiata" Foundation.

11 European Environment Agency, Air Quality Report 2019

Facts and figures regarding the data collection process

Data collection period: 01/11/2019 - 18/11/2019
Number of initial contacts: 7
Initial distribution of contacts by gender:

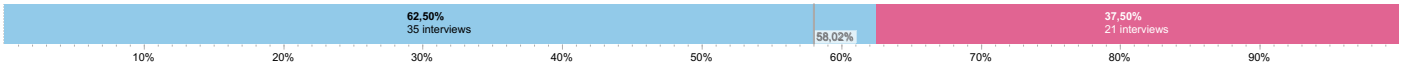
Initial distribution of contacts by thematic sector:



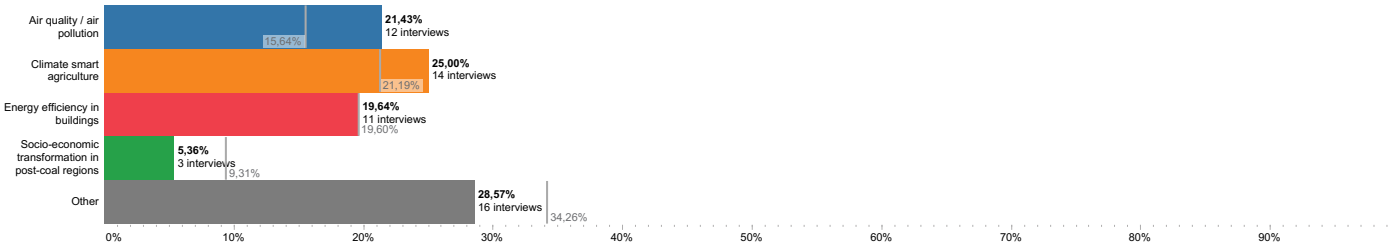
Number of contacted persons: 62
Finalised interviews: 54
Number of people not interested in participating in the study: 2
Response rate: 96.7%
Total number of nominations: 128
Total number of unique nominations: 105
Average amount of nominations by interview: 2.37

Interviewee profiles

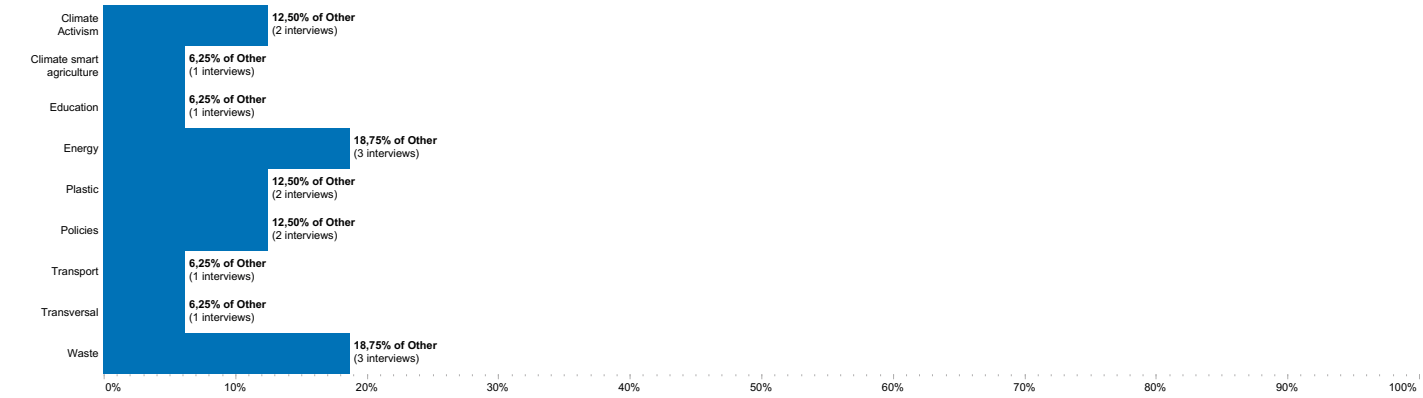
Distribution of interviewees by gender
(* data based on 54 conducted interviews)



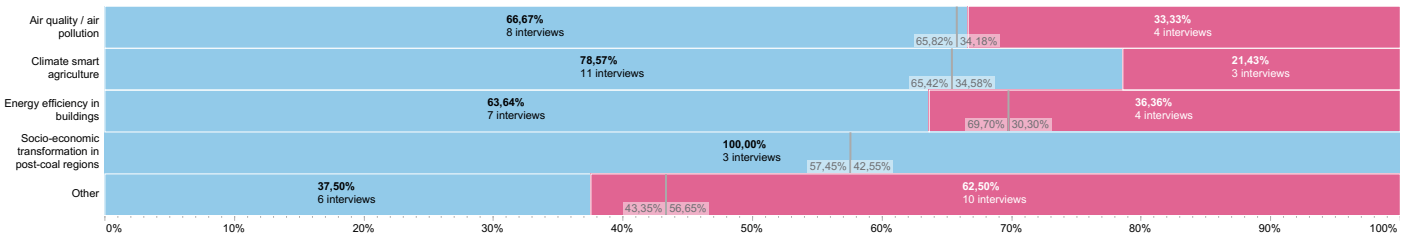
Distribution of interviewees by primary activity sector
(* data based on 54 conducted interviews)



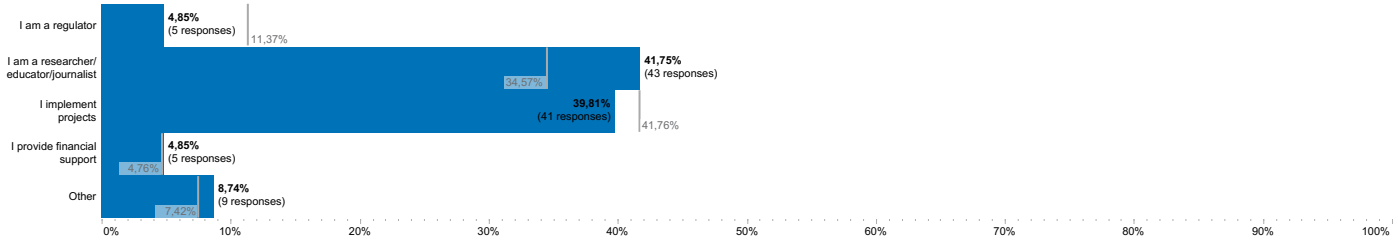
Breakdown of Other primary activity sectors
(* data based on 54 conducted interviews)



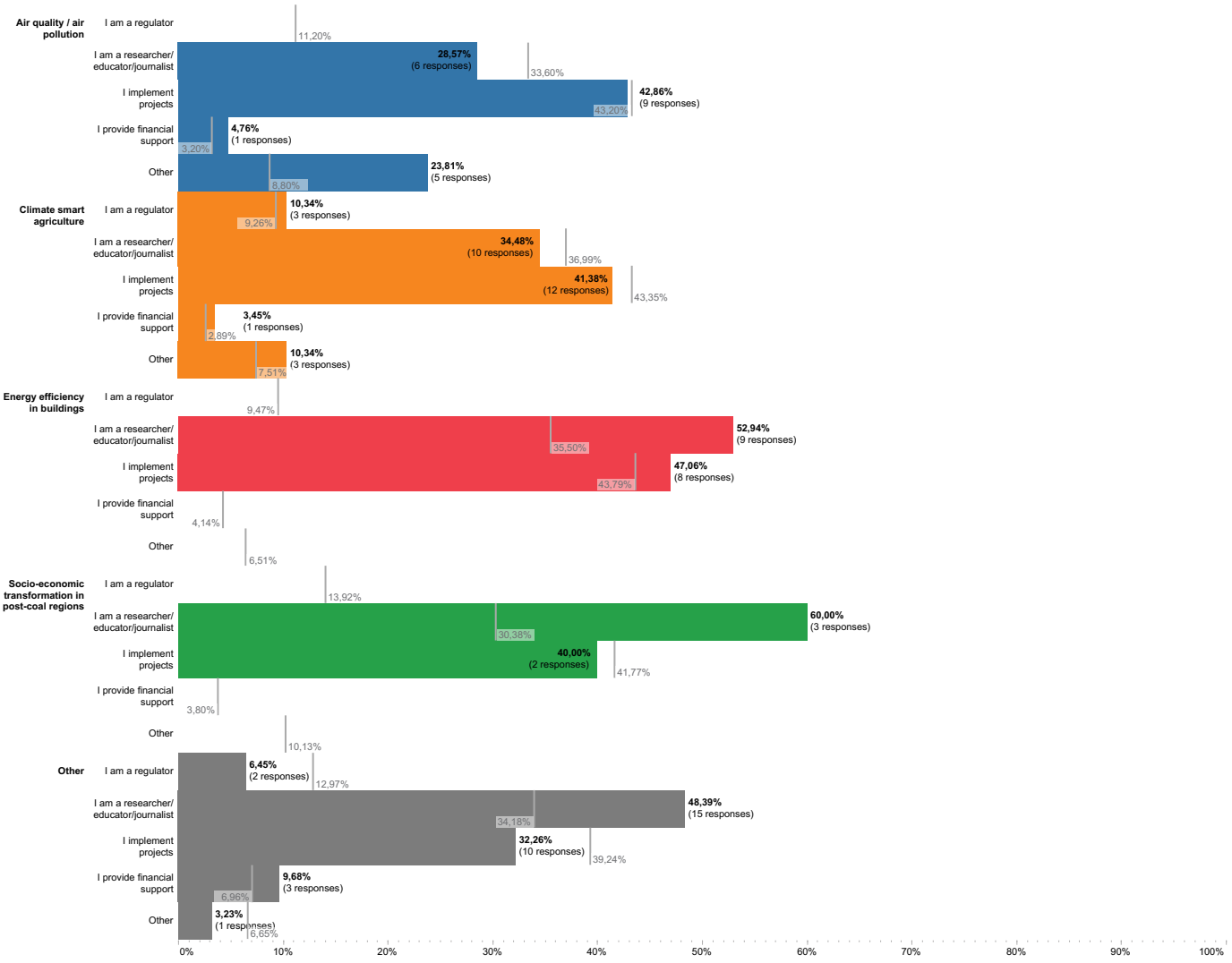
Gender distribution by primary activity sector
(* data based on 54 conducted interviews)



Distribution of interviewees by the type of role
(* data based on 54 conducted interviews)

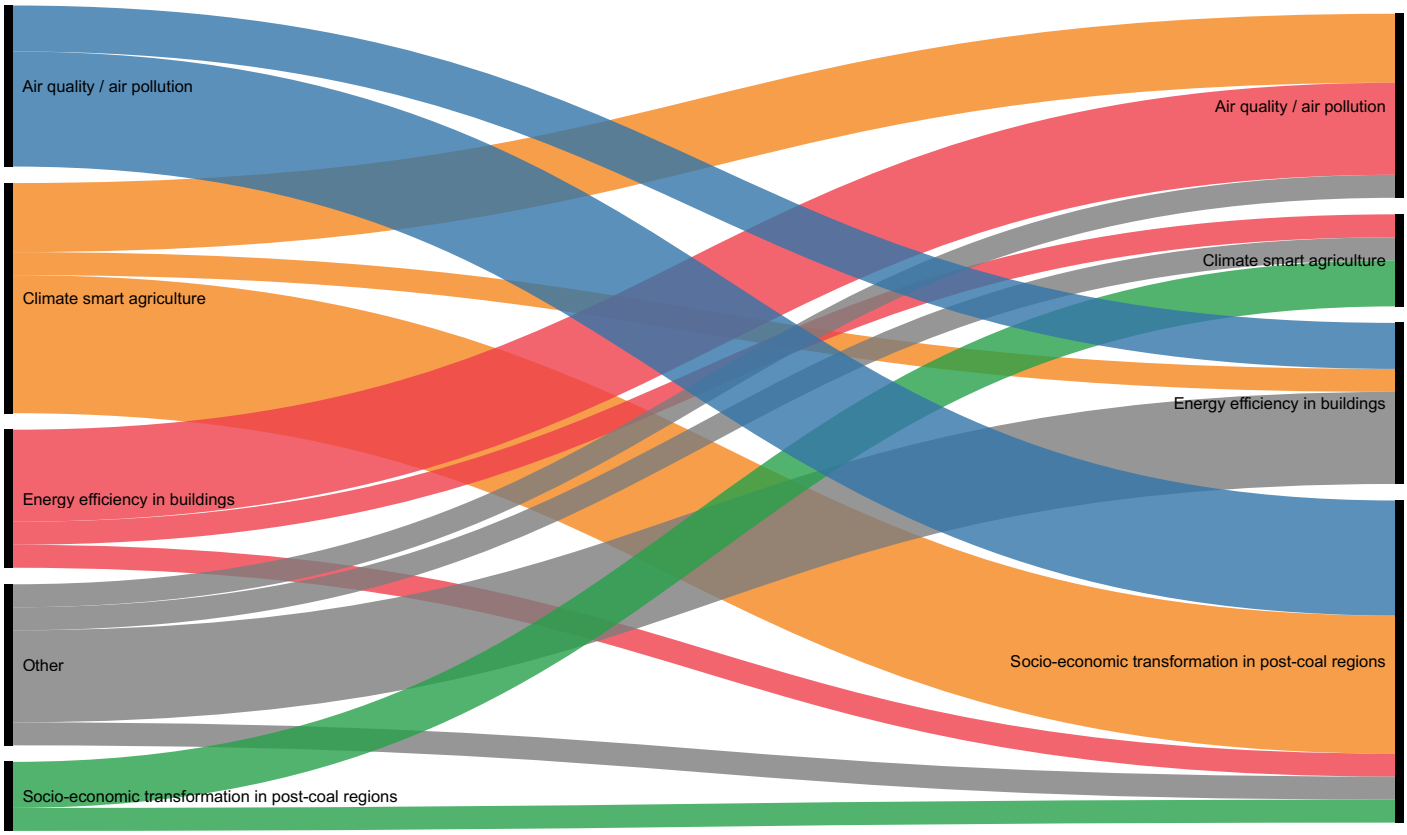


Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 54 conducted interviews)

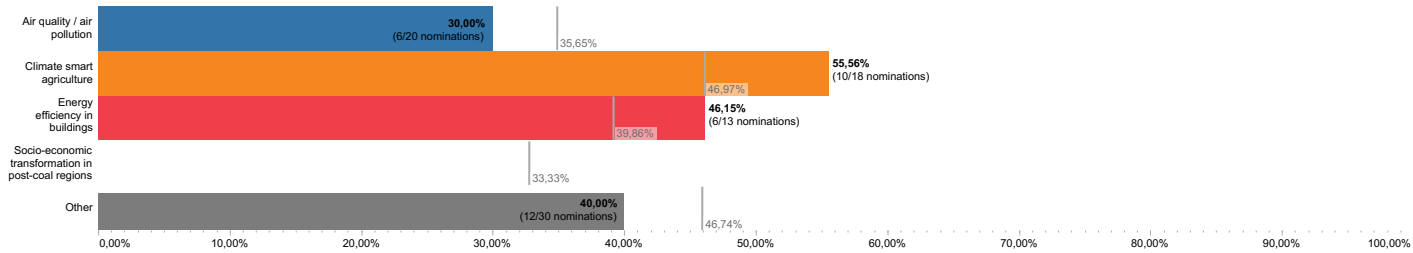


Distribution of interviews by region
(* more then 2 interviewees)

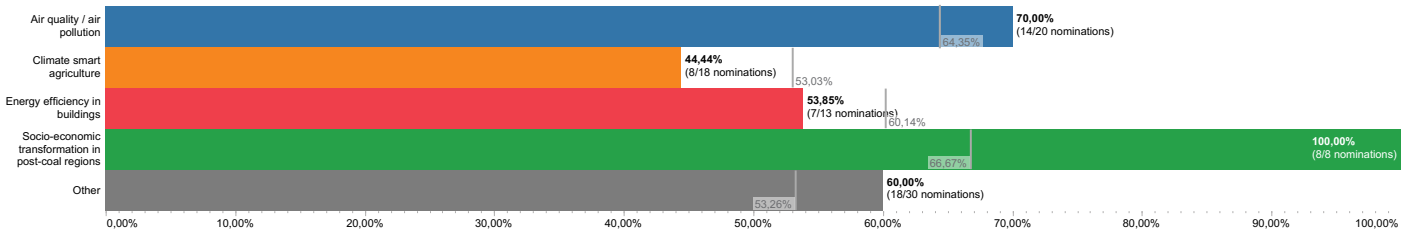
Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 105 conducted interviews)



Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 54 conducted interviews)

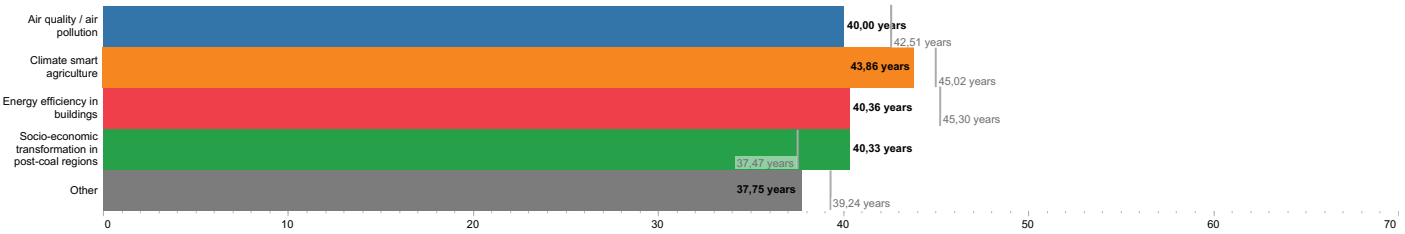


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 54 conducted interviews)

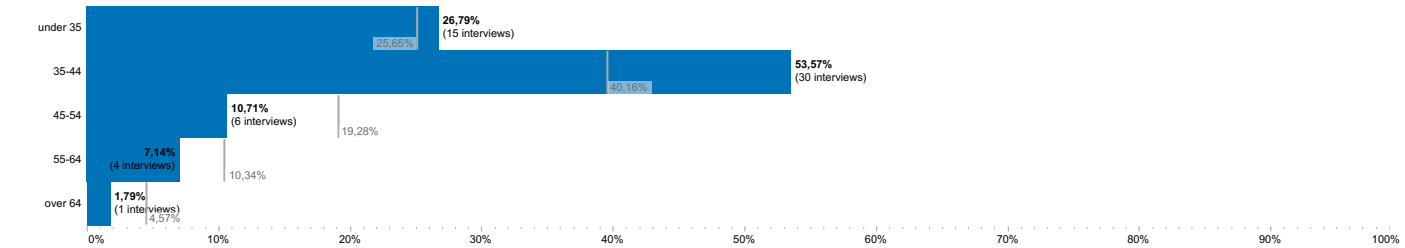


Average age of interviewees: 40.41 years (Regional average: 41.62 years)
(* data based on 105 conducted interviews)

Average age by primary activity sector
(* data based on 54 conducted interviews)



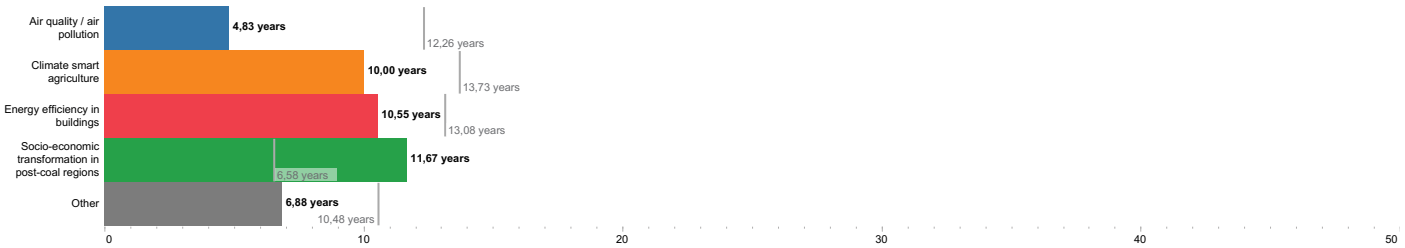
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 54 conducted interviews)



Average number of years of experience: 8.19 years (Reginal average: 11.58 years)
(* data based on 54 conducted interviews)

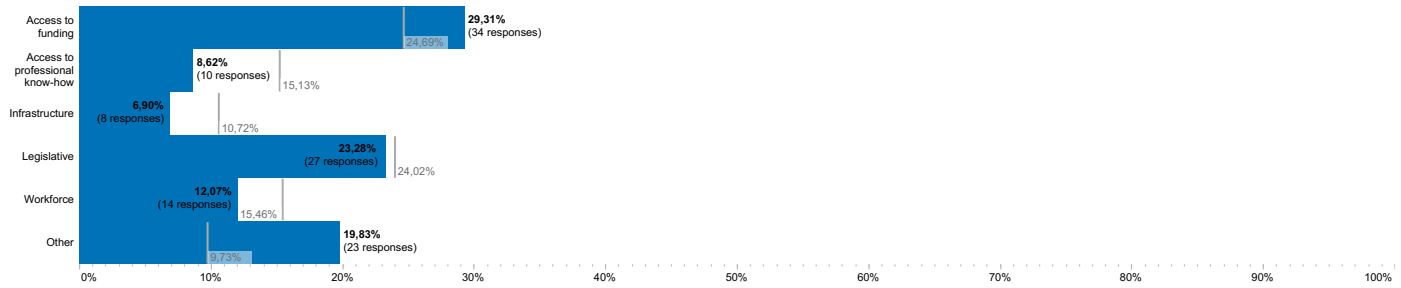
Average number of years of experience by gender
(* data based on 105 conducted interviews)

Average number of years of experience by primary activity sector
(* data based on 54 conducted interviews)

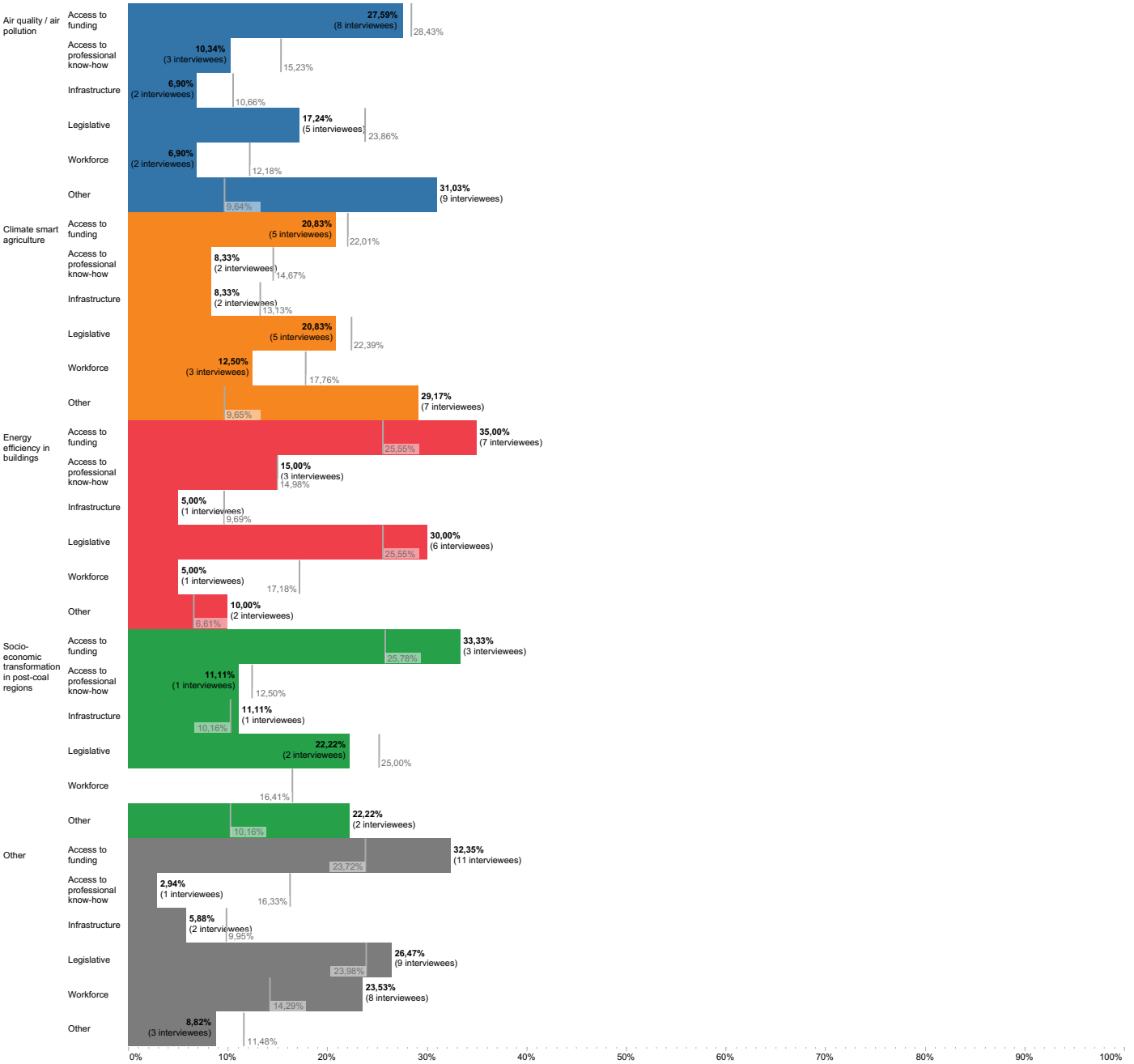


Average number of years of experience by the legal status of their member association
(* data based on 54 conducted interviews)

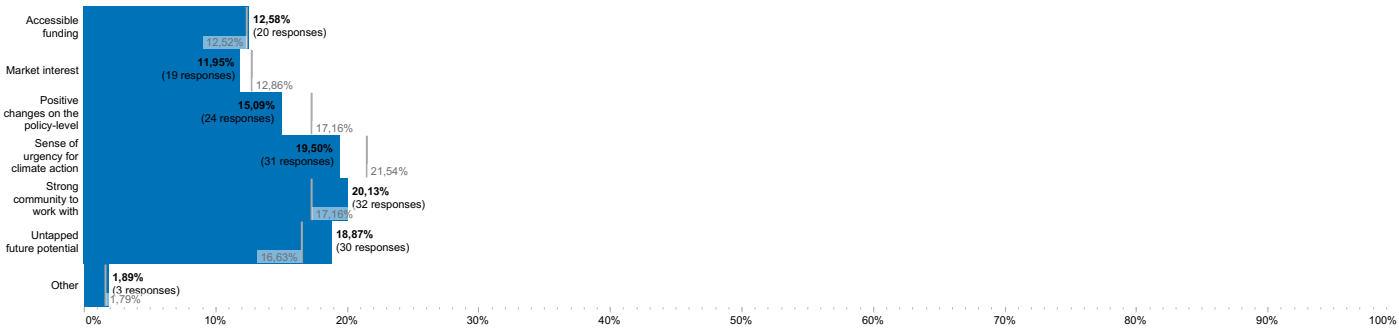
Distribution of interviewees by Barriers/Challenges category
(* data based on 54 conducted interviews)



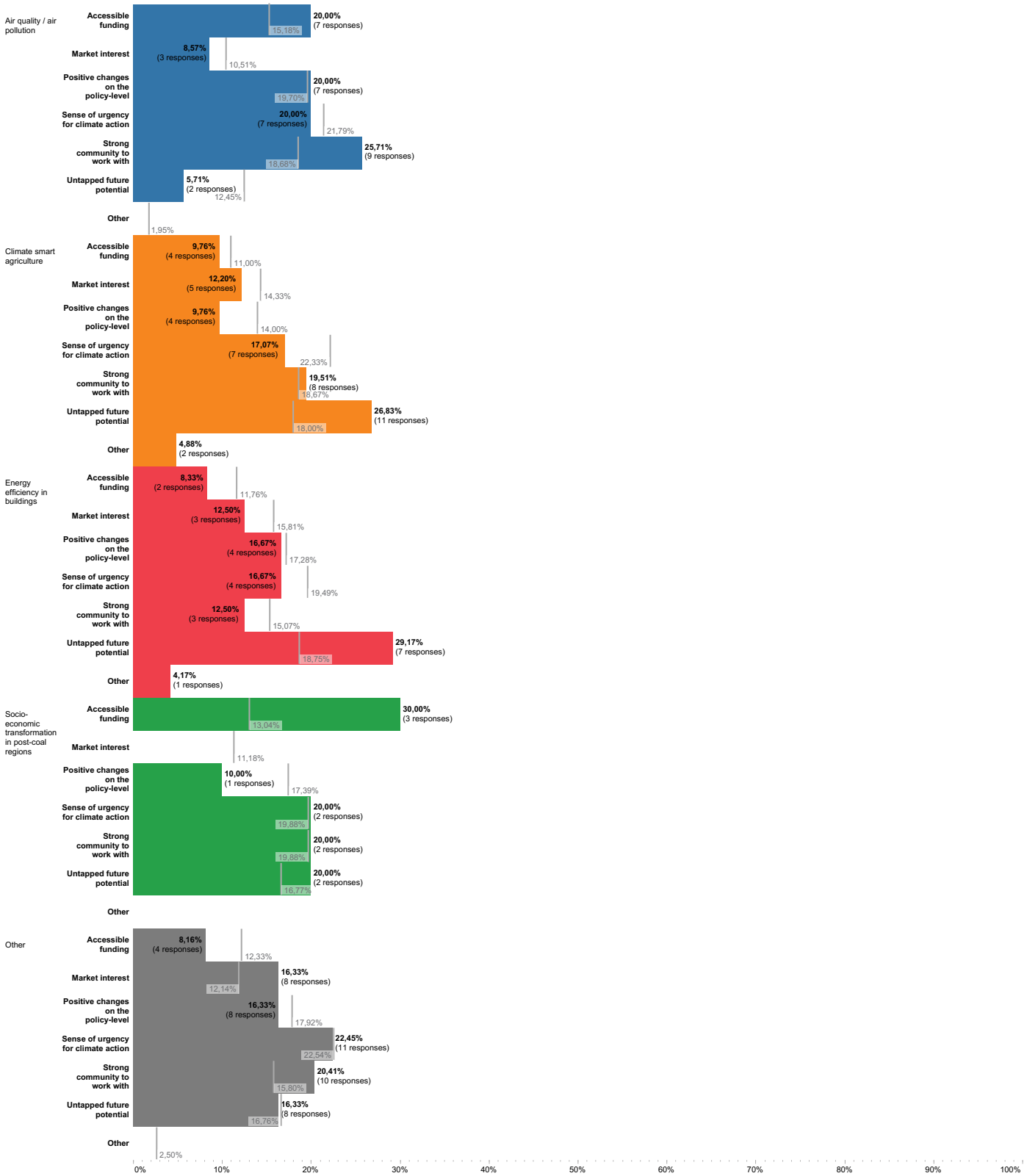
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 54 conducted interviews)



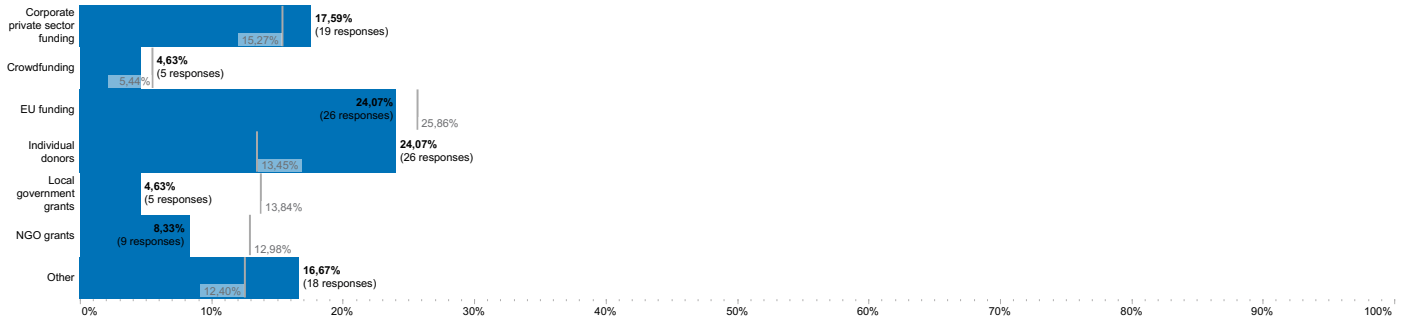
Distribution of interviewees by Opportunities category
(* data based on 54 conducted interviews)



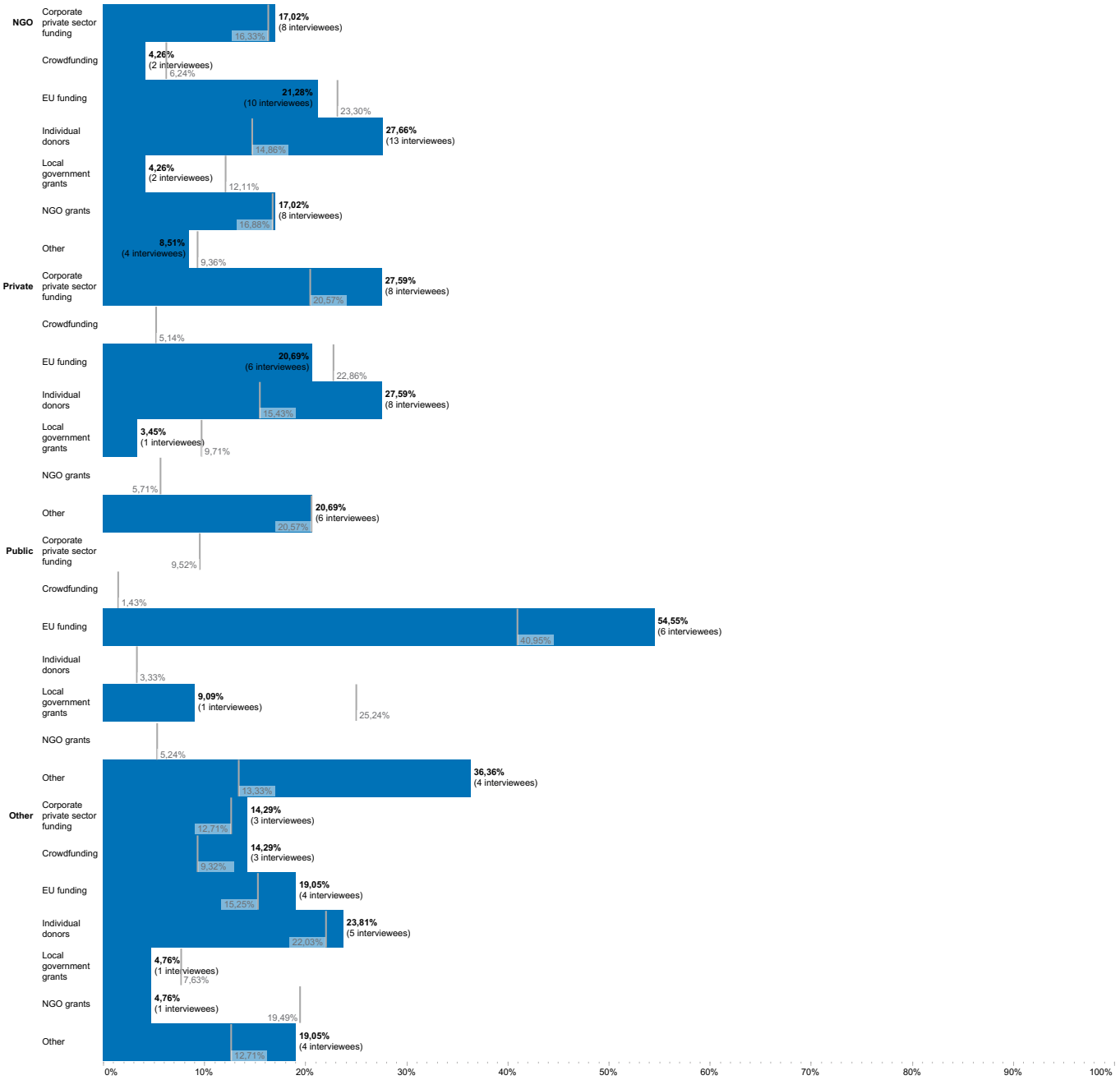
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 54 conducted interviews)



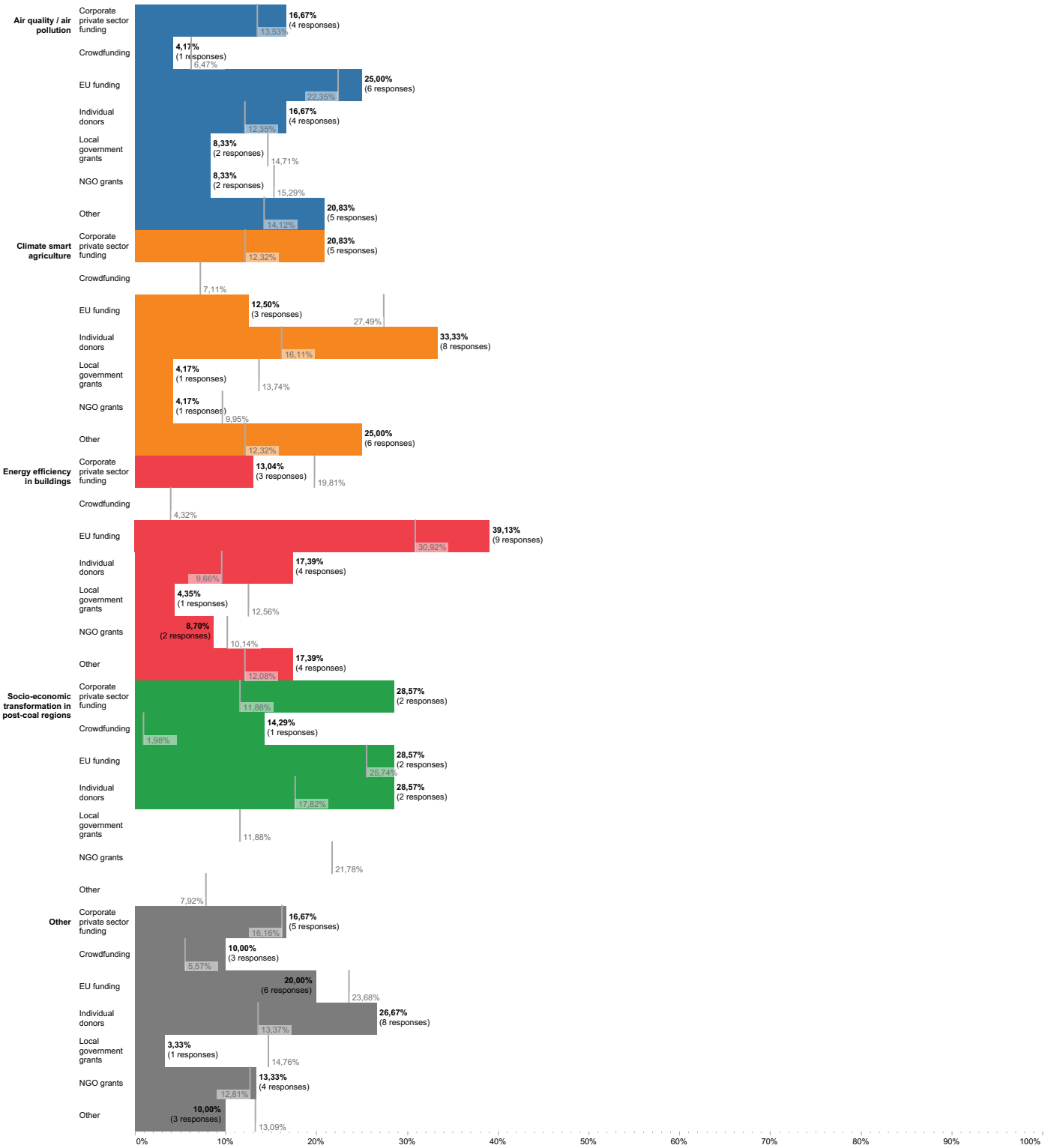
Distribution of interviewees by Funding opportunities category
(* data based on 54 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 54 conducted interviews)

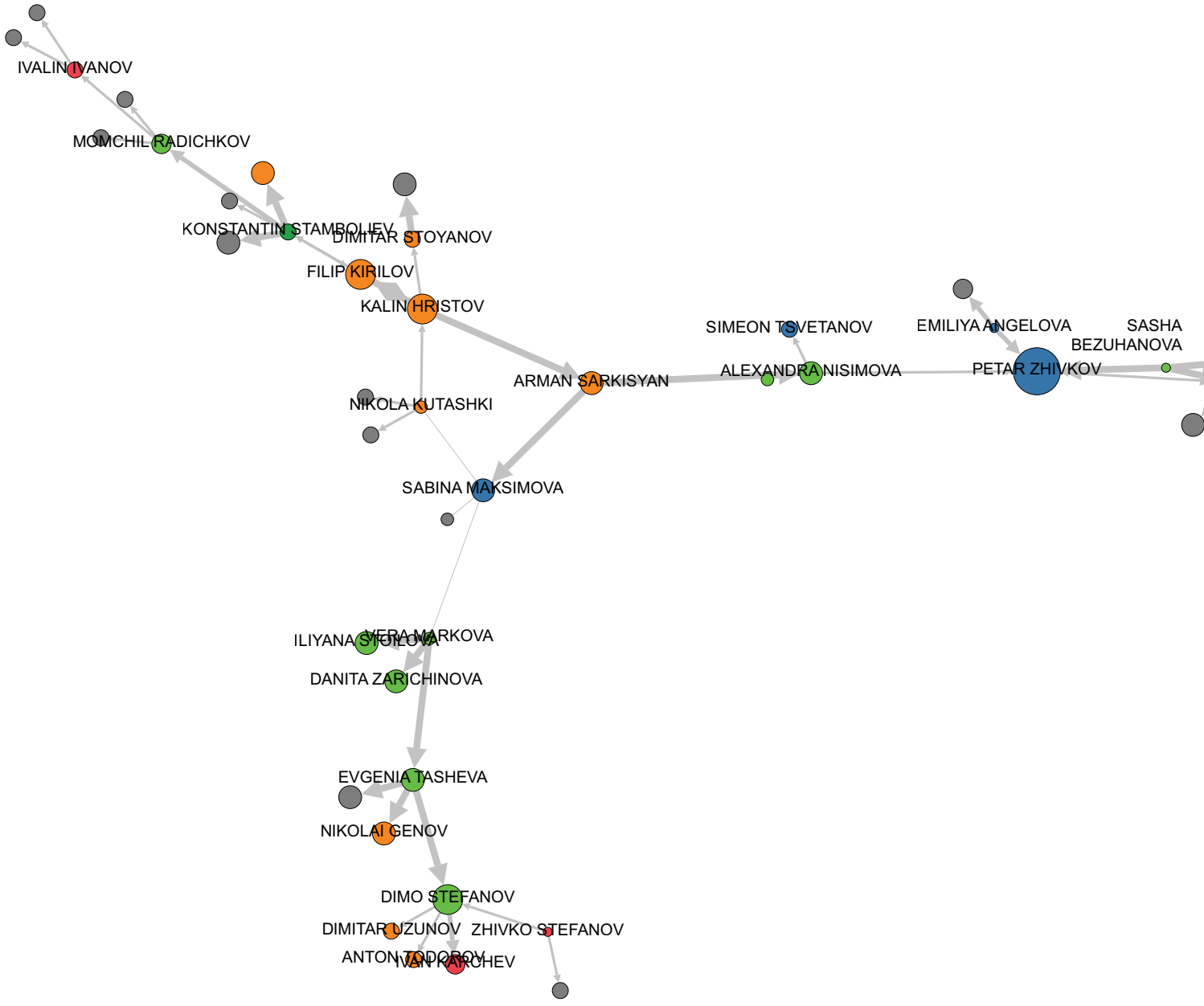


Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 54 conducted interviews)



Social network analysis

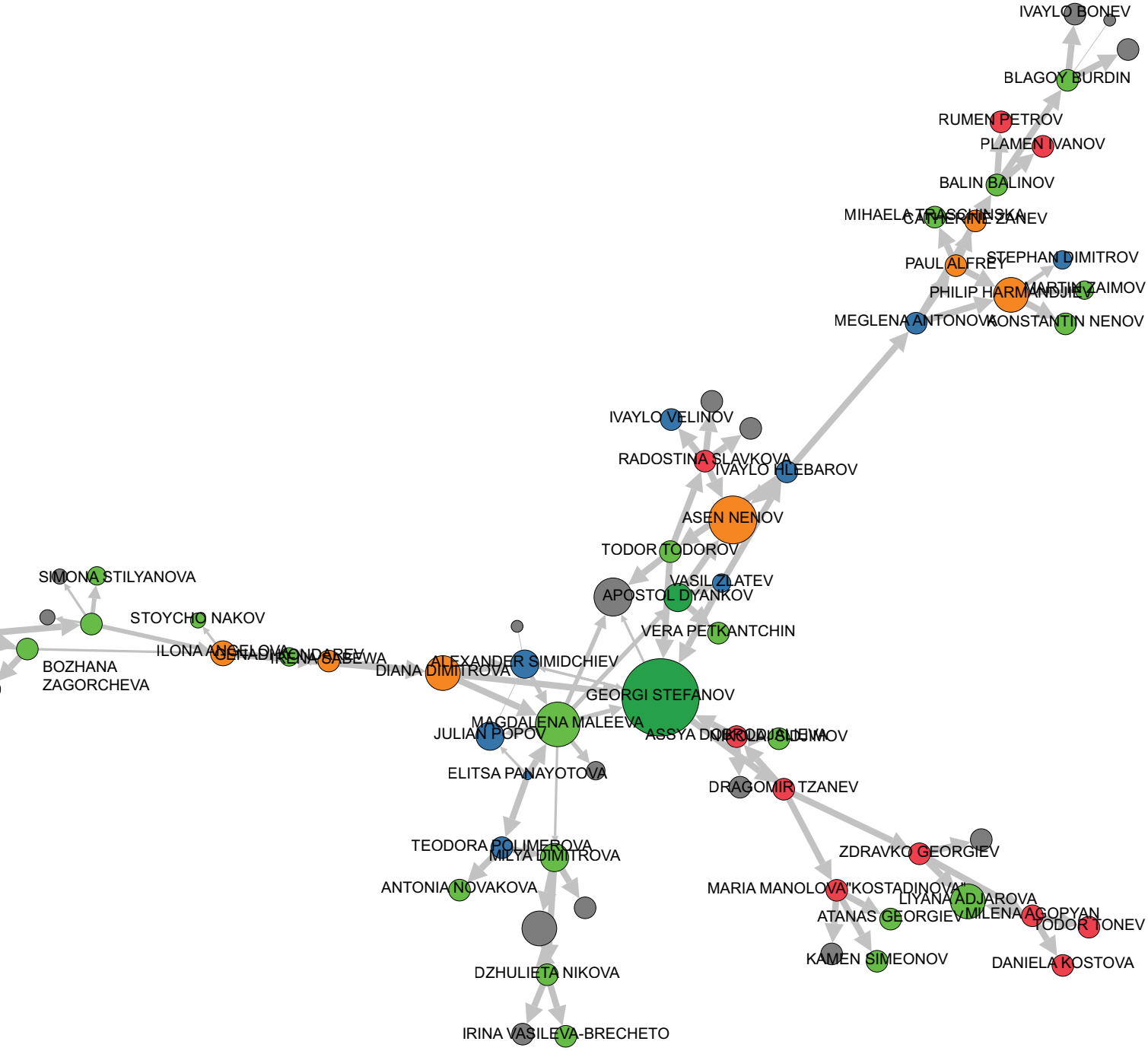
Overall social network map diagram (105 nodes / 128 edges)



Primary activity sector:

- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

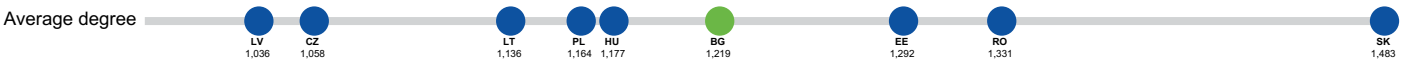
Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)


IVAYLO BONEV
BLAGOY BURDIN
RUMEN PETROV
PLAMEN IVANOV
BALIN BALINOV
MIHAELA TRASCHINSKA
CATHERINE ZANEV
PAUL ALFREY
STEPHAN DIMITROV
PHILIP HARMANDJIEV
MARTIN ZAIMOV
MEGLENA ANTONOVA
KONSTANTIN NENOV
IVAYLO VELINOV
RADOSTINA SLAVKOVA
IVAYLO HLEBAROV
ASEN NENOV
TODOR TODOROV
VASIL ZLATEV
APOSTOL DYANKOV
VERA PETKANTCHIN
SIMONA STILYANOVA
STOYCHO NAKOV
ILONA ANGELOVA
BOZHANA ZAGORCHEVA
DIANA DIMITROVA
ALEXANDER SIMIDCHIEV
GEORGI STEFANOV
MAGDALENA MALEEVA
JULIAN POPOV
ELITSA PANAYOTOVA
DRAGOMIR TZANEV
TEODORA POLIMEROVA
MILYA DIMITROVA
ANTONIA NOVAKOVA
DZHULIETA NIKOVA
IRINA VASILEVA-BRECHETO
ZDRAVKO GEORGIEV
MARIA MANOLOVA "KOSTADINOVA"
LIYANA ADJAROVA
ATANAS GEORGIEV
MILENA AGOPYAN
TODOR TONEV
KAMEN SIMEONOV
DANIELA KOSTOVA

Social network statistics

Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals

Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

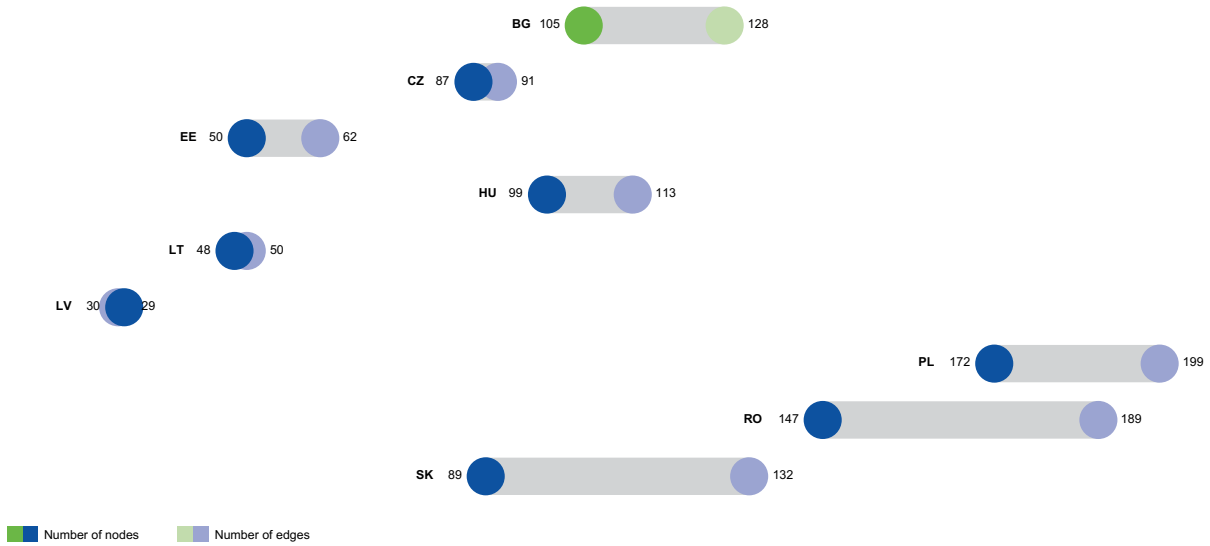
Number of discrete groups in the network

Number of nodes

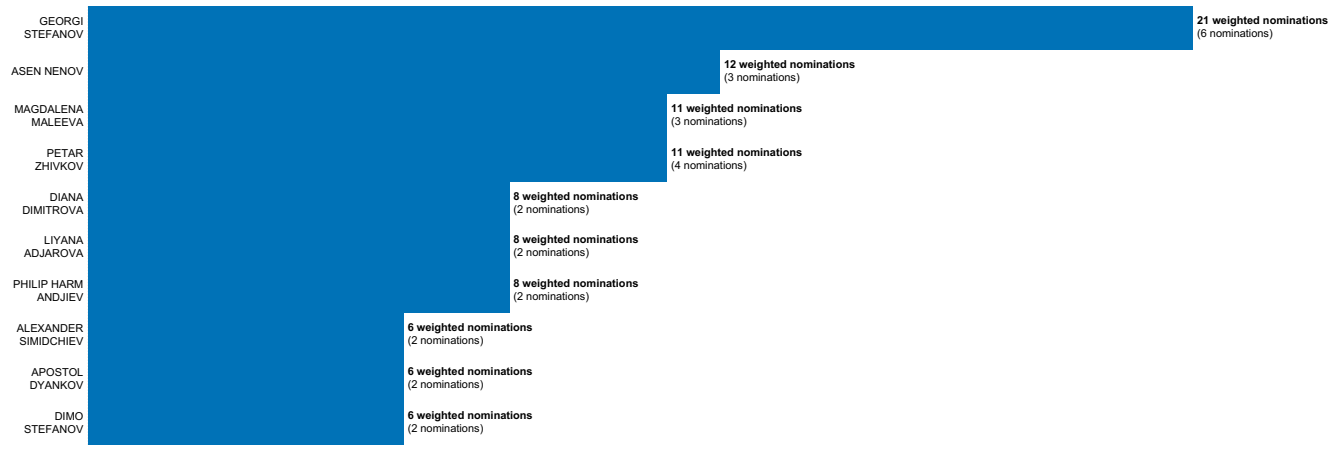
Number of individuals in the network

Number of edges (links)

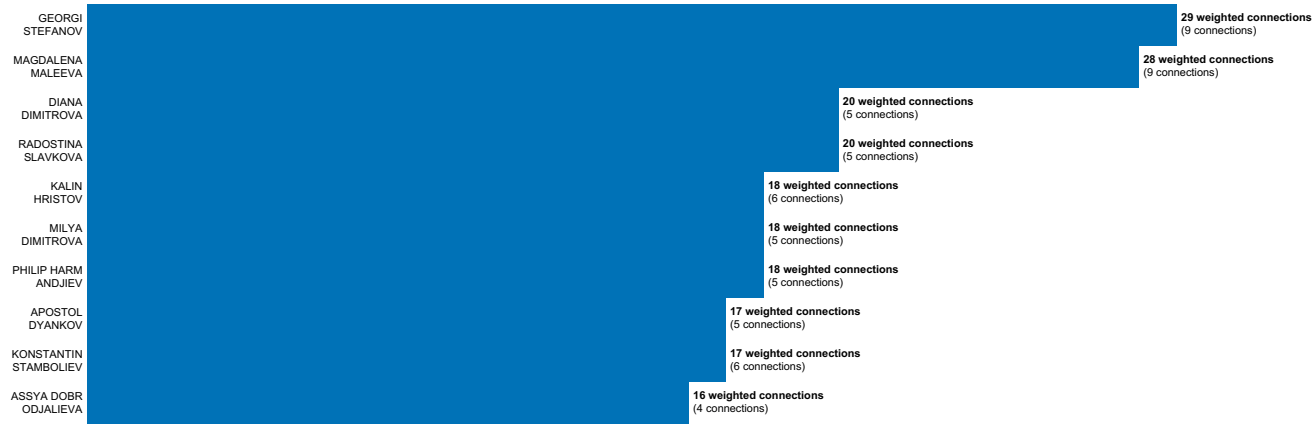
Number of relationships between individual in the network (in total)



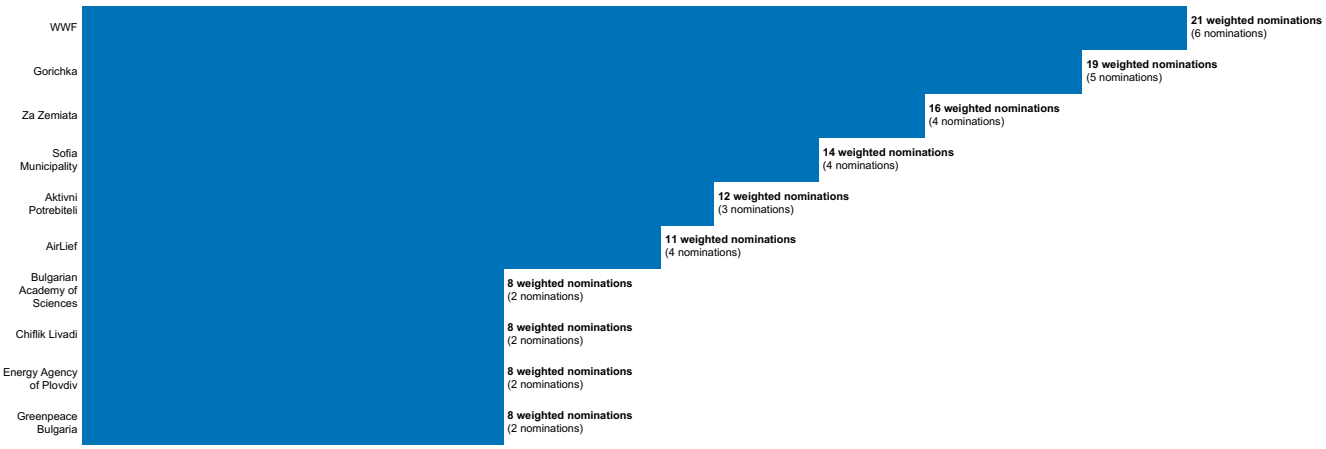
Top interviewees by the number of nominations (weighted in-degree)
(* 2 or more nominations)



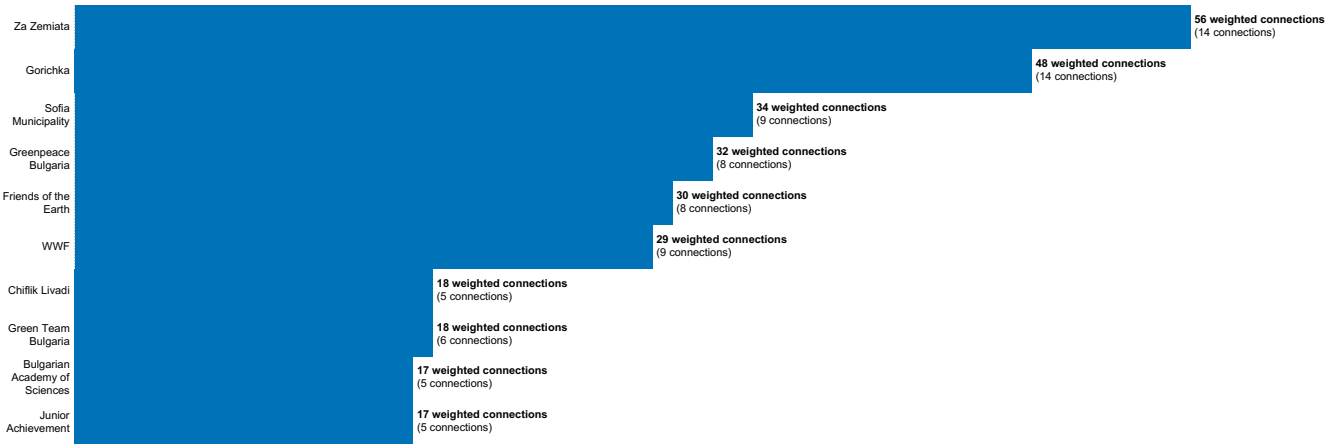
Top interviewees by the overall degree (in-degree and out-degree)
(* 2 or more connections)



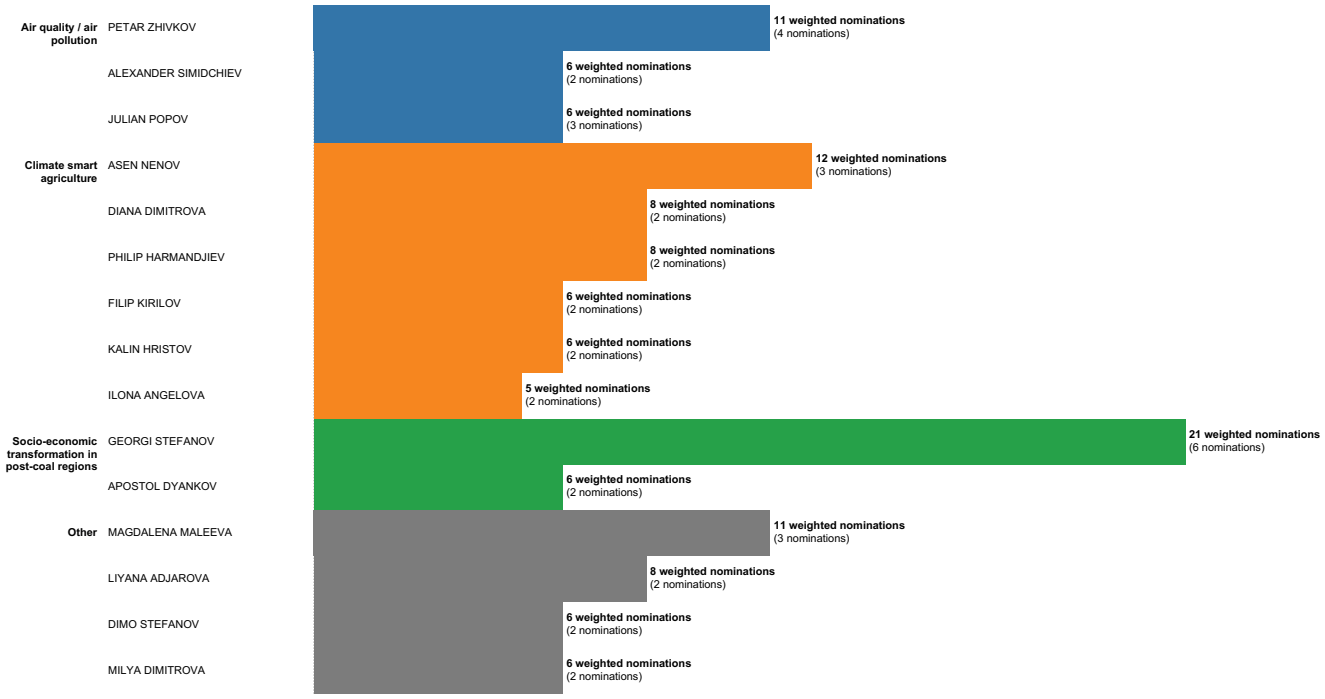
Top organisations by the number of nominations (in-degree)
(* 2 or more nominations)



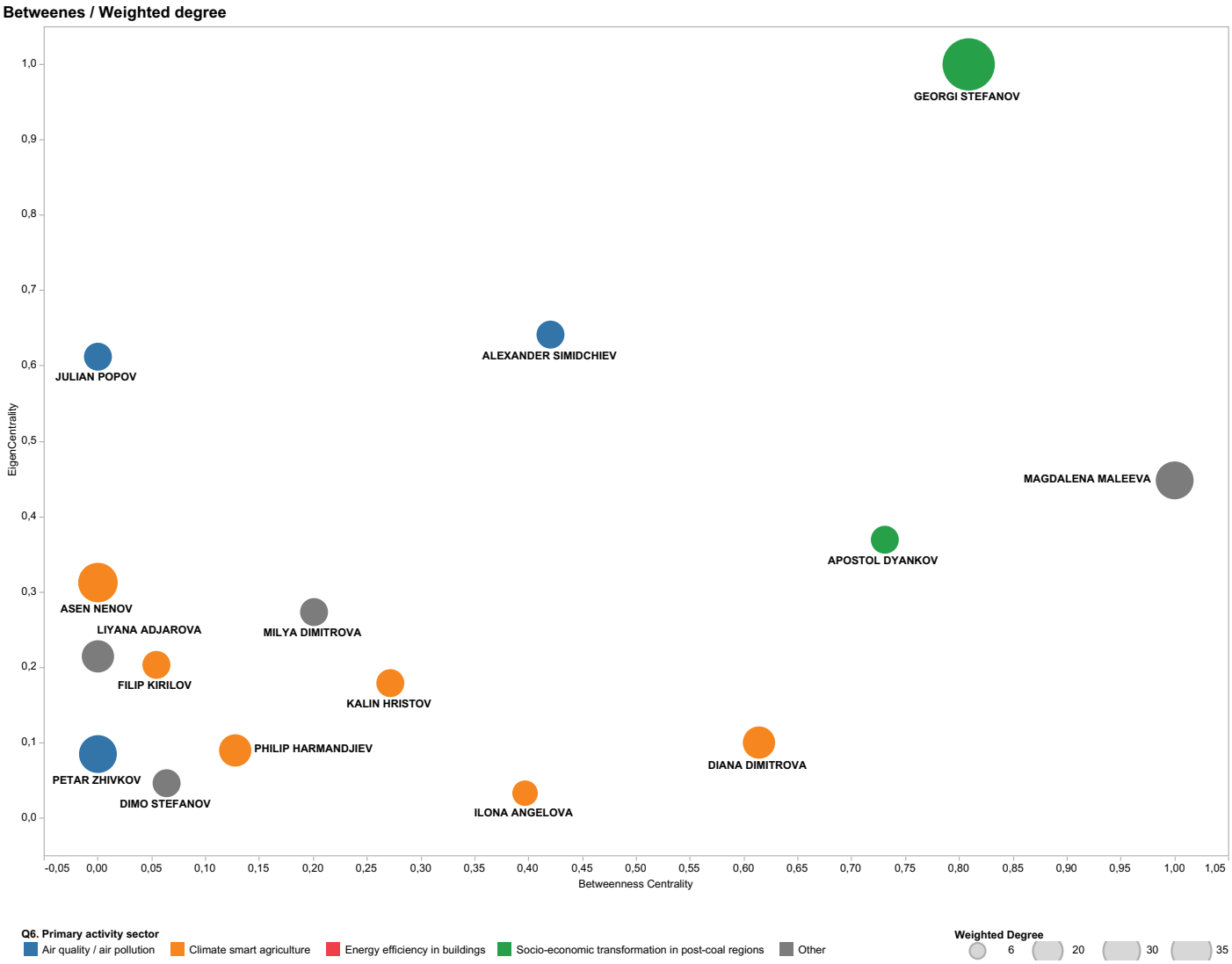
Top organisations by the overall degree (in-degree and out-degree) (* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector (* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with more then one nomination)



Betweenness centrality

Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality

EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 3: Qualitative and Network Analysis Hungary

by **Nora Feldmar** and **Ákos Gosztonyi**

Energy efficiency in buildings

State of Innovation

In terms of measuring energy efficiency innovation's development, we can use national spending on research, development and demonstration (RD&D) as it is used in IEA reports. Hungary spent approximately 86 million euros on energy related RD&D in 2012, which accounted for 0.08% of the national GDP. This number is double the median value of IEA countries' expenditures on energy-related RD&D. However, it is rather difficult to provide more up to date data on energy-related RD&D spending, as RD&D expenditures are not differentiated in national reports according to areas, and the IEA has not prepared an updated report yet.

The housing stock's status can also provide a starting point in evaluating innovation in energy efficiency. In Hungary, 19% of the housing stock was built before 1945, and 40% was built between 1945 and 1980[1]. Hence, 60% of the housing stock is more than 40 years old. The housing stock is quite neglected: only less than 16% of detached family houses built before 1980 are thermally insulated, while only 50% of the pre-fabricated blocks of flats are partially or fully insulated[2]. In the context of EU, Hungary lags behind in terms of residential energy efficiency: two third of the housing stock is obsolete. According to official national statistics, approximately 80% of the housing stock does not meet the criteria of modern structural and heating/cooling technologies[3].

This – besides other factors – contributes to the fact that in Hungary 35% of the final energy consumption derives from household energy consumption, compared to the 27% EU-average[4]. Nevertheless, according to the calculations of NÉeS (2014), a complex, well-executed residential housing renovation can result in decreasing primary energy consumption by 75%, and in a decrease of household energy expenditure by 50-60%. Thus, technologies are available to introduce energy efficiency measures, however, policy measures lack complexity (targeting partial renovations), and households lack savings to introduce such measures by themselves (90% of households in Hungary do not have relevant savings), even though approximately 92% of the housing stock is owner-occupied.

Public Authorities and Policies

In terms of buildings' energy efficiency, the 2002/91/EC directive was implemented in Hungary by the 7/2006 (V.24.) TNM Decree and the 176/2008 (VI.30.) Governmental Decree. The regulation targets major renovations of buildings above 1000 m2 and new constructions as well and introduces a building certification scheme, resulting in stricter technical heat requirements (by 30%). Through amending the 7/2006 TNM Decree based on the 2010/31/EU directive, the "cost-optimal energy efficient requirement" became a pre-condition for receiving grants from the state or through EU funds.

The so-called "panel" (prefabricated block house) refurbishment programmes initiated in 2008-2009 target prefabricated block houses and most family homes built between 1946 and 1980. Because of these programmes, approximately 35% of such buildings have been refurbished through complex energy efficiency measures until 2015. The interest-free loan scheme provided by MFB, the Hungarian Development Bank, was introduced in 2017 to incentivize energy efficiency renovations in residential buildings. The scheme targets homeowners, multi-apartment buildings and housing cooperatives. It is financed through EU Funds with a budget of approximately EUR 339 million. The loan supports energy efficiency investments in the form of thermal insulation, heating and cooling system modernization, summer heat protection, renewable energy projects and others.

The Green Economy Financing Scheme finances the "Warmth of Homes" programme, which provides non-refundable resources for energy efficiency measures in the residential sector and the state-owned building sector. Measures include heating system modernization, replacement of old household appliances and

1 NÉeS, 2014
2 The proportion of total thermal insulation of bigger condominiums built before 1945 is extremely low. (NÉeS, 2014: 58-59) According to the information presented in NEéS, the quality of buildings built before 1945 is far more likely to be "bad" or "satisfactory", compared to buildings built later. It is a frequent problem for the tenants/inhabitants of older family houses to heat up their entire home. The average income of people living in this type of buildings is lower as well.
3 NFM, 2015: 11
4 Eurostat, 2017

complex building modernizations as well. In the period of 2014-2017 approximately EUR 93,8 million was spent for this programme, which resulted in 1,1 PJ cumulative savings. The criticism of this programme highlights the disproportionate distribution of funding, and the lack of compatibility checks of specific partial interventions with existing conditions of buildings.

Public opinion

A comprehensive survey shows that the inhabitants of renovated residential buildings experienced around 10-30% decrease in expenditure, while 10% of them experienced an increase[5]. 90% of the people participating in the survey do not consider energy efficient investments as personal investments adding value to their own properties, but rather as a task and responsibility for the government. Moreover, there is a lack of complex residential renovations: most renovated buildings were retrofitted and/or renovated only partially, mostly window replacements (74%), façade thermal insulation (62%), roof insulation (41%) and heating system modernisation (36%)[6].

Other significant players and projects

On behalf of the private sector:

• MÉVSZ – THR: The coalition of Hungarian Building Chemical and Plaster Association's Total Thermal Insulation Working Group
• AHOGY: Hungarian Thermal Insulation Material Producers' Association
• ABUD – R&D in urban sustainability and architecture projects (e.g: STEP-UP deep energy renovation project, E-Co-Housing: efficient social housing with smart technologies)

On behalf of research and non-profit:

• Energia Klub (Energy Club)
• MEHI (Hungarian Energy Efficiency Institute)
• Budapesti Műszaki Egyetem – ÉMKÉK (Budapest
• University of Technology and Economics – Climate Change and Building Energetics Working Group)
• Central European University (CEU) – Ürge-Vorsatz Diána (IPPC Member)
• Lechner Tudásközpont (Lechner Knowledge Center)
• ÉMI Kft. (Construction Quality Control Innovation Kft.)
• Bay Zoltán Alkalmazott Kutatási Közhasznú Nonprofit Kft. (Bay Zoltán Nonprofit Applied Research Kft.)
• Hungarian Straw Bale Builders Association
• Passive House Hungary Association
• Efficient/passive pre-fab/modular houses (optionally with solar panels):
NOAH House (passive house)
EKO Modular (passive version also)
KeyCoHouse

Opposition to progressive development
There is an increasingly strong narrative on behalf of the populist government questioning the existence of climate change, which may have negative impacts on future energy efficiency measures. One grand scale nation-wide policy measure, the so called "Rezsicsökkentés"/"Utility Cost Reduction" can also be considered as an obstacle to effective energy efficiency interventions, as it artificially decreases residential energy prices, disincentivising household level energy efficiency investments.

Key initiatives

A key document – alongside the policies introduced above – is Hungary's National Energy Efficiency Action Plan until 2020.
There is a decree under development prepared by the Ministry of Innovation and Technology which will replace the above mentioned 7/2006 TNM Decree. An open workshop was organized in May 2019 where researchers and experts discussed the potential amendments' technical details.
The expected outcome of the new decree is to harmonize Hungarian building energy efficiency standards and certifications with EU standards.

Climate-smart agriculture

Hungary has been traditionally (in the previous regime) a forerunner in agricultural innovations such as plant/crop breeding. Alongside the large state-owned cooperatives there was a strong culture of household (backyard) cultivation for self-sufficiency. After the regime change the cooperatives were privatized and now large-

5 According to expert opinion, the increase may be explained by lack of planning and design, unprofessional/faulty instalment and implementation, and additionally some rebound effects (installing more equipment in place of the energy saved). However more in-depth research is needed to determine the exact cause of this phenomenon.
6 NÉeS, 2014

scale monocultures, mostly cereal and corn for export dominate the landscape – which has been enhanced by EU subsidies (direct payments). Simultaneously backyard cultivation has strongly declined and almost vanished. Nowadays alternatives are springing up in the field partly driven by climate and sustainability focused EU funding.

The specific term of "climate-smart agriculture" is not widely used in Hungary, neither by industry nor by alternative movements. Therefore, here we refer to climate change mitigating agricultural innovations on different scales. Despite a lack of considerable financial and legal support, there is a strong bottom-up movement and initiatives focusing on food sovereignty, permaculture and general climate awareness.

State of Innovation

We can separate innovations into two distinct groups:

- technological innovations, such as drop irrigation, precision agriculture, no-till agriculture, use of Effective Microorganisms, biochar, aerated compost-tea, agroforestry, etc.
- social innovations, such as community supported agriculture (CSA), consumers groups, farmers markets, festivals, eco-communities, etc.

Large industrial players have not started to invest in climate intelligent innovations on a notable scale. However, some conferences which showcase examples from different countries took place in recent years. Apart from this, there are a few isolated innovative experiments, for example in no-till farming. The Kishantos Organic Demonstration Farm, a 452 hectares farm widely known for their R&D in organic practices for over 20 years, was shut down in 2013 due to a controversial land consolidation. This triggered large scale public discontent and media coverage.

A notable example is a collaboration between national parks and herders to maintain biodiversity and eco system balance for example in Hortobágy and the Tisza river. In this area WWF has some pilot projects.

In terms of small scale and social innovations notable players are:

• Consumer groups: Szatyor in Budapest, Kosár Community in Nyíregyháza and several other in Budapest and other regions.
• Permaculture: Hungarian Permaculture Association
• Tündérkertek: promoting local and traditional varieties of fruit trees and the skills and knowledge associated with their cultivation through non-formal education from early ages

Public Authorities and Policies

Willingness is expressed to promote progressive climate mitigating practices through EU funded national subsidies both in terms of technological and social innovations. The ministry in charge is the Ministry of Agriculture. However, access to these funds are reported to be burdened by bureaucratic and non-transparent procedures by applicants.

Hungary is unique in that it has introduced a constitutional ban of GMOs – however imported GMO soy make up the majority of fodder used in animal husbandry in the country.
The National Agricultural Innovation Research Centre (NAIK) focuses on conventional large-scale agro-technical R&D. Topics such as agroforestry are subsequent on their agenda.

Other significant players and projects

• Universities: ELTE – Human Ecology Masters course, Gödöllő University of Agricultural Sciences
• NGOs: Védegylet Association (Agroecology and food sovereignty projects, e.g.: BOND H2020 project), Conscious Consumer Association, Small-scale Association, Hungarian Permaculture Association, Mindenegyüttmegy Egyesület, Seed-house (Magház)
• Research institutions: Research Institute of Organic Agriculture (ÖMKi), Environmental Social Science Research Group (ESSRG)

Socio-economic transformation in post-coal regions

State of Innovation

The only coal region in Hungary – Northern Hungary in the NUTS2 classification – is currently considered as an industrial crisis region. Following and accompanying the deterioration of heavy industries in the past three decades the social and economic structural changes resulted in an unjust transition. The overwhelming majority

of skilled and educated youth have migrated from the region, which remains an obstacle for local development, hand in hand with the low number of SMEs and the low extent of innovation compared to the national average. Renewable and alternative energy research and development is concentrated in the hands of big corporations, while new small lignite mines have been opened in the last years. Innovations aiming at a post-coal future have been rather small-scale, initiated by small developer/researcher groups and/or difficult to implement[7]. Citizen energy communities are being incentivized as a social innovation method, while clean coal technologies and heat pump technologies are currently being considered for implementation.

Public Authorities and Policies

Just energy transition is not embraced by authorities. The government's narrative about climate change represents the issue as a "technique" of "the elite" to cover "the real and most important issue" of migration. When it comes to coal, the narrative usually highlights energy sovereignty and the protection of workers and their workplace[8].
The National Energy and Climate Plan aims at ending coal-based electricity production by 2030 and phasing out residential coal (without deadline set), but no actual policy and subsidy plans have been introduced or developed so far. In Hungary rather local and national NGOs are the ones who try to keep the topic on the agenda of public discourse.

Public opinion

In many cases politicians utilize the existing – and considerably strong – "coal-nostalgia" for political gains, and legitimizing the opening of new (lignite) mines which are only beneficial for the investors, while deteriorating air and water quality in local communities. Moreover, climate change skepticism is also considerably strong in Hungary[9], also backed by the government's narrative. The topic of climate change in general divides people, which also results in divided public opinion on post-coal transition. It is, however, rather common – especially in settlements where new lignite mines are being opened – that local people demand this transition.

7 Political Capital, 2019
8 Political Capital, 2019
9 ankó et al., 2018

Other significant players and projects

- Greenpeace
- Klub – Energy Club
- WWF
- MTVSZ – Hungarian Nature Protectors' Association
- Ökológiai Intézet Alapítvány – Ecological Institute Foundation
- Zöld Kapcsolat Egyesület – Green Relations Association
- GreenDependent Institute
- E.ON Energiaközösségek – E.ON Energy Communities
- Habitat for Humanity Hungary
- rEdistributor Project (Elosztó Projekt)

Initiatives [10]

A new National Energy and Climate Plan (2021-2030) is being developed currently, alongside with the National Clean Development Strategy (2020-2050, obliged by the Paris Agreement). The government received strong criticism for not involving enough the public for consultation. Both documents need to be submitted by the end of 2019.

MTVSZ (mentioned above) has developed numerous policy and technological recommendations for clean energy solutions in (post-)coal regions and potential workplace creation opportunities accompanying the process of post-coal transition. They are also working with communities to roll out pilot projects of community energy. E.ON, an electricity and gas company, together with the Hungarian Maltese Charity Service, has started a project on solar energy as an alternative to solid fuel heating in a village living in deep poverty. However, there is little publicly available information on the project.

Air pollution

Air pollution in Hungary is a largely problematic issue, with recent reports from 2019 stating "The per-capita death rate from air pollution in Hungary has been estimated as the second highest in the world after China."

The number one driver of air pollution is household

10 As far as we are concerned, no EU- or Government-funded specific re-skilling or vocational training programmes have been applied so far in (post-)coal regions. Potential possibilities may be discovered through LEADER/CLLD.

solid fuel heating – 42% of households use wood to some extent, around 20% rely only on tis source for heating. The other main driver is the transport sector, especially the emission of diesel trucks. Large cities are hot spots of air pollution as emissions taken by wind from the countryside are combined with the pollution of vehicle traffic. The poorest regions are most effected – as wood and coal heating as well as the burning of synthetic materials is mainly practiced by low income households. Furthermore, in some regions, such as the Northern-Eastern region (which is also the poorest), this problem is exaggerated by the geographical specificities of being a valley surrounded by hills that effectively trap the pollution.

Public opinion

Especially during the winter there are many media reports highlighting the situation – usually as a response to studies and campaigns done by environmental NGOs. There is also a tendency to put the blame on poor households for burring synthetic materials and wet wood. At the same time, it is apparent that many people practice these harmful practices irrespective of income levels.

Public authorities and policy

There have been infringement proceedings by the European Commission for over 10 years against Hungary due to the level of air. Despite this the situation has not improved and there are no public funds and programs which are directed to support transition to less polluting household heating systems. In May last year, the European Commission took Hungary (among other countries) to the highest court for failing to comply with EU air quality standards.

National environmental regulations determine emission standards for different actors (such as Gov. Reg. 306/2010. (XII. 23.) in relation to household heating) in combination with local regulations which can vary between regions. Individual households burning inappropriate materials can be persecuted in most regions, however this is rarely perused due to difficulties with providing evidence of wrongdoing. At the same time, there is awareness that many households resort to these practices due to inability to afford good quality fuels and criminalizing them would only make matters worse.

There are a couple of national campaigns/ programs directed at the problem, mainly focusing on awareness raising.

Heat smartly! (Fűts okosan!) campaign – awareness raising on proper wood heating
LIFE IP HungAIRy – national project focusing on air pollution (EU budget of 16 million EUR)

Innovation

In terms of household solid fuel heating most technological innovation comes from Austria, where there is significant R&D activity in the field. The Hungarian Masonry Heater Builders' Association (MACSOI), which acts as a trade association, encourages stove builders to follow new developments in the field. The Association for Environmental Wood Heating was founded in 2019, Alongside with progressive professionals it gathers companies and manufacturers who are ready to comply with the coming stricter EU regulations. Both associations are advocating for differentiating harmful, polluting wood heating from environmentally sound, low emissions wood heating, which makes wood a viable renewable energy source.

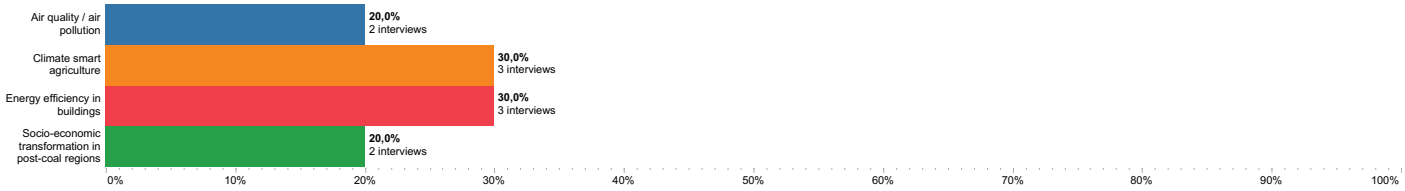
NGOs active in the field

- Clean Air Action Group (Levegő munkapcsoport)
- Greenpeace Hungary (Clean Air Campaign)
- Green Connection Association (Zöld Kapcsolat Egyesület)
- Hungarian Bicycle Club (Kerképárosklub – Bike to work! Heat maps generated by mobile app used by commuters)

Facts and figures regarding the data collection process

Data collection period: 28/10/2019 - 28/11/2019
Number of initial contacts: 10
Initial distribution of contacts by gender:

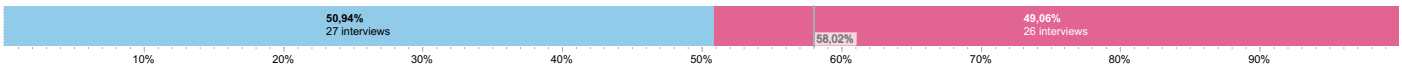
Initial distribution of contacts by thematic sector:



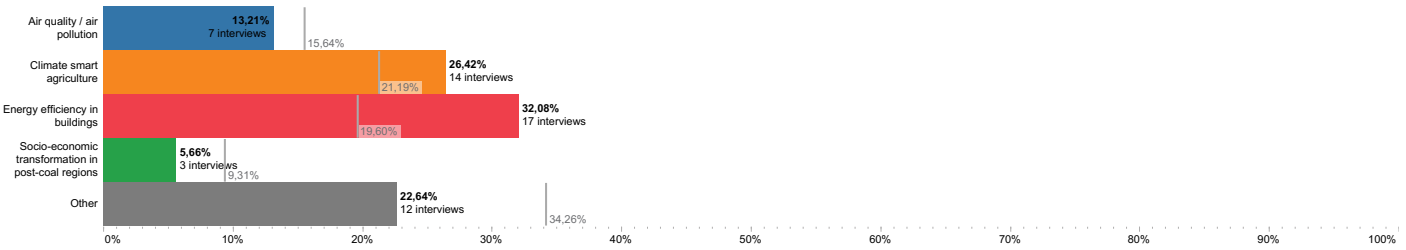
Number of contacted persons: 54
Finalised interviews: 53
Number of people not interested in participating in the study: 1
Response rate: 98.14%
Total number of nominations: 113
Total number of unique nominations: 99
Average amount of nominations by interview: 2.13

Interviewee profiles

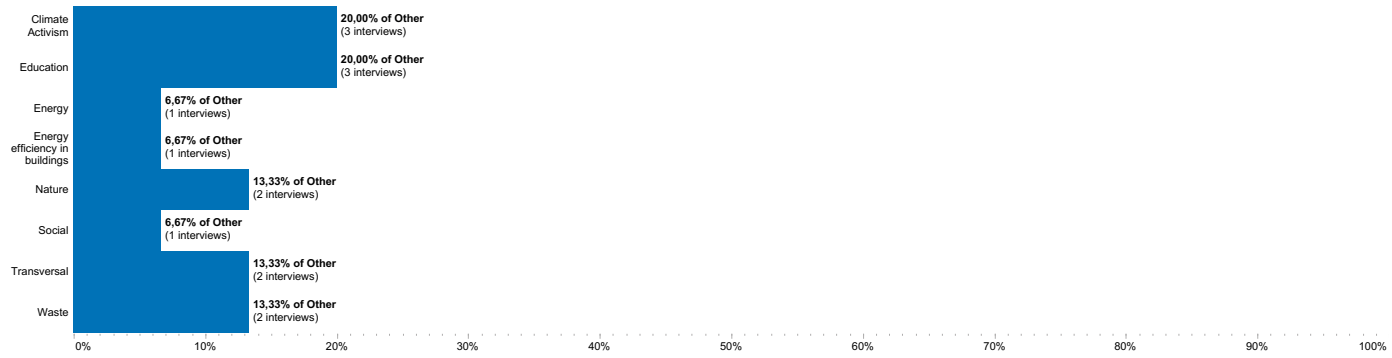
Distribution of interviewees by gender
(* data based on 54 conducted interviews)



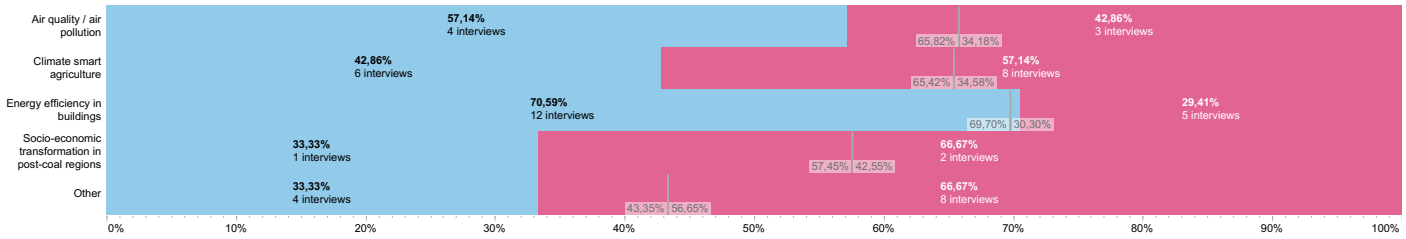
Distribution of interviewees by primary activity sector
(* data based on 54 conducted interviews)



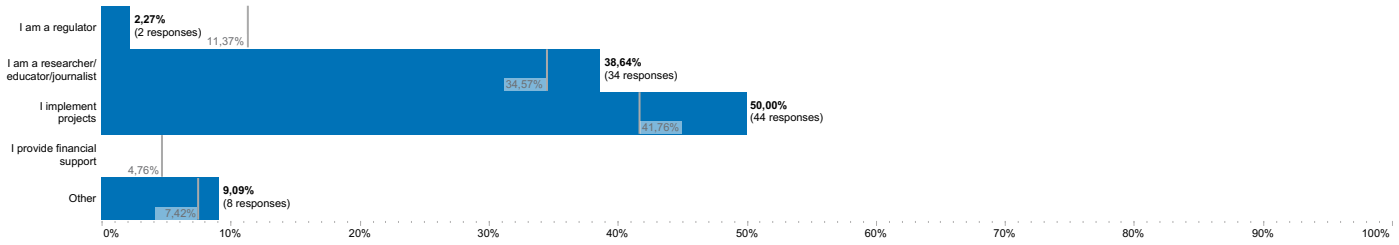
Breakdown of Other primary activity sectors
(* data based on 54 conducted interviews)



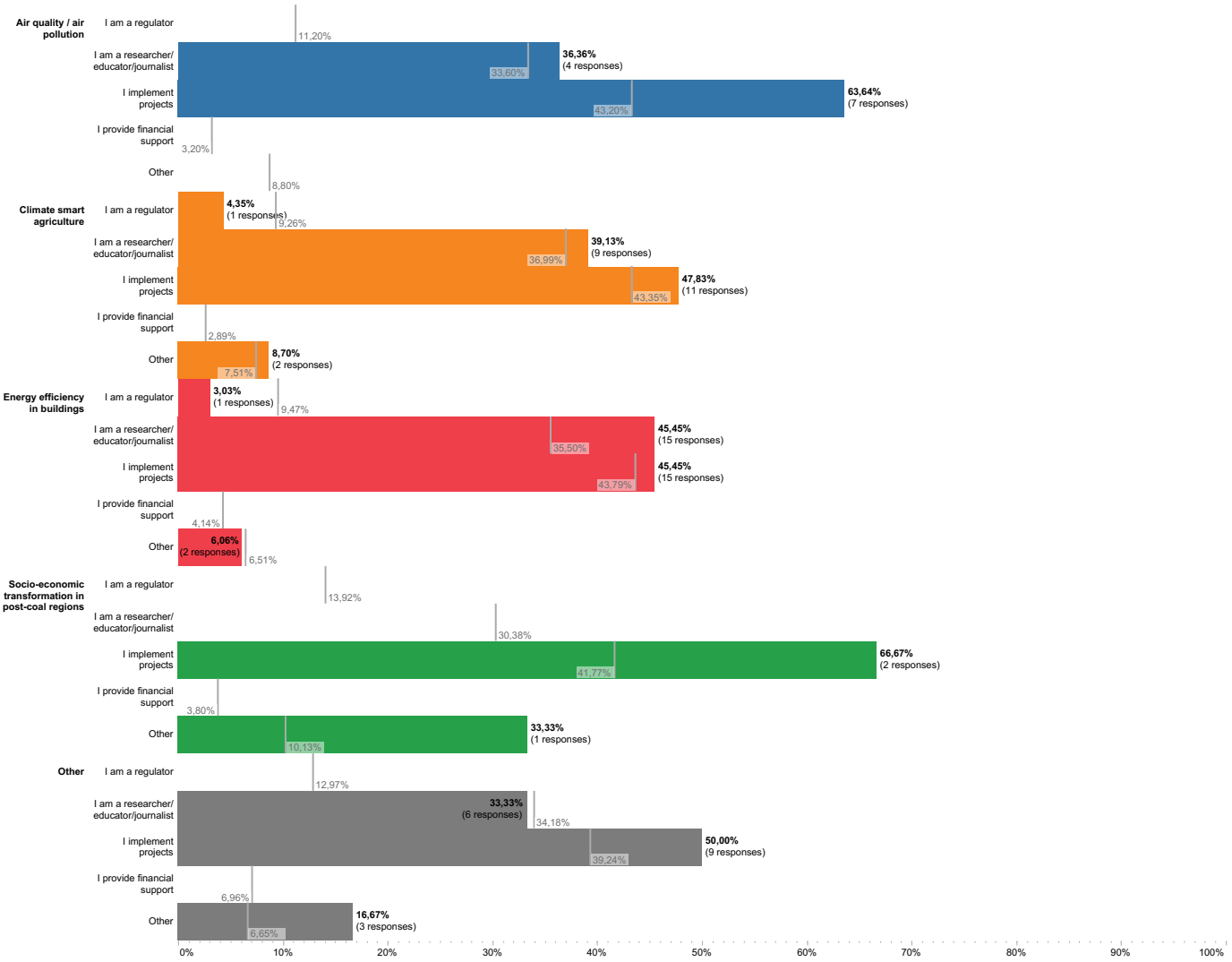
Gender distribution by primary activity sector
(* data based on 54 conducted interviews)



Distribution of interviewees by the type of role
(* data based on 54 conducted interviews)

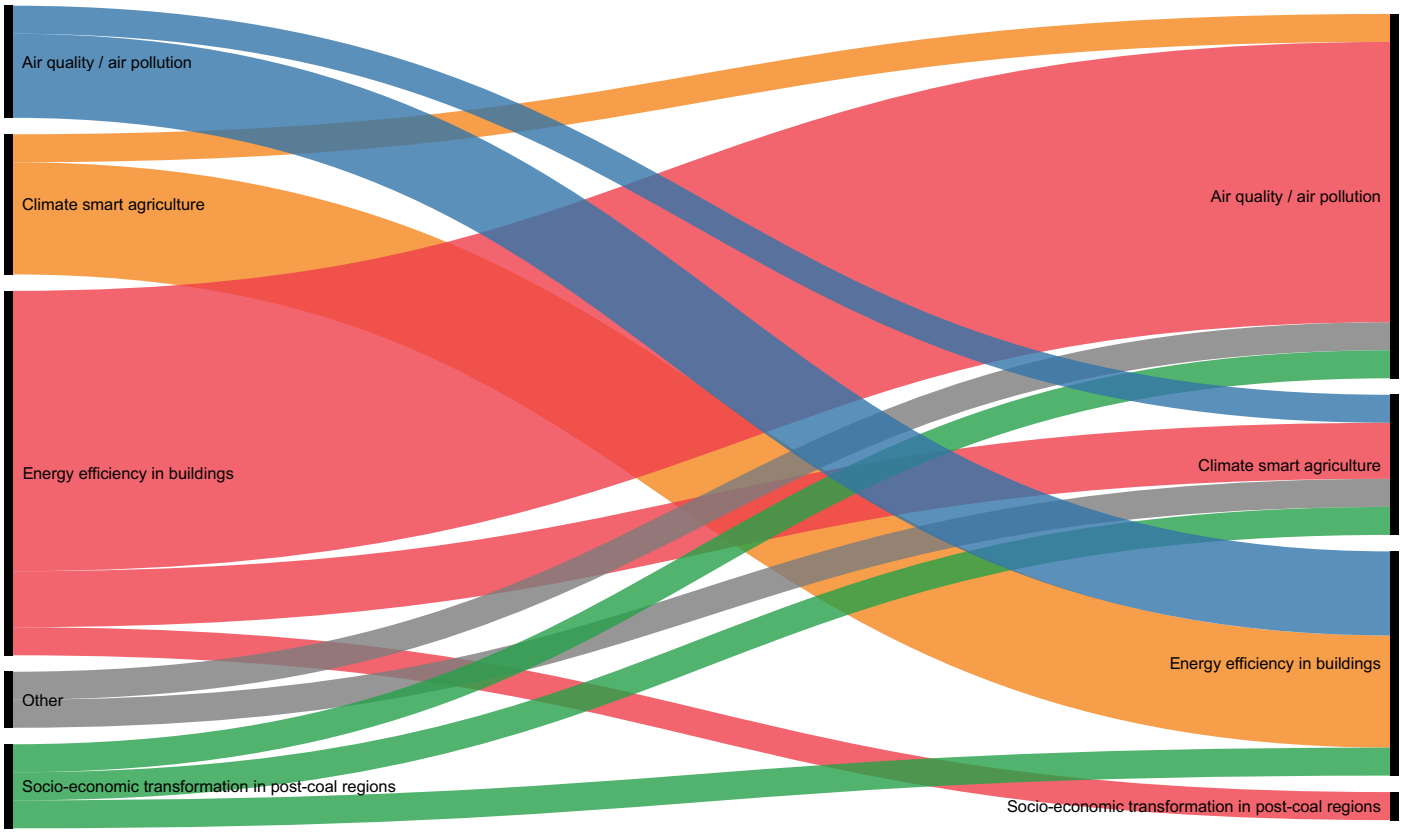


Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 54 conducted interviews)

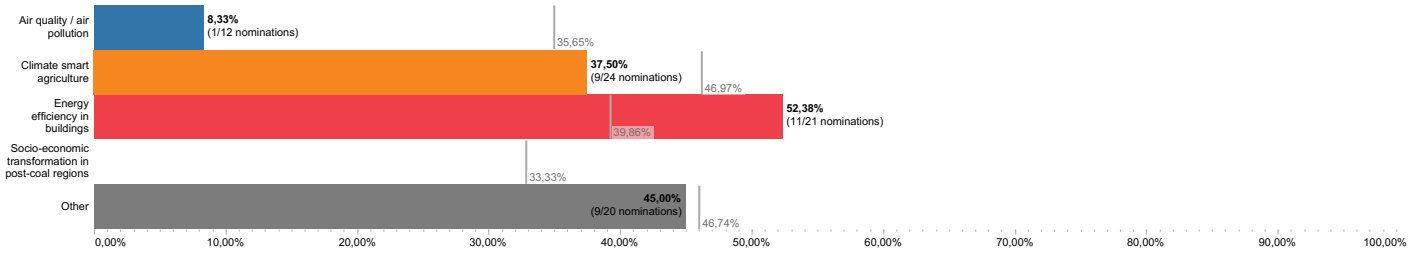


Distribution of interviews by region
(* more then 2 interviewees)

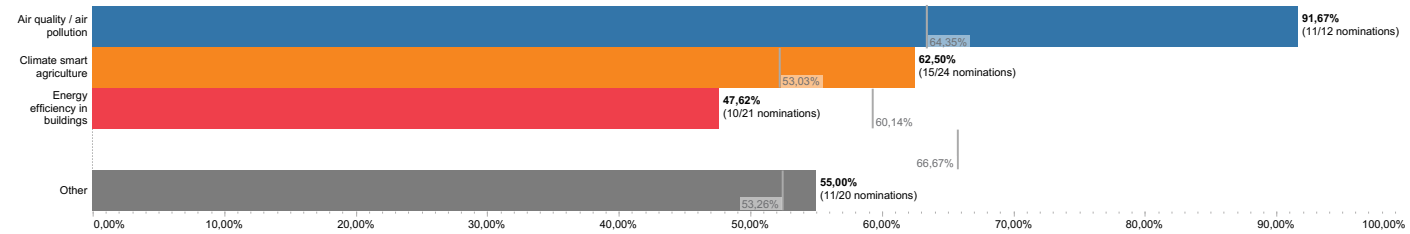
Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 54 conducted interviews)



Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 54 conducted interviews)

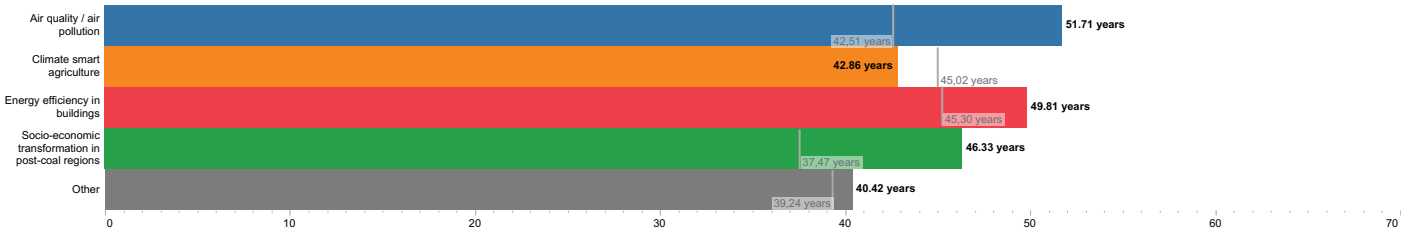


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 54 conducted interviews)

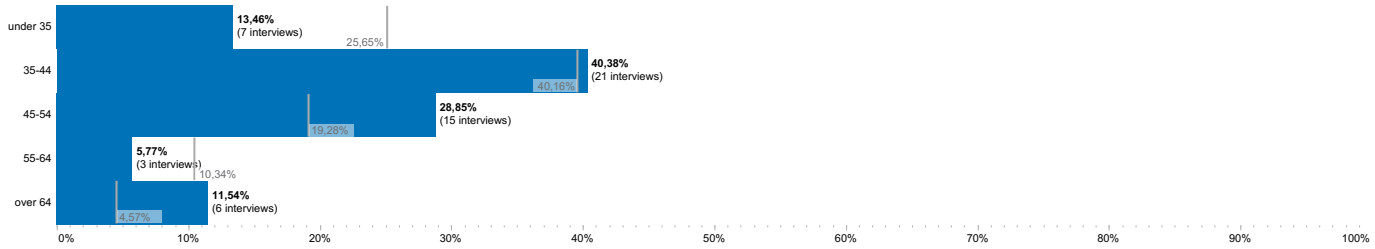


Average age of interviewees: 45.83 years (Regional average: 41.62 years)
(* data based on 54 conducted interviews)

Average age by primary activity sector
(* data based on 54 conducted interviews)



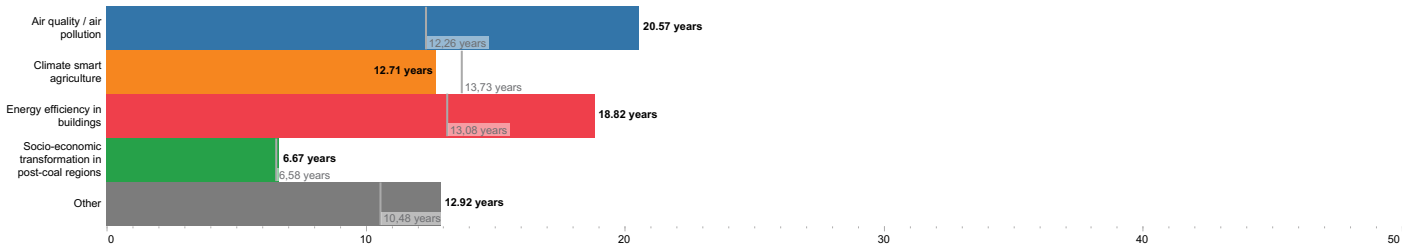
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 54 conducted interviews)



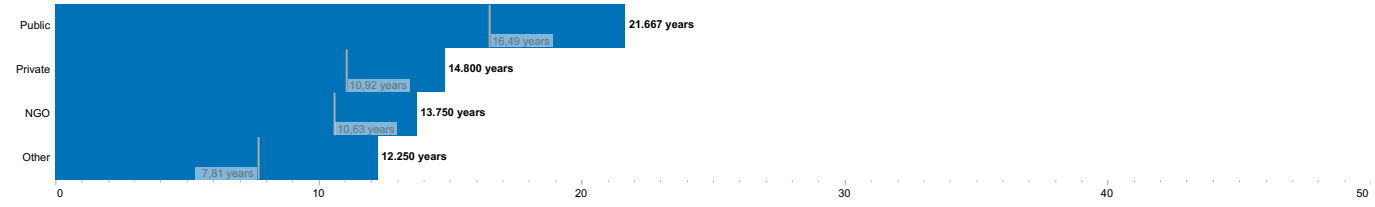
Average number of years of experience: 15.42 years (Reginal average: 11.58 years)
(* data based on 54 conducted interviews)

Average number of years of experience by gender
(* data based on 54 conducted interviews)

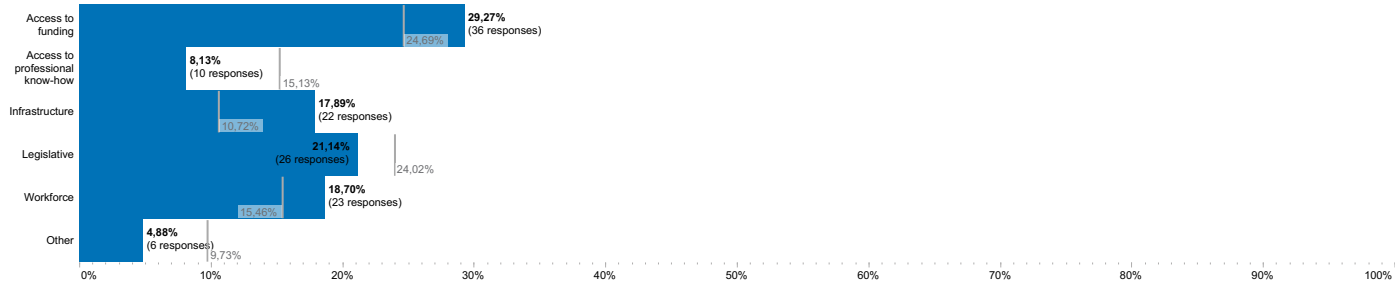
Average number of years of experience by primary activity sector
(* data based on 54 conducted interviews)



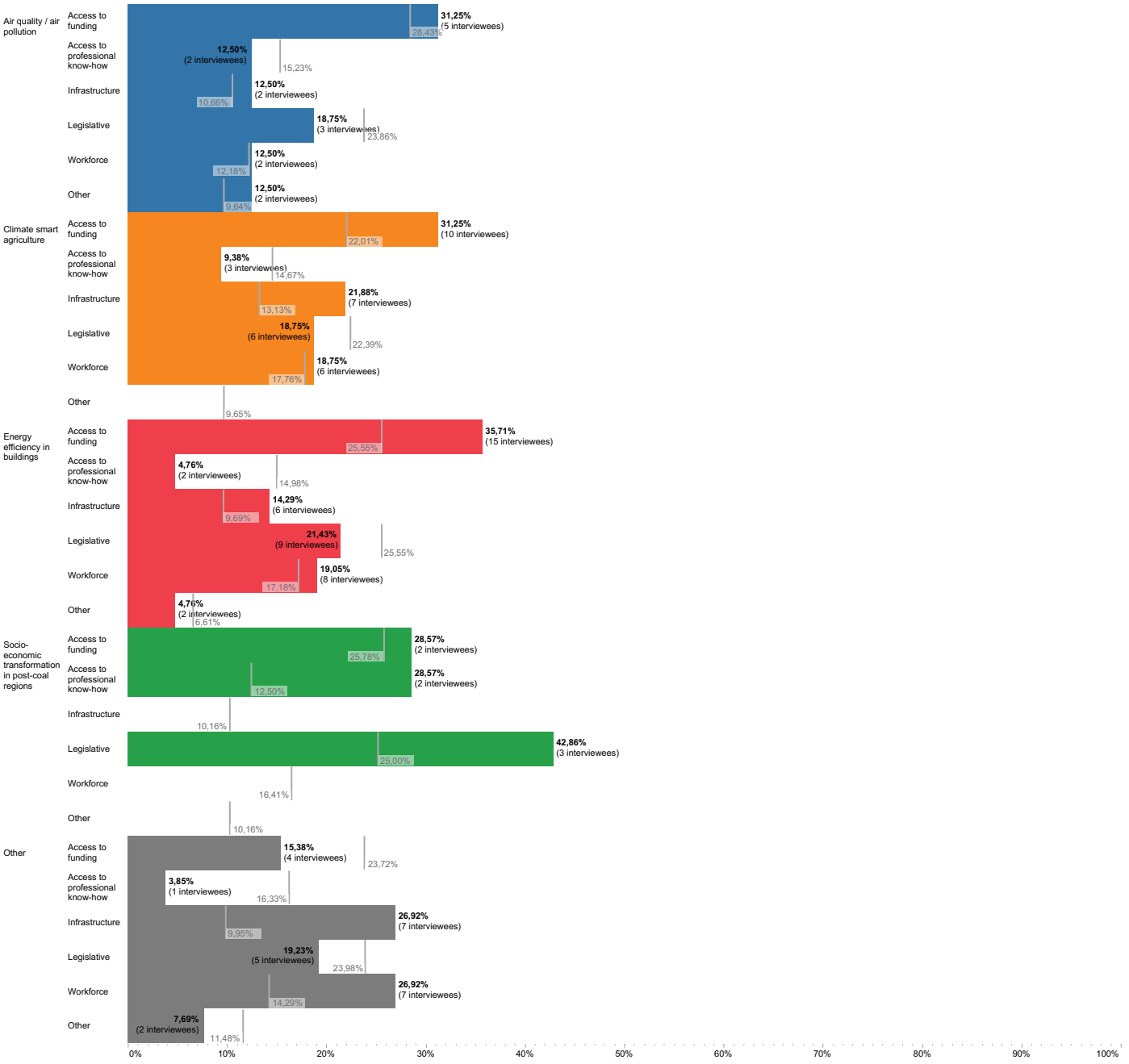
Average number of years of experience by the legal status of their member association
(* data based on 54 conducted interviews)



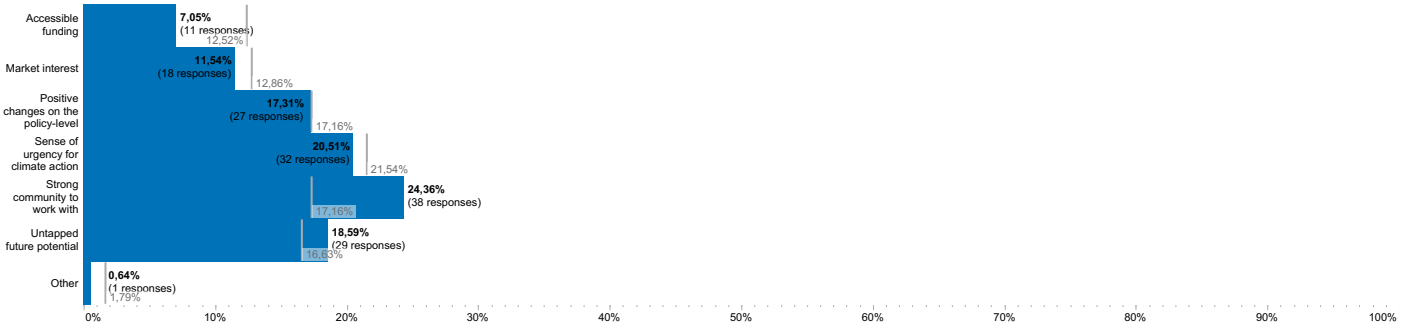
Distribution of interviewees by Barriers/Challenges category
(* data based on 54 conducted interviews)



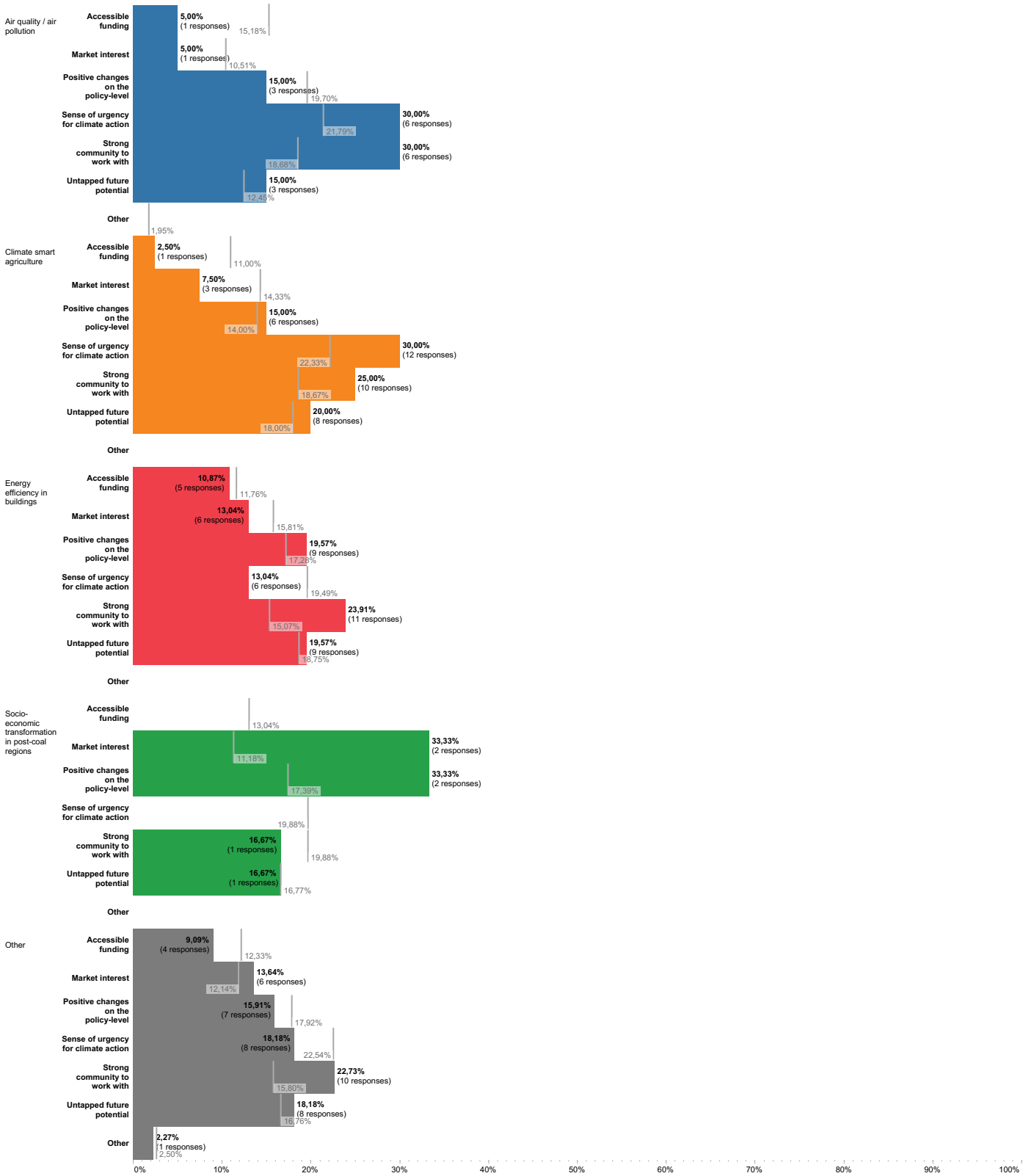
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 54 conducted interviews)



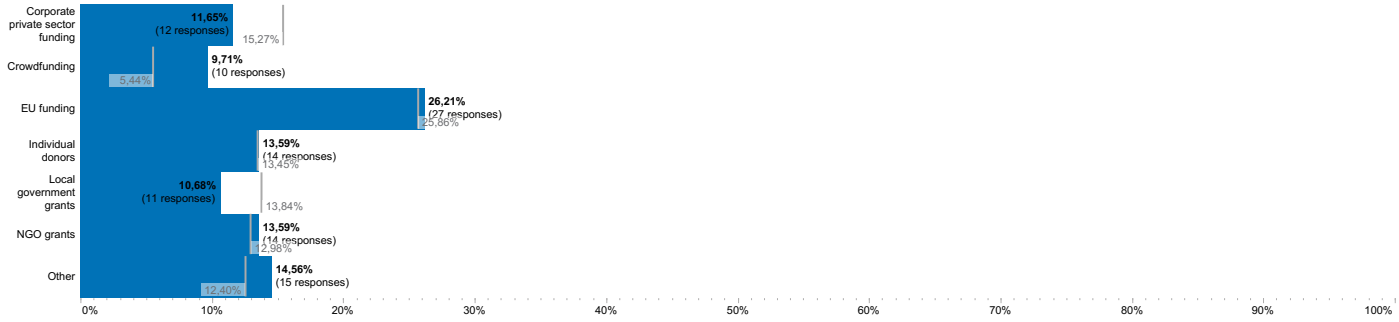
Distribution of interviewees by Opportunities category
(* data based on 54 conducted interviews)



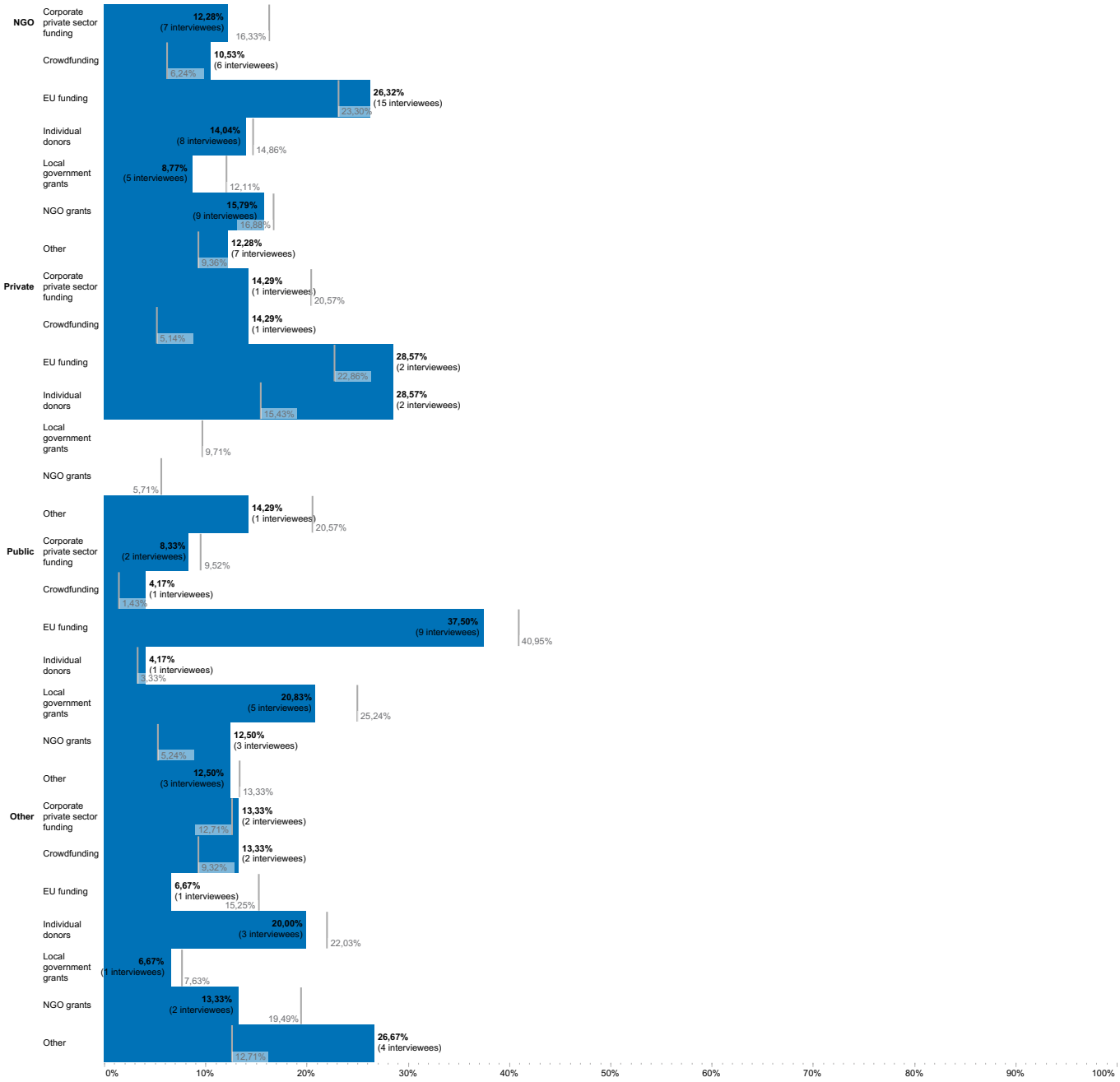
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 54 conducted interviews)



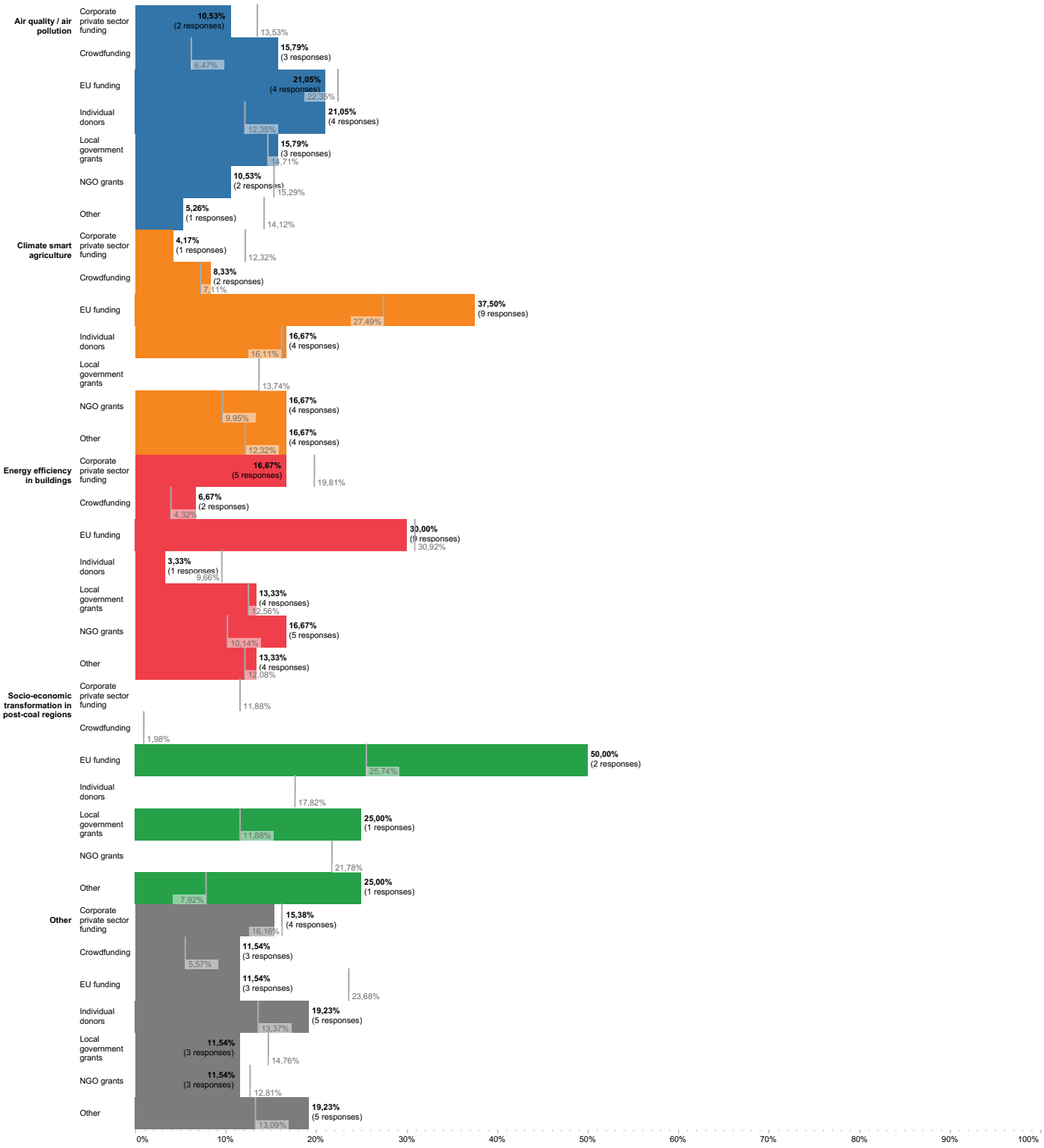
Distribution of interviewees by Funding opportunities category
(* data based on 54 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 54 conducted interviews)

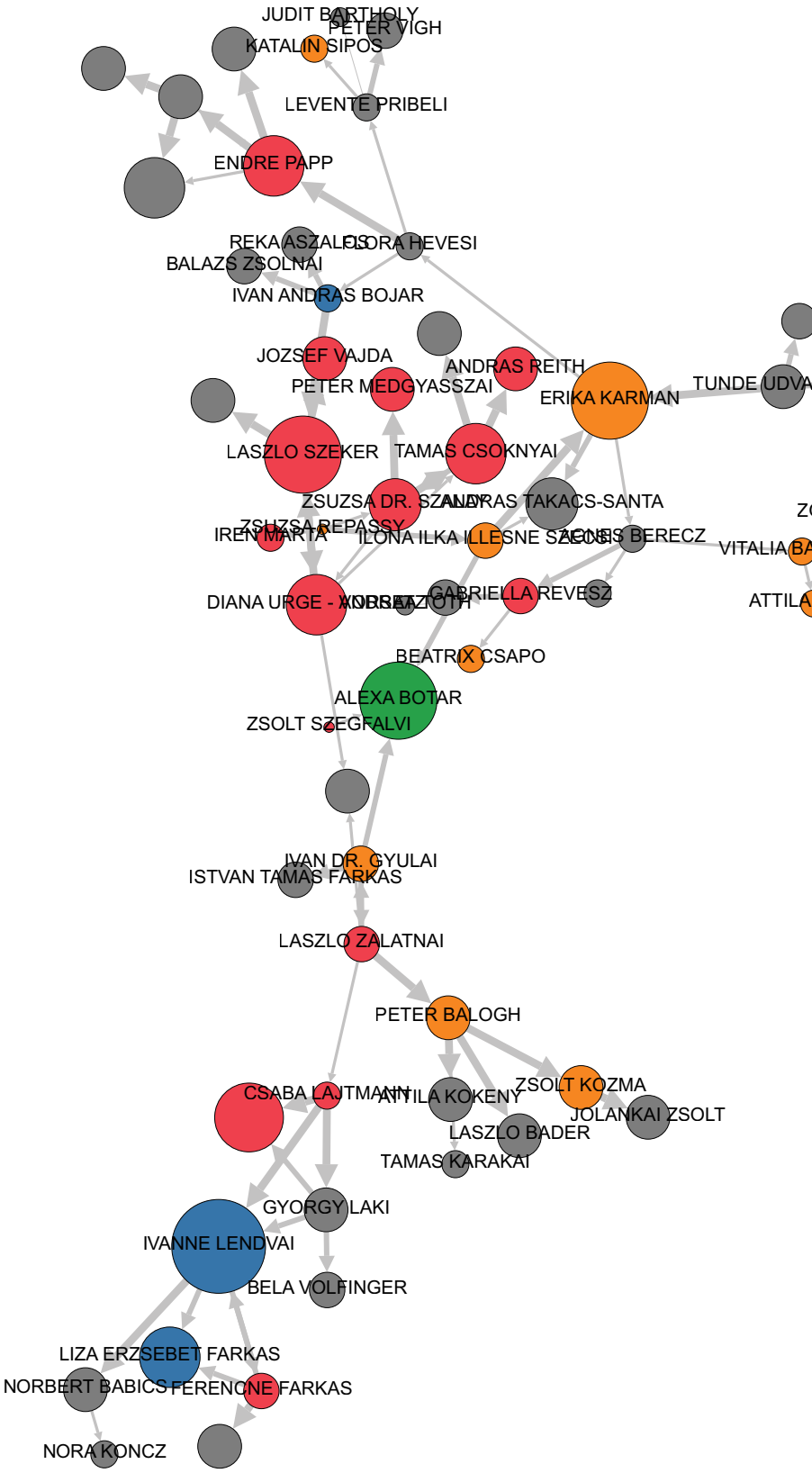


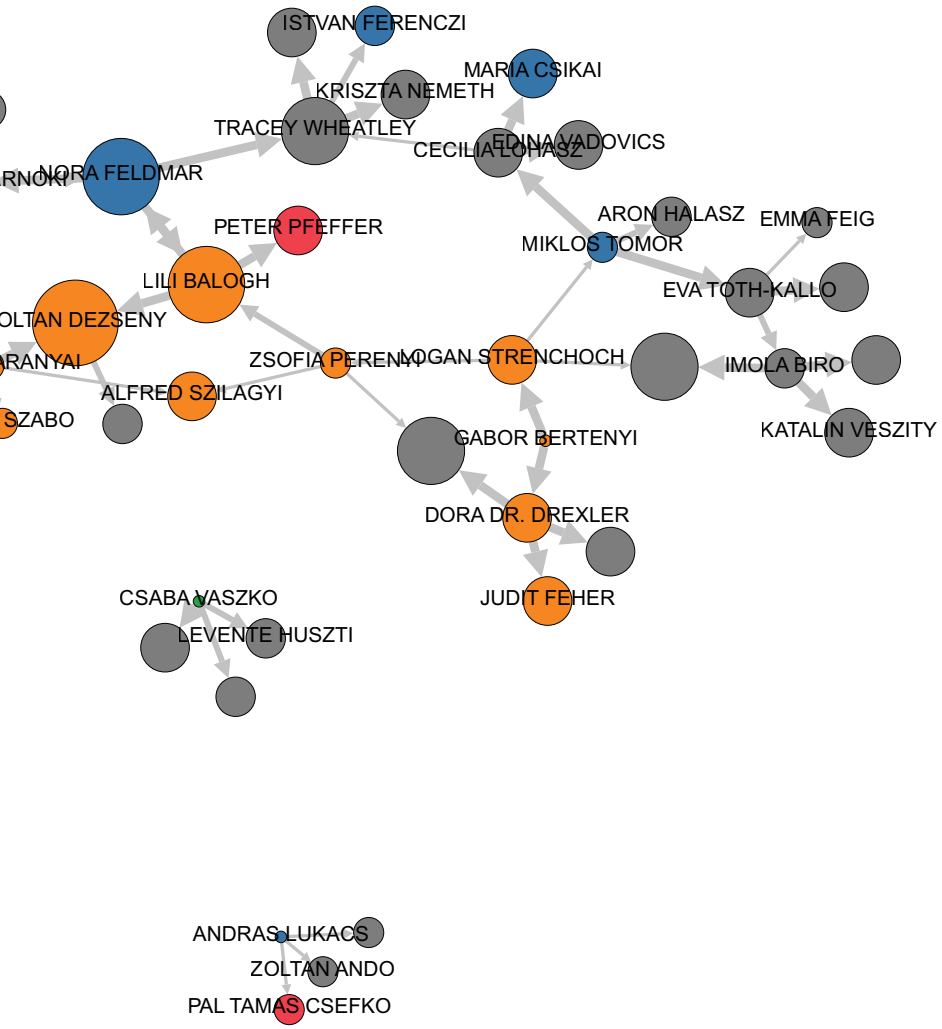
Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 54 conducted interviews)



Social network analysis

Overall social network map diagram
(99 nodes / 113 edges)





Primary activity sector:

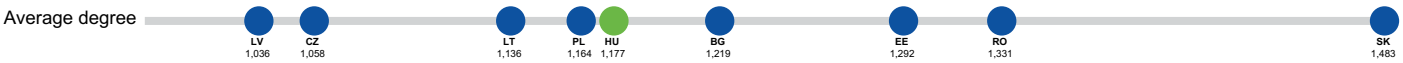
- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)

Social network statistics

Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals

Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

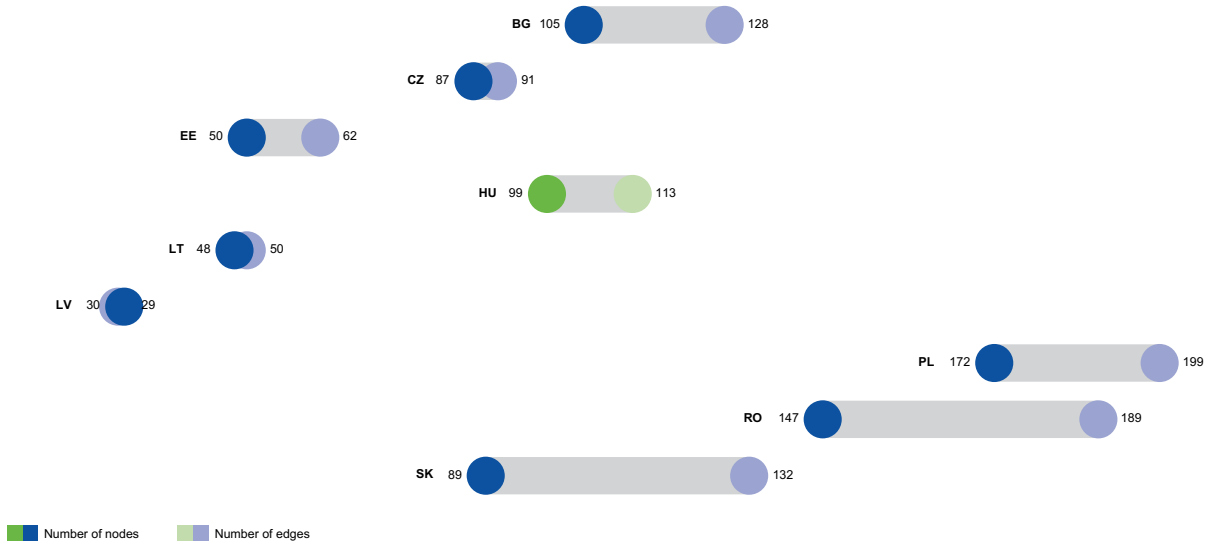
Number of discrete groups in the network

Number of nodes

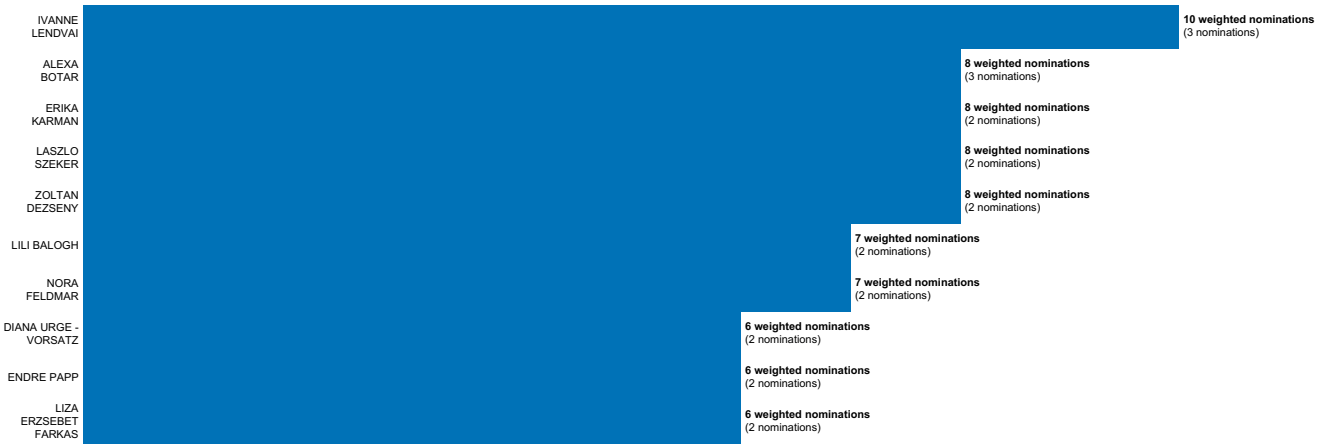
Number of individuals in the network

Number of edges (links)

Number of relationships between individual in the network (in total)

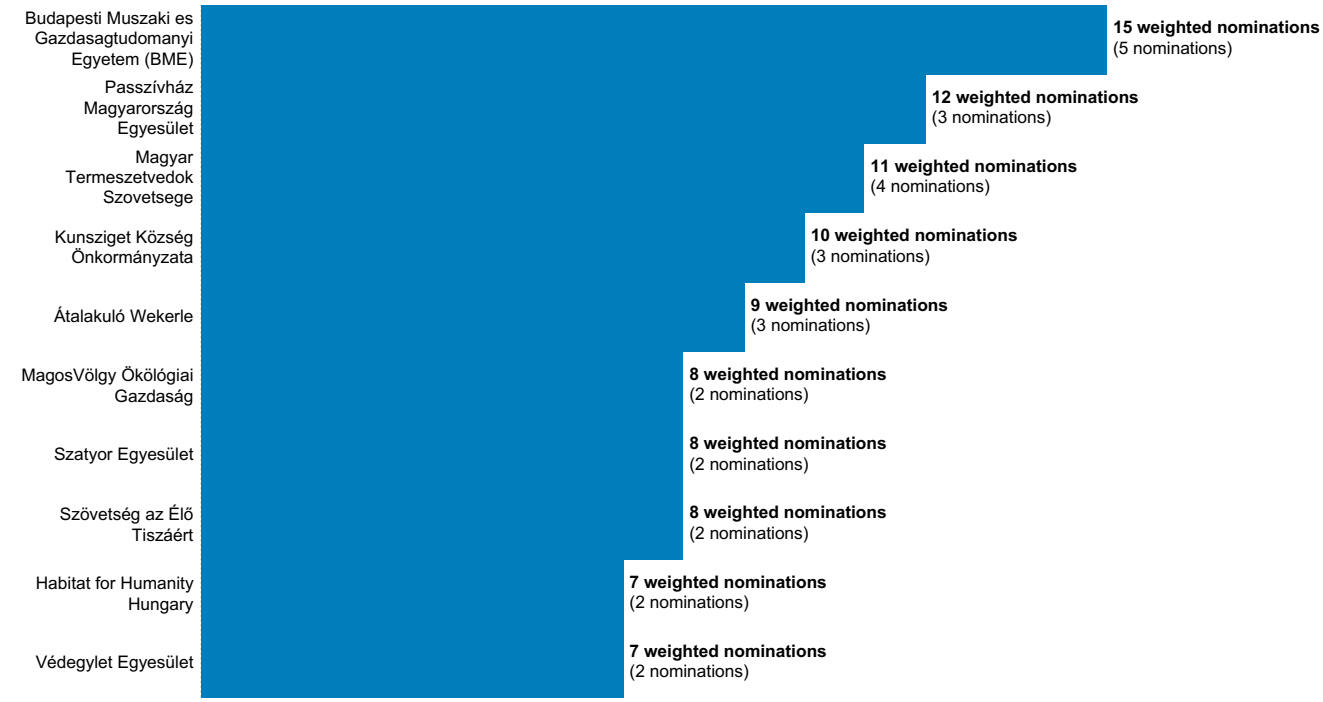


Top interviewees by the number of nominations (weighted in-degree)
(* 2 or more nominations)

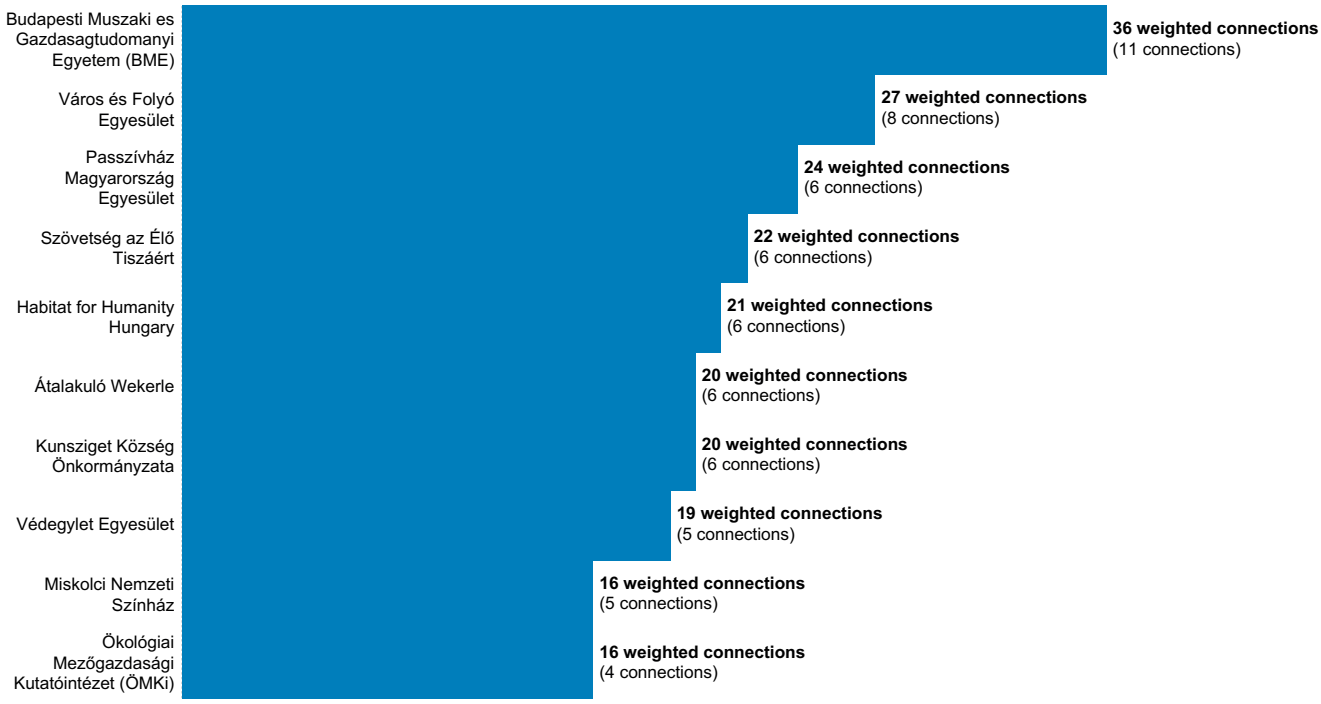


Top interviewees by the overall degree (in-degree and out-degree)
(* 2 or more connections)

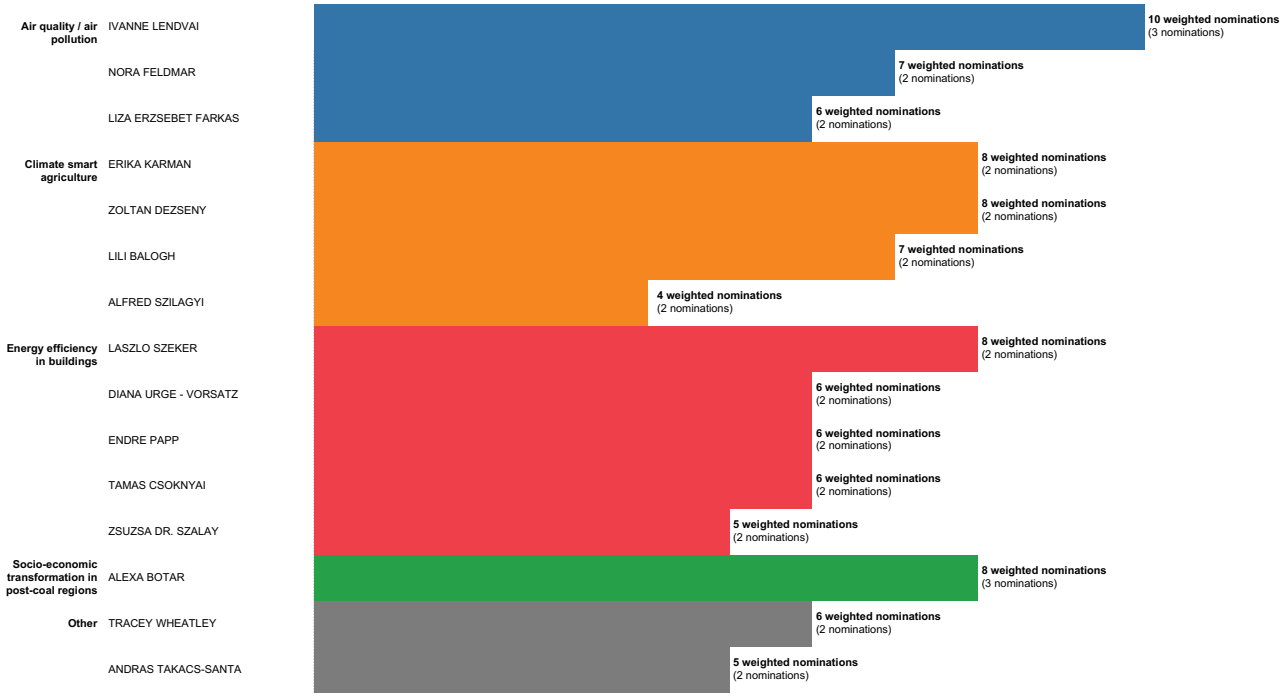
Top organisations by the number of nominations (in-degree)
(* 2 or more nominations)



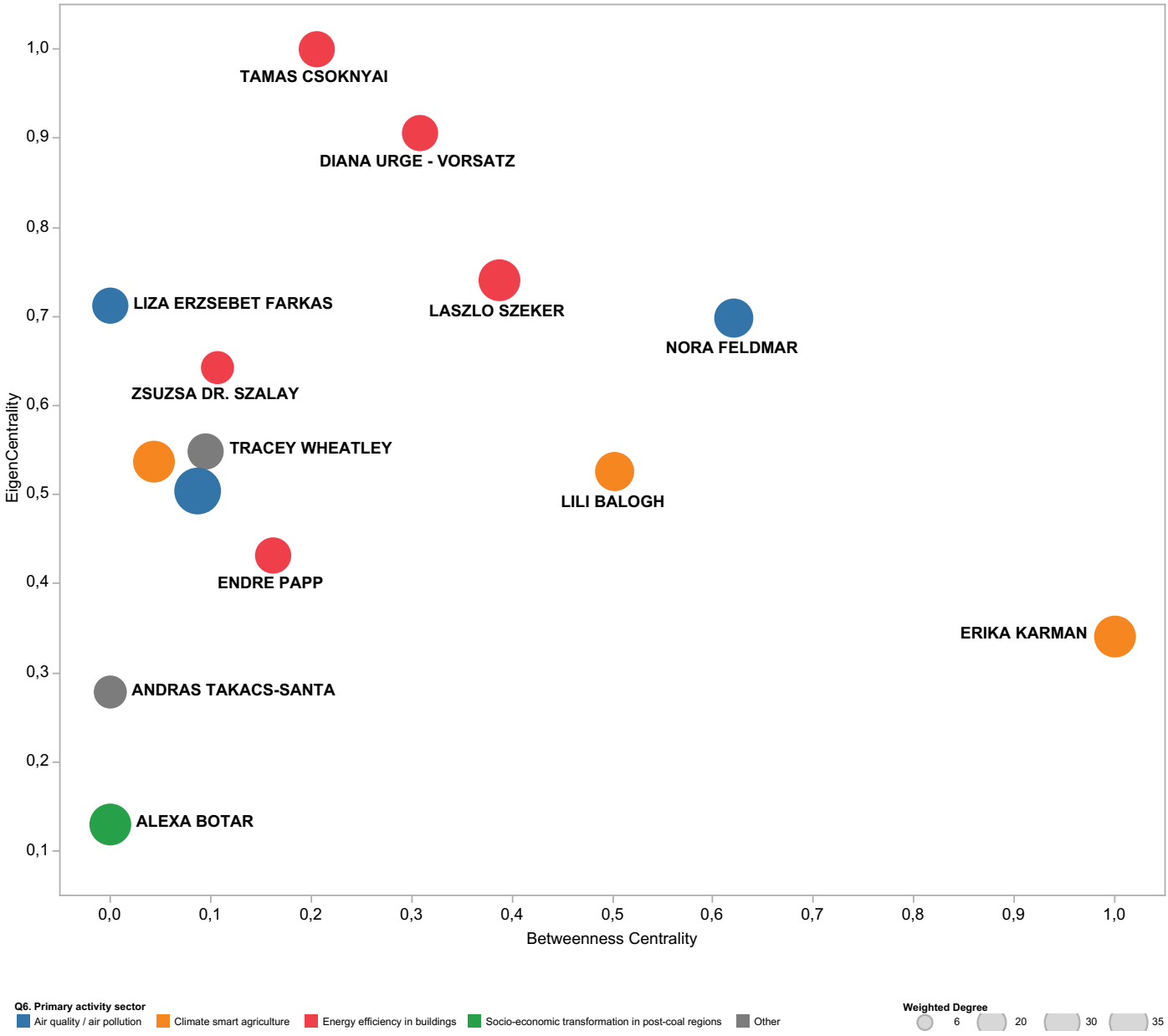
Top organisations by the overall degree (in-degree and out-degree) (* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector (* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with 2 or more nominations)



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 4: Qualitative and Network Analysis Czech Republic

Prepared by: **Martin Sedlak, Ivan Touska**

Energy efficiency in buildings

General context

There are approximately 1.8 million family houses and apartment houses with 2.5 million apartments in the Czech Republic. Another large group are state and public administration buildings (43 thousand), buildings of the agricultural sector (18 thousand) and industrial buildings (11 thousand). A specific feature of the Czech Republic are the almost 280 thousand holiday homes (cottages, cabins) According to Chance for Buildings, an alliance by leading trade associations that supports energy efficient construction, about 25% of family houses and up to 55% of apartment buildings underwent renovations[1].

In the Czech Republic, the district heating system plays an important role in the supply of heat and hot water. The total consumption of customers connected to the central heat supply is around 180 PJ per year, with almost 90 PJ in industry and 90 PJ in buildings.

By 2030, 65 PJ could be saved in buildings, which could help achieve up to 75% of the Czech energy efficiency target. Chance for Buildings calculated that using this potential would reduce the consumption in buildings by 20% and the economic savings would reach CZK 250 billion. As of 2020, all new buildings should meet the so-called near-zero energy category with heating consumption in the range of 30-70 kWh / m2 per year.

In the area of energy savings, the Czech Republic will not be able to meet its overall target by 2020 within the framework of the European strategy. This is due to a weak state information campaign and strong administrative barriers, which were criticized by the Supreme Audit Office in 2018[2]. In the past, governments have wrongly set up support systems that were too burdensome for users (complicated submissions of applications and short-term calls were also a limiting factor). However, the capacity of the Intermediate Body, the API Agency, has become a persistent problem of increasing the pace of spending on energy savings. This often results in applicants withdrawing or changing projects more often to adapt them to the new situation in a rapidly changing market.According to a Deloitte analysis, there are 775 buildings in the use of the central government which need renovations[3].

An example of good practice to reduce consumption in buildings is the use of the Energy Saving with Guarantee method. That method is based on the American model, which came to the Czech Republic in the early 1990s. The advantage of this solution is that a company or government institution does not need to have the means to invest in energy savings (most commonly thermal insulation, replacement of a heat source or installation of renewable sources, batteries, regulation of consumption), but the necessary investment is paid from guaranteed energy savings. The solution vendor is thus motivated to achieve the declared savings. Realized projects in the Czech Republic show that the method can be applied to a wide range of buildings - from historical (National Theater, Art Nouveau Municipal House buildings, public buildings - hospitals, schools, to industrial sites).

Innovation

The Center for Energy Efficient Buildings deals with the development of innovative solutions in the area of adaptation of buildings to climate change. Their experts are designing green roofs and water features in cities to prevent overheating[4]. Solutions from the circular economy are also penetrating the construction industry, such as the reuse of rubble in the form of recycled concrete[5]. The local micro-power plant Wave, which uses biomass energy and can produce heat and electricity, is dedicated to the supply of local heat from renewable sources for small municipalities[6].

Other dynamic areas are photovoltaic power plants and energy storage from a startup called OIG Power. It has won a prize in the Quality Innovation Awards 2017[7].

1 http://sanceprobudovy.cz/wp-content/uploads/2018/04/strategie-renovace-budov.pdf
2 https://www.e15.cz/byznys/prumysl-a-energetika/cerpani-evropskych-dotaci-na-uspory-energie-je-pomale-ukazalo-setreni-nku-1349185
3 https://www2.deloitte.com/cz/cs/pages/public-sector/articles/energeticke-uspory-ve-verejne-sprave.html
4 https://www.uceeb.cz/aktuality/mapy-tepelne-zranitelnosti-nam-ukazuji-kde-se-mesta-prehrivaji
5 https://www.uceeb.cz/aktuality/pracujeme-na-betonu-z-recyklovaneho-kameniva
6 https://www.uceeb.cz/aktuality/podporte-mikolajice-ve-finale-souteze-eon-energy-globe-2019
7 https://www.obnovitelne.cz/cz/clanek/301/cesky-start-up-uspel-s-inovativnim-resenim-bateriveho-systemu-a-fo-

Progressive office complexes are also being built in the Czech Republic, such as the construction of the ČSOB building in Prague in 2019, which meets the strictest LEED Platinum certification conditions[8]. The building uses active concrete, which can heat the building in winter and cool it in summer. There are pipes built into the ceiling structure through which water flows from 173 geothermal wells with a depth of up to 150 meters and a total length of 26 kilometers.

In 2019, the first "living hall" in the Czech Republic was opened. LIKO-S has developed a green hall that uses natural technology installed on the roof and walls to cool down[9].

Progressive projects originated in Budišov nad Budišovkou or in the Adler logistics center in Ostrava. They share the use of photovoltaics, batteries and cogeneration and connection in the local distribution system.

The primary motivation for using innovations is to save money and another common factor is the need to change technology. There are outdated central heating boilers often operate in the cities and it is advantageous to carry out a complete conversion with modern technology instead of simply replacing the boiler. Progressive city management is also an important factor, but it is not so common.

The Union of Modern Energetics and other actors in the field of renewable energy or energy savings aim to promote bottom-up change: increasing energy literacy, providing information on the benefits of new solutions. The government does not run or systematically fund a similar campaign, so it is mostly an independent initiative.

Public opinion

According to a survey of the attitudes of the Czech public on environmental protection issues prepared by Masaryk University in 2018, activities to reduce energy consumption (eg lower room temperature, use of energy-saving appliances) were performed frequently, very often or always by 77% of the population[10]. A poll by the Public Opinion Research Center (2017) states that 55% of the population conserves energy and water for the environment at all times or often.

A survey conducted for the Ministry of Industry and Trade on households' incentives to implement energy savings projects showed that homeowners most often renovate by themselves out of personal finances (76% of respondents financed from their own funds, approximately 1/3 took some form of credit and only 7% used subsidies). Very few of these people use professional services: 4% used architects, 6% energy specialists, 10% construction supervisors and 21% designers[11].

A KPMG survey shows that one quarter of large companies are considering modernizing lighting and more than 18% want to modernize production.

Public policies

The National Energy Efficiency Action Plan of the Czech Republic is the basic document for increasing the energy efficiency of the Czech economy. It is supposed to lead the Czech Republic to fulfill its national share within the Europe-wide goal of reducing consumption by 2020. The Czech Republic was supposed to save up to 51 PJ, target which cannot be achieved. The basic support programs include:

New Green Savings: The program supports the realization of energy savings in family houses and apartment buildings and supports the installation of photovoltaic power plants up to 10 kW since 2015. There has been a growing interest in supporting photovoltaic panels supplemented by energy storage since 2018. The annual drawdown of the program is CZK 2 billion. The program also supported the construction of 1,800 new buildings in a passive energy standard.

Operational Program Environment: supports energy-efficient renovation of public buildings and supports the construction of new public buildings in an energy-passive standard.

The Operational Program Enterprise and Innovation for Competitiveness supports energy savings in the business sector, including renovation of buildings.

tovoltaicke-elektrarny/
8 https://www.obnovitelne.cz/cz/clanek/996/ceska-nejmodernejsi-bankovni-budova-vytapi-teplem-ulozenym-z-leta/
9 https://www.obnovitelne.cz/cz/clanek/849/dost-bylo-rozpalenych-budov-vizionarska-hala-se-ochladi-bez-klimatizace/
10 https://munispace.muni.cz/library/catalog/view/1001/3110/767-2/#preview
11 https://www.mpo.cz/assets/cz/rozcestnik/pro-media/tiskove-zpravy/2019/5/MPO_pruzkum-povedomi_uspory-energie_zavery-a-doporuceni_2021.pdf

The integrated regional operational program supports energy savings in apartment buildings outside the Prague.

Smart agriculture in the context of climate

General context

In recent years the Czech Republic focused on topics such as large fields of fields, disappearing trunks and dirt roads and soil degradation. In general, these phenomena are attributed both to short-term land lease (80% of farmers are not the owners of the land they farm) and to large enterprises whose relationship to the landscape is purely economic. A report from 2015 reveals that 1.8 million hectares of land are under threat and 0.5 million hectares are already damaged by water erosion, while the total area of agricultural land is 4.2 million hectares[12]. The pressure of the professional and general public in 2019 led to the preparation of regulations to mitigate such effects. According to the plans of the Ministry of Agriculture, the continuous cultivation of an area only with one crop will be limited to 30 hectares from 2021.

Czech agriculture is also struggling with high levels of pesticide use and other chemical compounds. This has a negative effect on the quality of drinking water. The 2016 Czech Republic Environmental Report published by the Ministry of the Environment of the Czech Republic shows that 28% samples of groundwater were contaminated with pesticides[13]. The State Veterinary Administration registered in 2018 more than 130 dead bee colonies due to pesticide use. In the Czech Republic, more than 4,200 farmers farm in organic way, accounting for 12% of the total agricultural land.

The droughts of recent years are partially caused by poor land management and inappropriate forest management. Governmental drought measures are critiqued by many experts and other state actors, such as the Supreme Audit Office[14].

12 https://cz.boell.org/sites/default/files/chb-shrnuti-2015-web_1.pdf
13 https://www.mzp.cz/C1257458002F0DC7/cz/zpravy_o_stavu_zivotniho_prostredi_publikace/$FILE/SOPSZP-Zprava_ZP_CR_2016-20171211.pdf
14 https://www.nku.cz/cz/pro-media/tiskove-zpravy/zasadni-opatreni-pro-boj-se-suchem-chybi--skody-se-pritom-jen-v-minulem-roce-vysplhaly-na-24-miliard-korun-id10893/

The Ministry of the Environment has invested in more than 14 thousand projects worth CZK 11 billion, but these funds were spent mainly on analytical projects and less on implementation of measures. In the area of forestry, both drought and calamity of the pest had a negative impact in recent years. Wood production caused by these influences has doubled last year compared to 2012.

Innovation

Most technological innovations in agriculture are focused on efficiency. The current trends could be described as follows:

- performance of agrotechnics (higher speeds, minimization of losses);
- precision farming systems (individual adaptation to local anomalies, precise navigation);
- higher automation of operations;
- breeding of more efficient varieties and breeds.

Innovative approaches to agriculture also focus on food quality:

- Community-supported agriculture connects farmers and consumers. Personal ties increase confidence in the quality of food and there is also certainty in purchasing and product prices.
- Incubation farms are ready to train those interested in farming in the form of long-term internships and give them advice on starting their own business. During such educational process, theoretical preparation alternates with practice, which will increase operational, management and administrative competencies in organic farming and landscape management.

The Association of Private Farming provides the Czech Republic with relatively progressive positions and support for small agricultural companies. It consists rather of family farms and small farms. On the contrary, the conservative Agricultural Union represents large agribusinesses and undercover conservation of agriculture based on chemical fertilization and pesticide use. They also partially support the sustainable agriculture of environmental organizations (the Rainbow Movement, the Glopolis Institute).

In recent years, new associations have also been established, often based on the student

environment. For example, the project On the Fruit (the possibility to get fruit from old orchards), great response is also Save the Food (support vegetables or fruit that is not "right" for supermarkets).

Brno's start-up World from Space analyzes current satellite data[15]. The results are processed into regular information on vegetation, drought, infrastructure or economic activities, for example, to farmers or cities. Satellite data can be used to continuously monitor the state of the fields.
In terms of research, Mendel University of Agriculture in Brno (Prof. Žalud) is active in the field of climate change. The topic of agriculture is also one of the research areas of the Academy of Sciences, which has the Institute of Global Change Research - Czech Globe. Research priorities include ecosystem functions, adaptation measures to environmental change in forest-agricultural landscape; changes in land use or carbon storage in the landscape.

Public opinion

Recently, it has been possible to observe the growth in demand for food products with different character of added value, such as organic food, regional and local food, food obtained through direct sales (yard sales, farmers' markets) or higher quality food and non-traditional food (quality meat products, steaks, quality cheeses, including goat and sheep, etc.). If before the share on the domestic market of such products was negligible, nowadays this demand segment represents a great potential for diversification of production, emphasizing the quality and economy of production.

Targeted customer-farmer relationships are being built, farms and regions are open to present their specificities to customers.

Public policies

Drought Protection Concept for the Czech Republic: The objective is to create a strategic framework for the adoption of effective legislative, organizational, technical and economic measures to minimize the effects of drought and water scarcity. The Czech Republic wants to invest CZK tens of billion in the fight against droughts.

15 http://worldfrom.space/cs/domu/

National Drought Coalition: the target is to strengthen the field of research and development of drought control, but also concrete measures to retain water in the landscape.

Strategy of the Ministry of Agriculture of the Czech Republic for 2030: the government's strategy is to ensure adequate food self-sufficiency in basic commodities and to develop the sustainable management of natural resources, maintain the landscape and support its non-production functions[16].

Research and Development and Innovation Concept of the Ministry of Agriculture 2016-2022: the target of this strategy is to ensure sustainable management of natural resources, sustainable agriculture, forestry and food production.
On the practical level, however, the fulfillment of these basic strategic documents encounters a conflict of interests from large agrarian enterprises. Another problematic phenomenon is the connection of Prime Minister Andrej Babiš to one of the largest agricultural enterprises in the Czech Republic - Agrofert.

Socio-economic transformation in post-coal regions

General context

The Czech Republic is the third largest coal producer in the EU, with its 48% share of electricity produced from coal equating more than double the EU average (20%). Lignite regions are characterized by lower education, poorer access to healthcare, poverty and higher mortality rates. Since 2017, the European Commission has been paying increasing attention to coal-fired areas due to the approaching decline in mining.

The three coal regions of the Czech Republic have historically specialized in traditional industries with an important role for heavy industry, mining and energy. For these reasons, the economic transformation of these regions was more demanding, difficult and only partially successful.

The coal industry in the Czech Republic is also affected by larger global economic trends (such as the price of energy raw materials, a reduction in

16 https://www.reuters.com/article/us-czech-eu-babis/eu-audit-finds-czech-prime-minister-babis-in-conflict-of-interest-report-idUSKBN1Y51CO

the need for human labor), and coal regions and their economic structures will suffer more than other regions of the Czech Republic.

The largest proportion of the Czech population suffering from material deprivation live in lignite regions (16% in 2018 compared to non-coal mining regions 3.2%)[17]. Their residents more often cannot afford to either pay unexpected several thousand costs, eat meat every day or its substitutes, heat home enough, or take at least a week's holiday to their family. Material deprivation and the risk of poverty are also linked to agricultural regions, employment[18].

Innovation

There is a lack of higher education facilities and low capacity for innovation in mining regions. Almost one fifth of the population over the age of 15 has only compulsory or no education (in 2015). Although this is a relatively young region, the prospects of young professionals are very limited. Unemployment among high school students in the Ústí nad

Labem and neighboring regions of Karlovy Vary is particularly high compared to Prague and its surroundings.

Public opinion

The transformation of the economy after the Velvet Revolution brought protection to municipalities against the expansion of mining. The attempts of mining companies to break the mining limits lasted until 2017. The current President Milos Zeman continues to talk about coal mining as in Czech gold. Of course, the miners continue to be among the relatively loud supporters of coal mining.

Generally there are no public debates on the decline of the coal industry. However, there is a general belief that other coal-fired power plants will inevitably be shut down due to low coal reserves and decreasing mining capacity, stricter air pollution limits and other factors. There is hardly any discussion about managing the transition to climate-friendly energy or about the real social, economic and environmental costs of continuing in the current direction. The State Energy Policy of the Czech Republic from 2015 only describes several desirable ranges of energy production from coal in the future and assumes that 11–21% of the produced electricity will come from coal in 2040, most of which is brown coal. The range of nuclear sources is similarly broad. However, for 11% or 21% of coal in the energy mix, the brown coal regions represent fundamentally different energetics and completely different framework conditions and timetables for limiting coal extraction and combustion.

However, positive factors of transformation can be found, for example, in Horní Jiřetín - a town with 2,000 inhabitants was to give way to mining but managed to save it. Today the population is growing there, and the city has been run by Vladimír Buřt, who was awarded the prestigious environmental prize of for the second time.

Public policies

With increasing ambitious EU climate targets, the transition to a low carbon economy is likely to accelerate over the coming decades. The EU already offers various sources of funding that coal regions can use to facilitate this energy transition and mitigate the consequences for the affected workers. The European Union also offers the Czech Coal Regions a unique opportunity to get systemic assistance with a move away from coal and sustainable economic development. Between 2021 and 2027, several sources of funding will continue to be available, ranging from social funding for market reiteration and job search, investment opportunities in the energy and climate adaptation sector, and research into new clean technologies.

The RE: START program has been running in the Czech Republic for several years, within which the Government approves action plans with specific projects every year[19]. While environmental organizations consider the program to be meaningful in principle, they point out that it has no clear plan for specific regions to diverge from fossil fuels and does not sufficiently involve the local public. A total of 16 new measures were prepared but without claims on the state budget. The update Action Plan focuses mainly on EU funds under the new programming period 2021. According to EU support there will be offer

17 https://www.ekonomickymagazin.cz/2019/11/uhelne-regiony-spojuje-nizsi-zivotni-uroven-a-vedou-v-umrtnosti/
18 https://cz.boell.org/sites/default/files/final_report_cz_online.pdf
19 https://restartregionu.cz/

interesting prospects in the field of sustainable energy within a few years. And also, there are some experts working in region like Jiří Stich, an experienced consultant in the field of smart cities and regions development.

Air pollution

General context

The Czech Republic is failing to comply with measures to improve air quality and there is a risk of non-compliance with the set limits of pollutants in the air by 2020. The sources of households, transport and, in some locations, industrial sources have the greatest impact on air quality. The Czech Hydrometeorological Institute determined that Czech sources are responsible for approximately half of the pollution in areas with the exceedance of the limit value, while the other half is caused by cross-border impacts (mainly from Poland)[20].

Dust microparticles, the highest values of the smallest PM2.5 dust particles, affect the Northwest zone, and are related to emissions of sulfur and nitrogen oxides from coal-fired power plants and to ammonia emissions from agricultural farms. Furthermore, higher concentrations of secondary aerosols occur in a belt stretching across the zone of Central Bohemia, in the Northeast of the Czech Republic, and in Moravia. The lowest values are reached in pure mountain areas.

Some of the other important air polluters are household heating (300,000 households still use coal), road transport, and industrial sources. Sources of emissions from Czech households account for 20–70% of air pollution caused by particulate matter PM10 and PM2.5.

Transport accounts for around 20% of the annual averages of PM10 and PM2.5 (in Prague and Brno, however, up to around 60-70%). The reported emissions of primary particulate matter from industry accounts for 20-30% of PM10 and PM2.5 air pollution.

Several factors have helped to improve air quality in the past 30 years, such as the greening of resources after the Velvet Revolution. The Air Protection Act of 1991 ensured that coal power plant operators had to invest in desulphurization plants. The result was a radical reduction in sulfur dioxide emissions, which previously had caused smog calamities in cities and decimated Czech forests with acid rain.

Innovation

The air in Czech towns and villages would significantly improve with modern energy solutions. One possibility is to replace coal with biomass. or solar energy solution. Photovoltaic installations can be complemented by heat pumps, solar collectors and batteries for energy storage.

Planting trees in urban space supplemented by modeling has been successfully implemented by CLAIRO in Ostrava with a budget of 65 million crowns[21]. The project uses spatial data of local airflow and it calculates where it is appropriate to plant greenery. In addition, it develops special organic watering, which makes the planted plants more resistant.

Safe cycling in the big towns is promoted by the Automat Association in Prague and the Brno on Bicycle Association in Brno. Also successful is the Rekola community project, which repairs old bikes for bike sharing. There is also growing interest in car sharing. The largest system is Autonapůl. Today it operates in Brno, Prague, Pilsen, Liberec, Ostrava, Pardubice, Hradec Králové, Olomouc and České Budějovice. Shared cars have discounts on sling charges in some cities.

The Czech startup Dustee has developed a device that measures dust levels in the air[22]. Using IoT, it processes sensor data and can recommend where to place air purifiers. Now the device is being tested in some kindergartens in the Ostrava region.

The startup World from Space also analyzes the air quality according to satellite images and completed a project in the city of Pilsen[23].

Progressive steps like banning old diesel cars in towns have not been implemented in the Czech Republic yet. Prague is considering possible regulation, but so far it is rather purely ideological

20 https://www.mzp.cz/cz/news_20191220_Aktualizace-PZKO

21 https://clairo.ostrava.cz/

22 https://dustee.cz/

23 https://www.sitmp.cz/projekty_detail/satelitni-analyza-plzenskeho-ovzdusi/

intentions. However, many cities are investing in greening public transport - see the mention of replacing diesel buses with electric or CNG drives.

Public opinion

Air quality has long been one of the topics that the public evaluates negatively. According to the Flash Eurobarometer (2013), 75% of Czechs assess transport as the most serious threat to air quality in the Czech Republic[24].

A more recent survey by Masaryk University shows a greater detail on the perception of air pollution: the majority of Czech citizens are mostly satisfied with the air quality at their place of residence, most Czechs identify industry and car transport as the main sources of pollution and believe that public authorities and households are not doing enough for air quality. A large majority of respondents agree with the "polluter pays" principle.

According to Flash Eurobarometer (2013), Czechs consider asthma and allergies (88%), cardiovascular disease (86%) and respiratory diseases (80%) to be the most serious health consequences, with slightly fewer respondents considering the effects on the environment. The Czech public has reduced its emissions over the last two years mainly by frequent use of public transport, bicycles or walking instead of cars, and by replacing old energy-intensive equipment with newer ones.

Public policies

National Climate and Energy Plan: this is a key strategy for reducing emissions by 2030, which is intended to meet the national share of increasing renewables, reducing consumption and emissions in line with approved European commitments. The Czech target is among the lowest in the EU in terms of increasing the share of renewable sources in the electricity sector. There is not enough room in the strategy to support the development of local solutions that should lead to the replacement of fossil fuels in households.
Air quality improvement programs: the program establishes measures to achieve the required air quality in the shortest possible time. It lays down measures at regional and local level. Together with the National Program for Reducing Emissions of the Czech Republic, these are basic strategic documents for improving air quality.

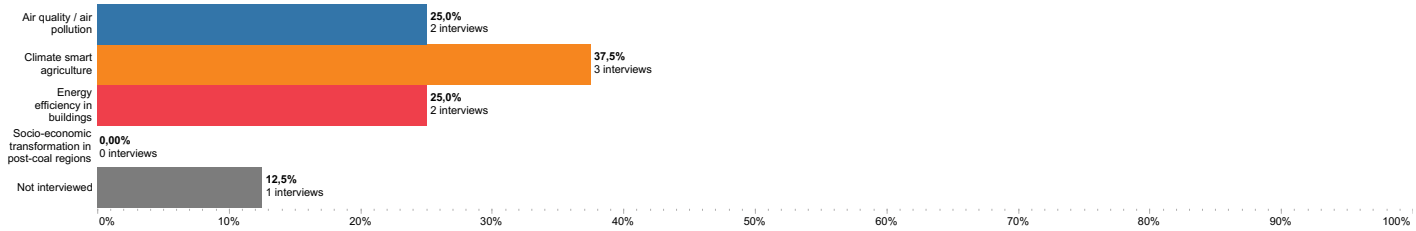
Government documents are criticized by opposition and environmental organizations for their limited ambitions. For example, the updated National Emission Reduction Program proposes reducing nitrogen oxides by up to 5,000 tons per year by increasing the use of renewable sources. The problem, however, is that the current National Climate and Energy Plan of the Czech Republic requires an increase of renewable energy sources by only 22% by 2030. This target is so low that it does not motivate the use of renewable resources fast enough. Furthermore, the strategy lacks a specific plan to replace coal in local furnaces, fails to introduce a high enough energy tax on coal and does not reduce the exemptions from emission limits for coal-fired power plants. In particular, the program ignores the application of the new European emission limits for coal-fired power plants, which will be effective from August 2021.

24 https://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/ResultDoc/download/DocumentKy/68007

Facts and figures regarding the data collection process

Data collection period: 05/11/2019 - 29/11/2019
Number of initial contacts: 8
Initial distribution of contacts by gender:

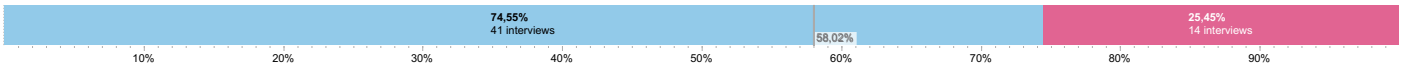
Initial distribution of contacts by thematic sector:



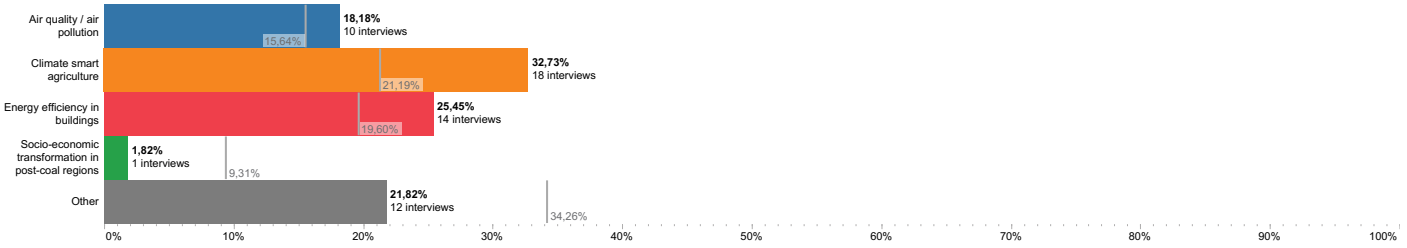
Number of contacted persons: 67
Finalised interviews: 55
Number of people not interested in participating in the study: 8
Response rate: 88.05%
Total number of nominations: 91
Total number of unique nominations: 87
Average amount of nominations by interview: 1.70

Interviewee profiles

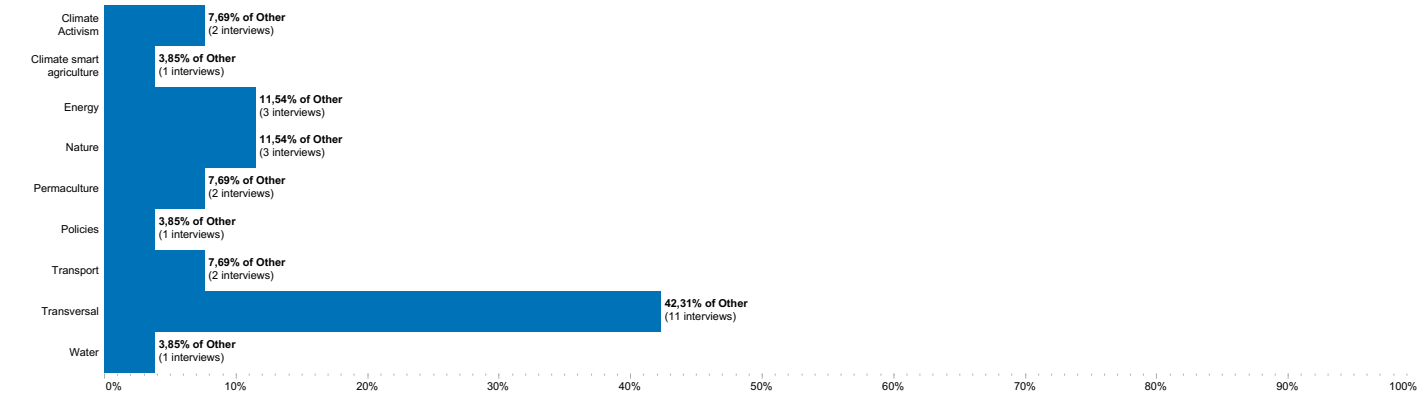
Distribution of interviewees by gender
(* data based on 55 conducted interviews)



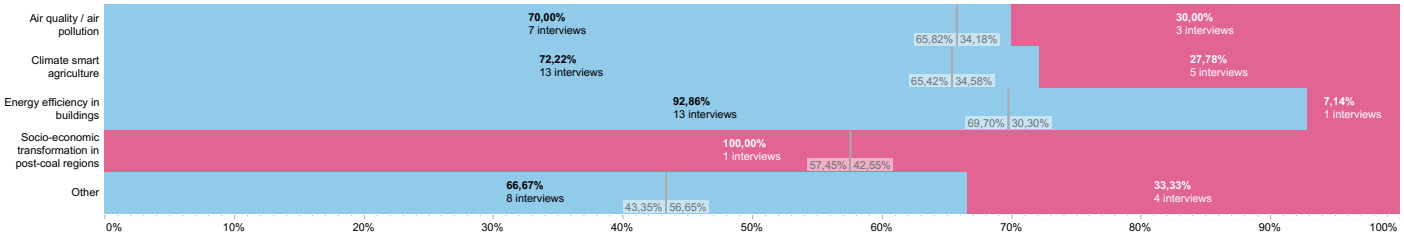
Distribution of interviewees by primary activity sector
(* data based on 55 conducted interviews)



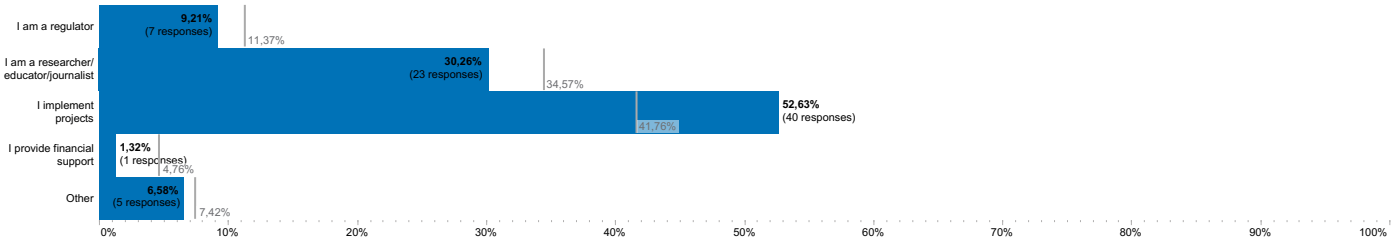
Breakdown of Other primary activity sectors
(* data based on 105 conducted interviews)



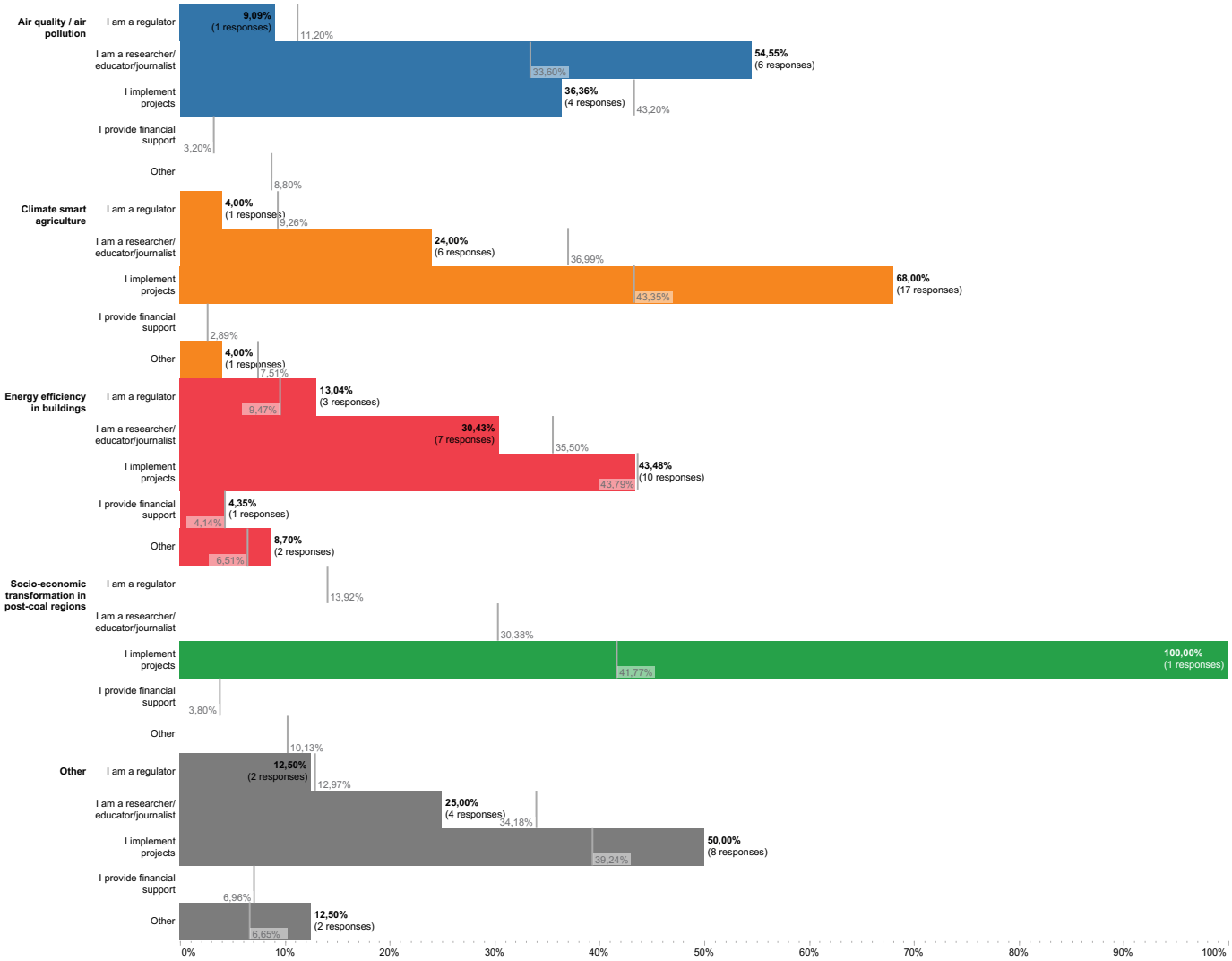
Gender distribution by primary activity sector
(* data based on 55 conducted interviews)



Distribution of interviewees by the type of role
(* data based on 55 conducted interviews)



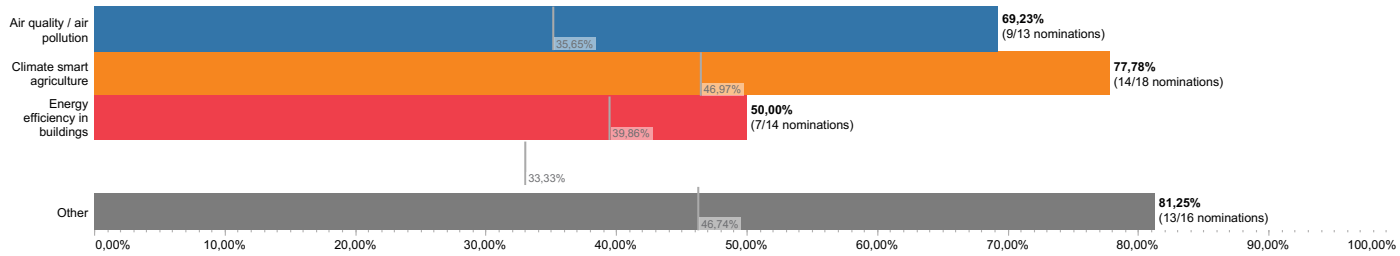
Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 55 conducted interviews)



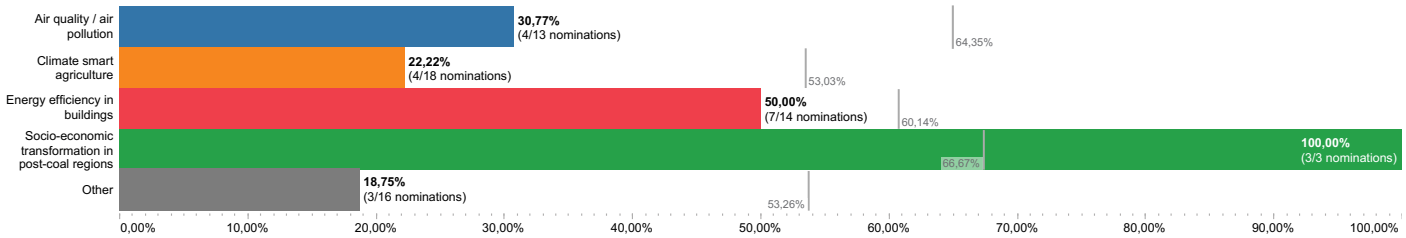
Distribution of interviews by region
(* more then 2 interviewees)

Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 105 conducted interviews)

Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 55 conducted interviews)

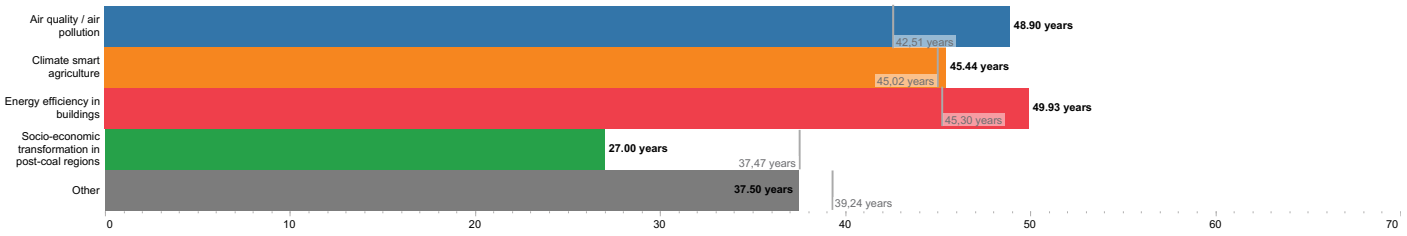


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 55 conducted interviews)

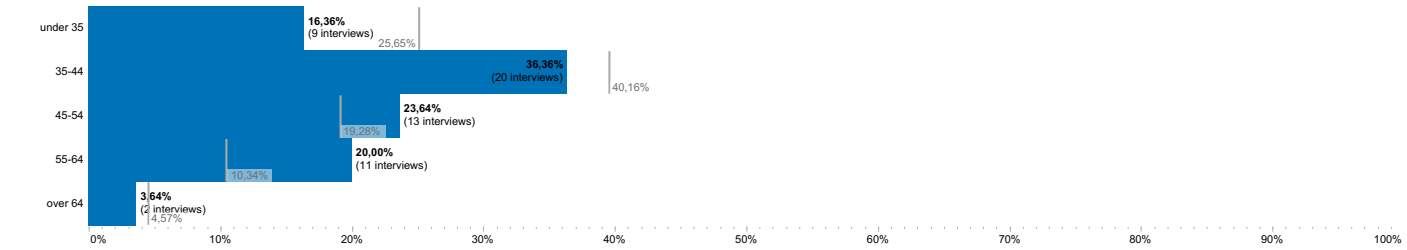


Average age of interviewees: 45.15 years (Regional average: 41.62 years)
(* data based on 55 conducted interviews)

Average age by primary activity sector
(* data based on 55 conducted interviews)



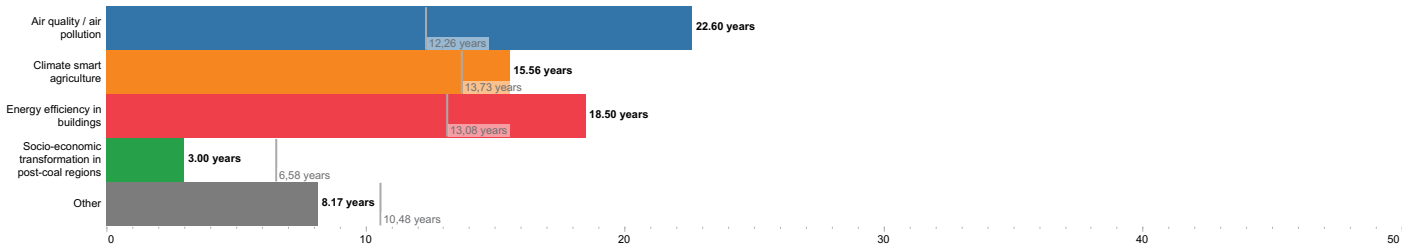
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 55 conducted interviews)



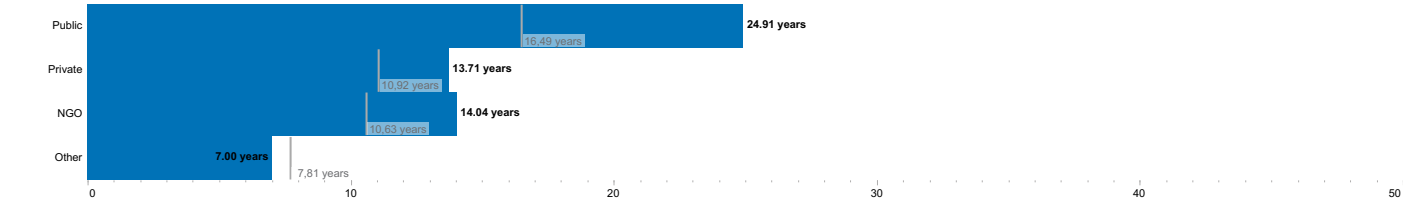
Average number of years of experience: 15.75 years (Reginal average: 11.58 years)
(* data based on 55 conducted interviews)

Average number of years of experience by gender
(* data based on 55 conducted interviews)

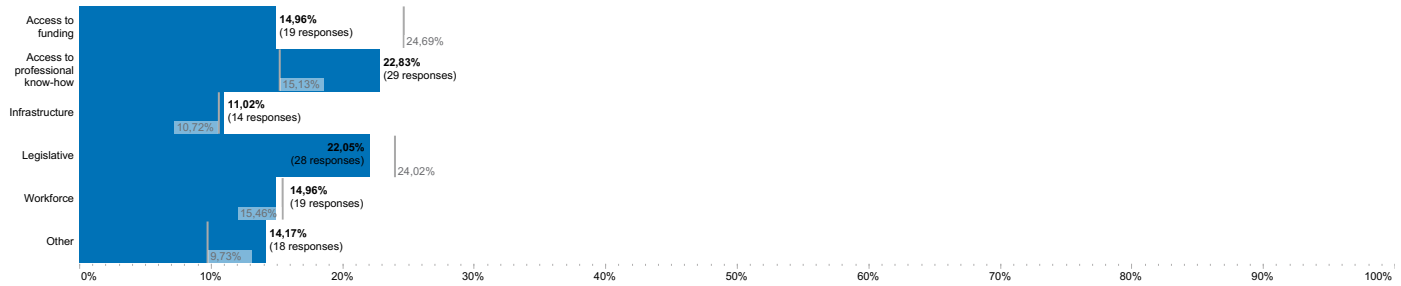
Average number of years of experience by primary activity sector
(* data based on 55 conducted interviews)



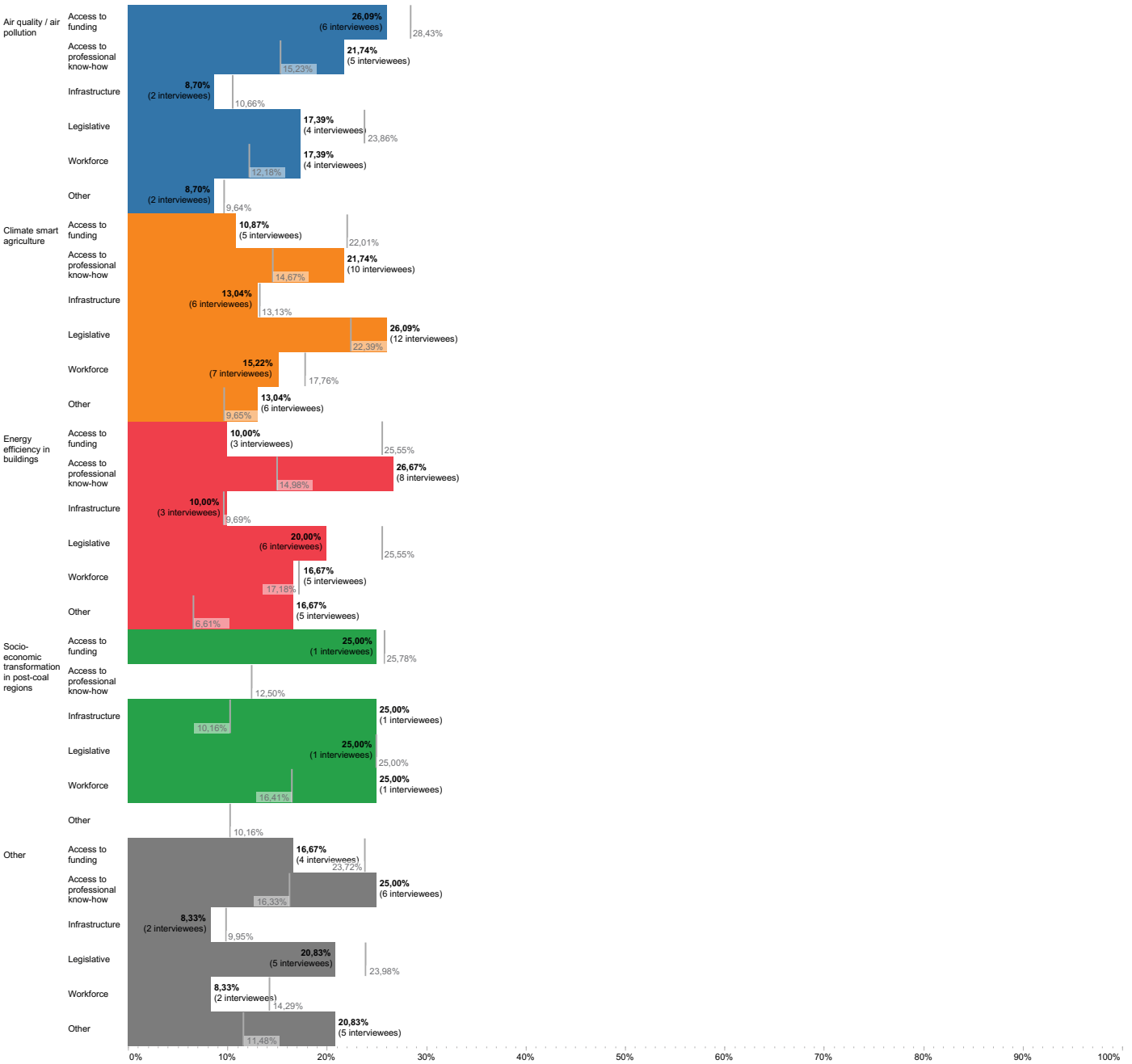
Average number of years of experience by the legal status of their member association
(* data based on 55 conducted interviews)



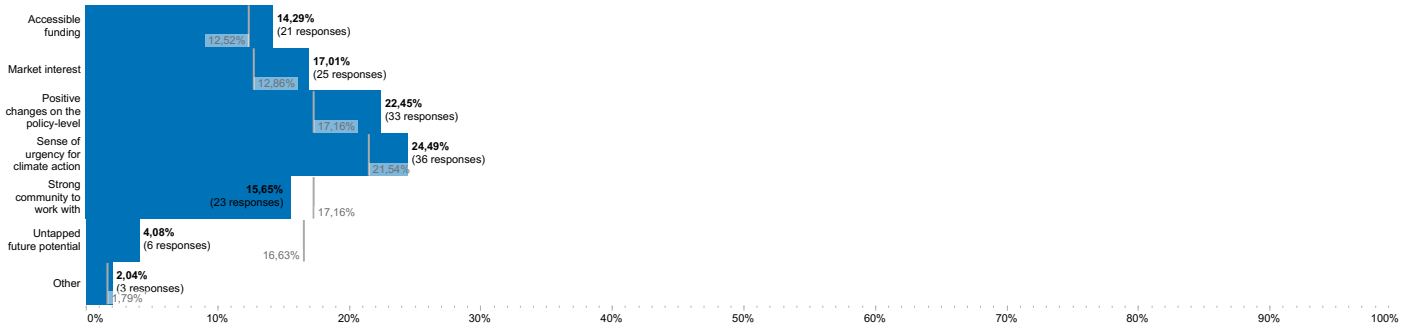
Distribution of interviewees by Barriers/Challenges category
(* data based on 55 conducted interviews)



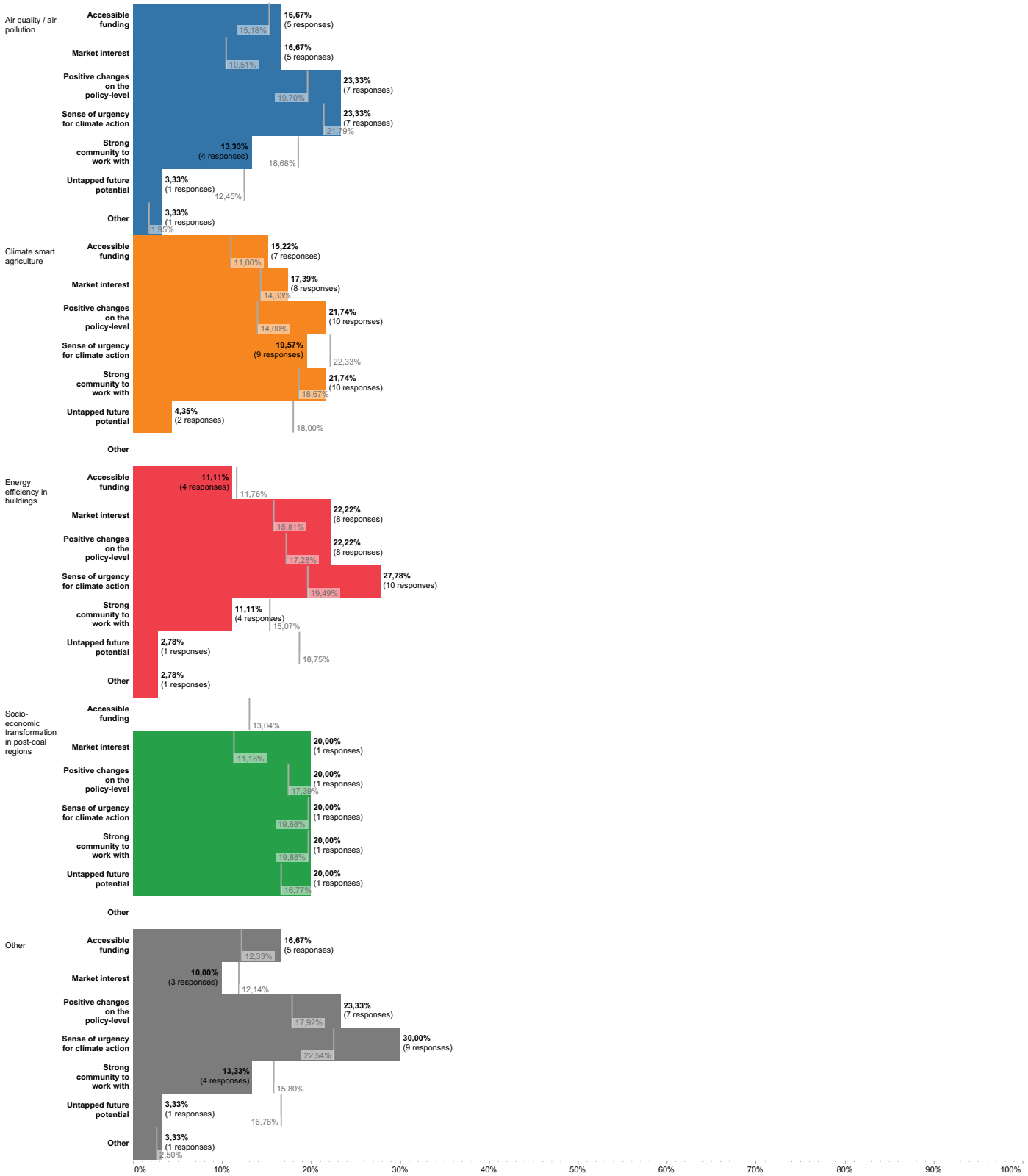
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 55 conducted interviews)



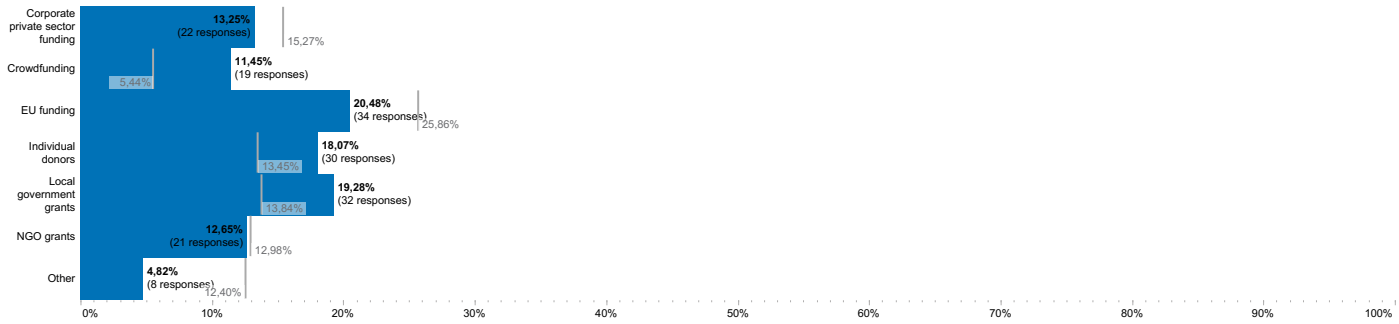
Distribution of interviewees by Opportunities category
(* data based on 55 conducted interviews)



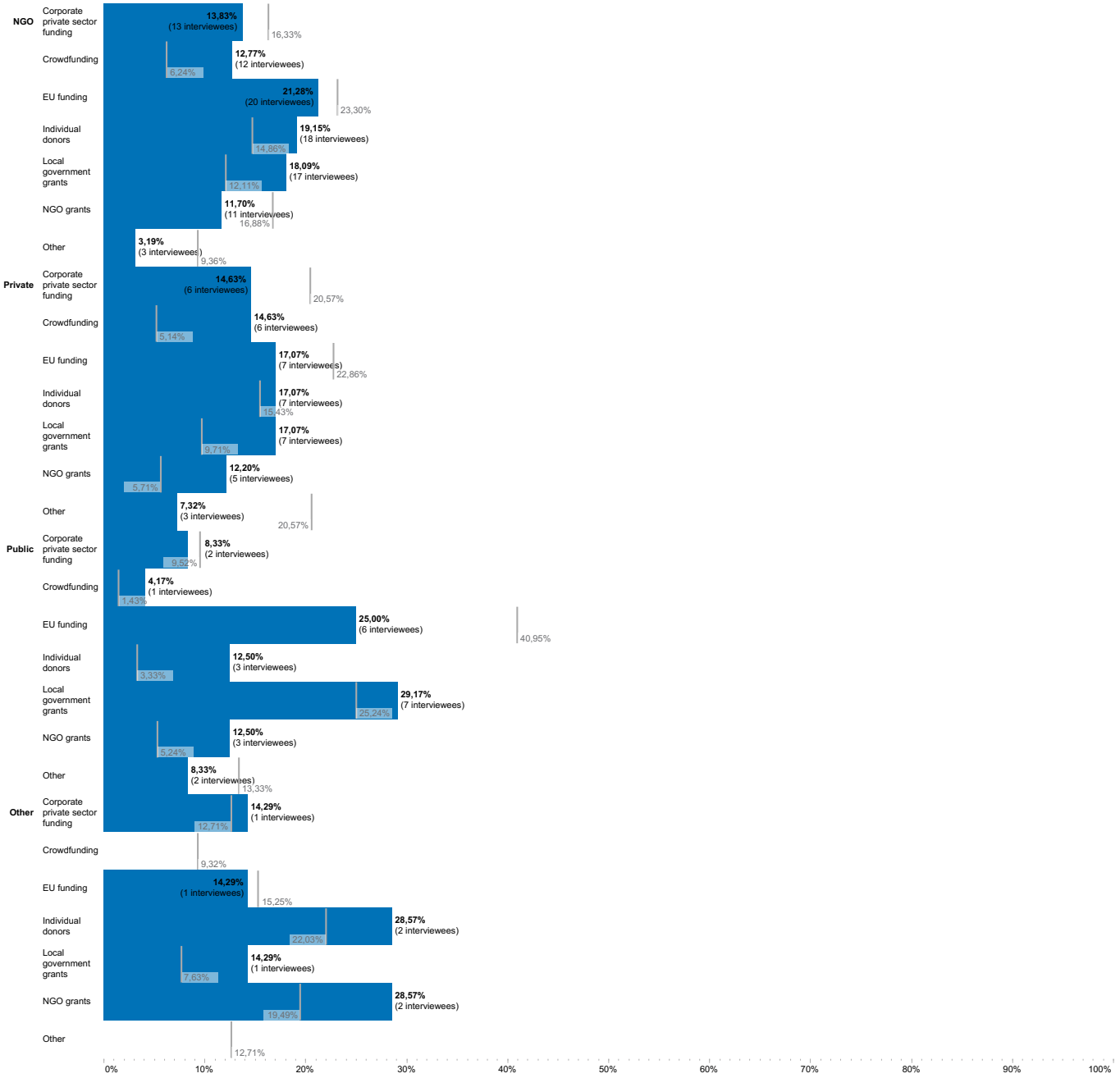
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 55 conducted interviews)



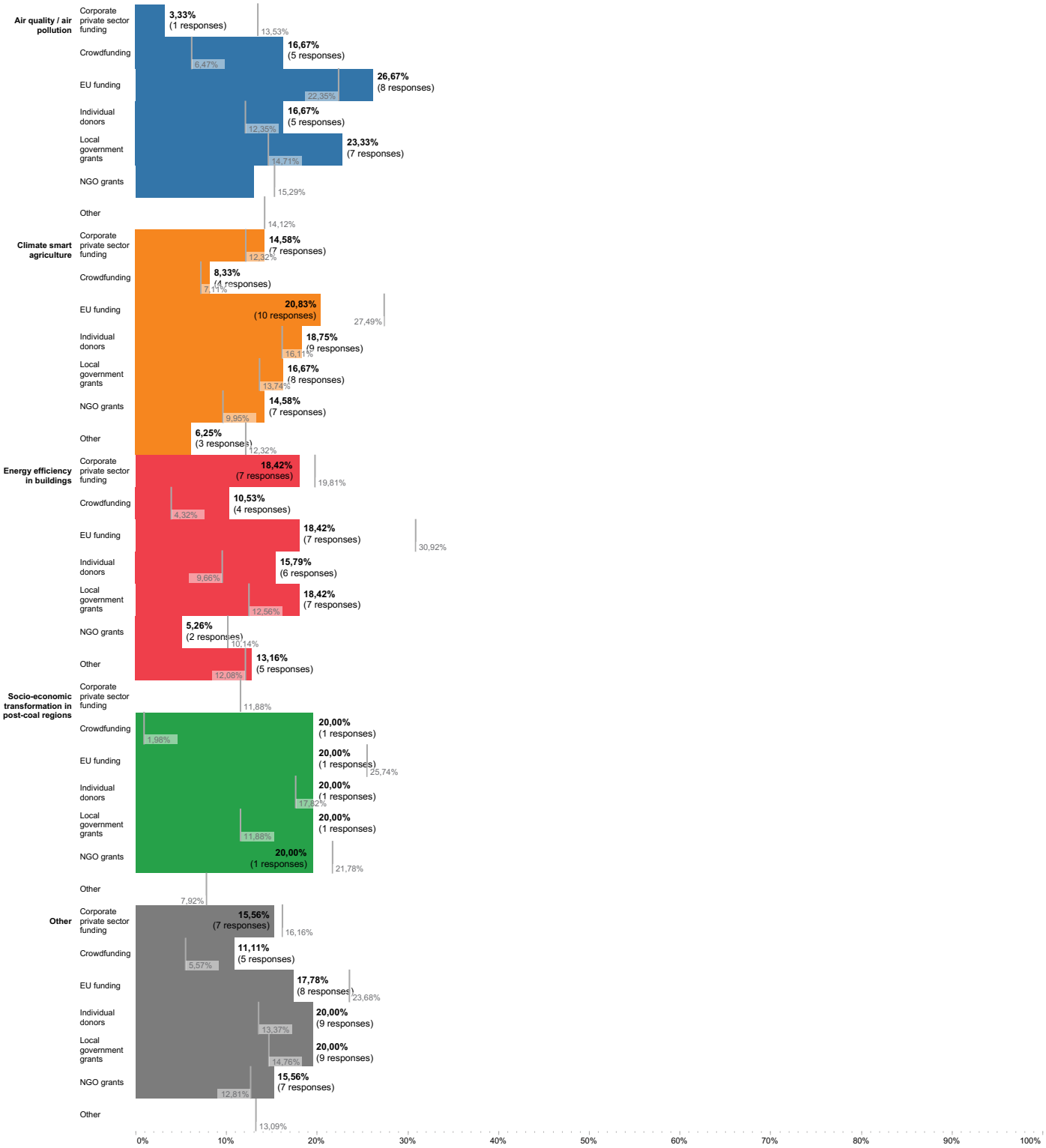
Distribution of interviewees by Funding opportunities category
(* data based on 55 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 55 conducted interviews)

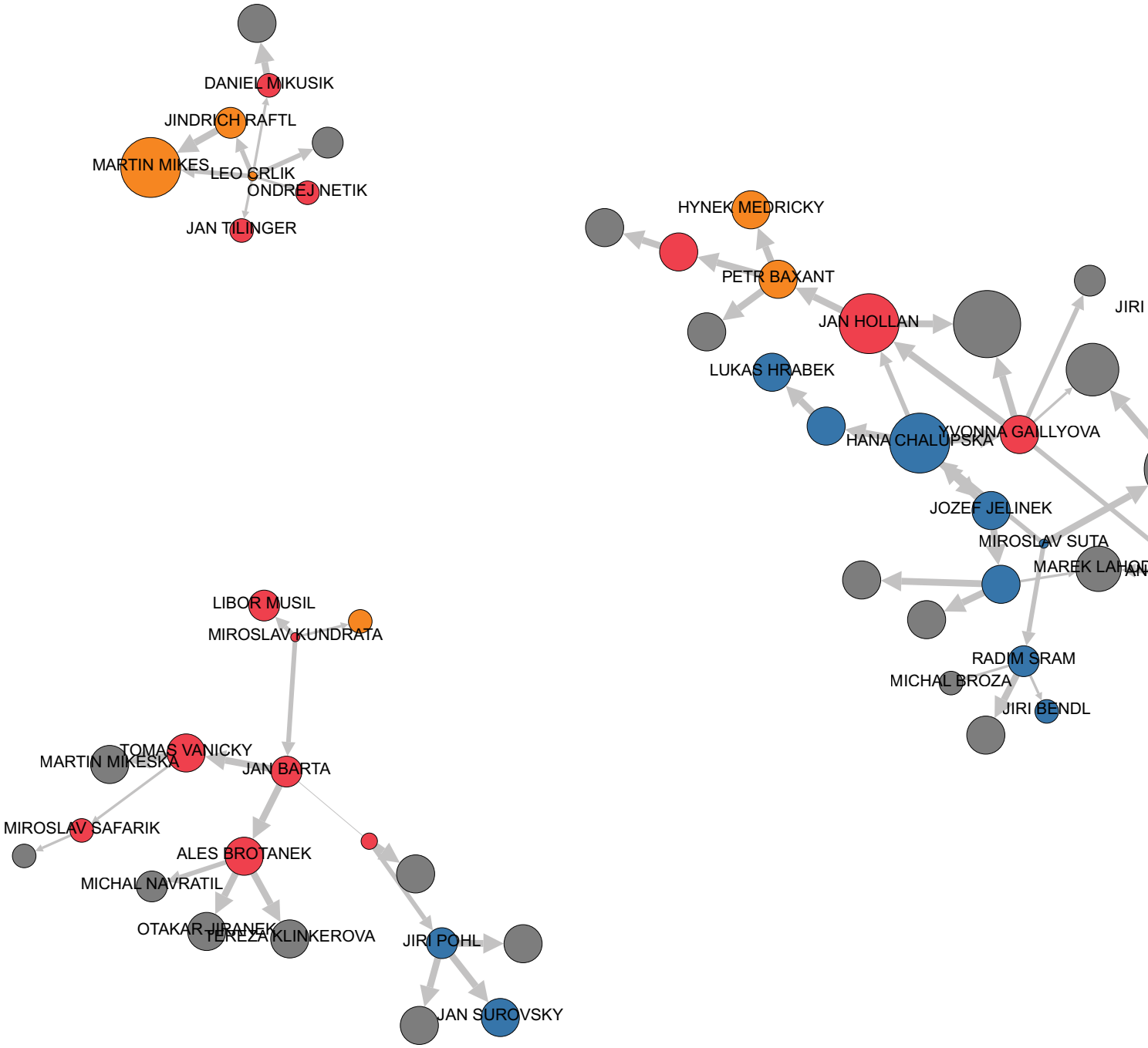


Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 55 conducted interviews)



Social network analysis

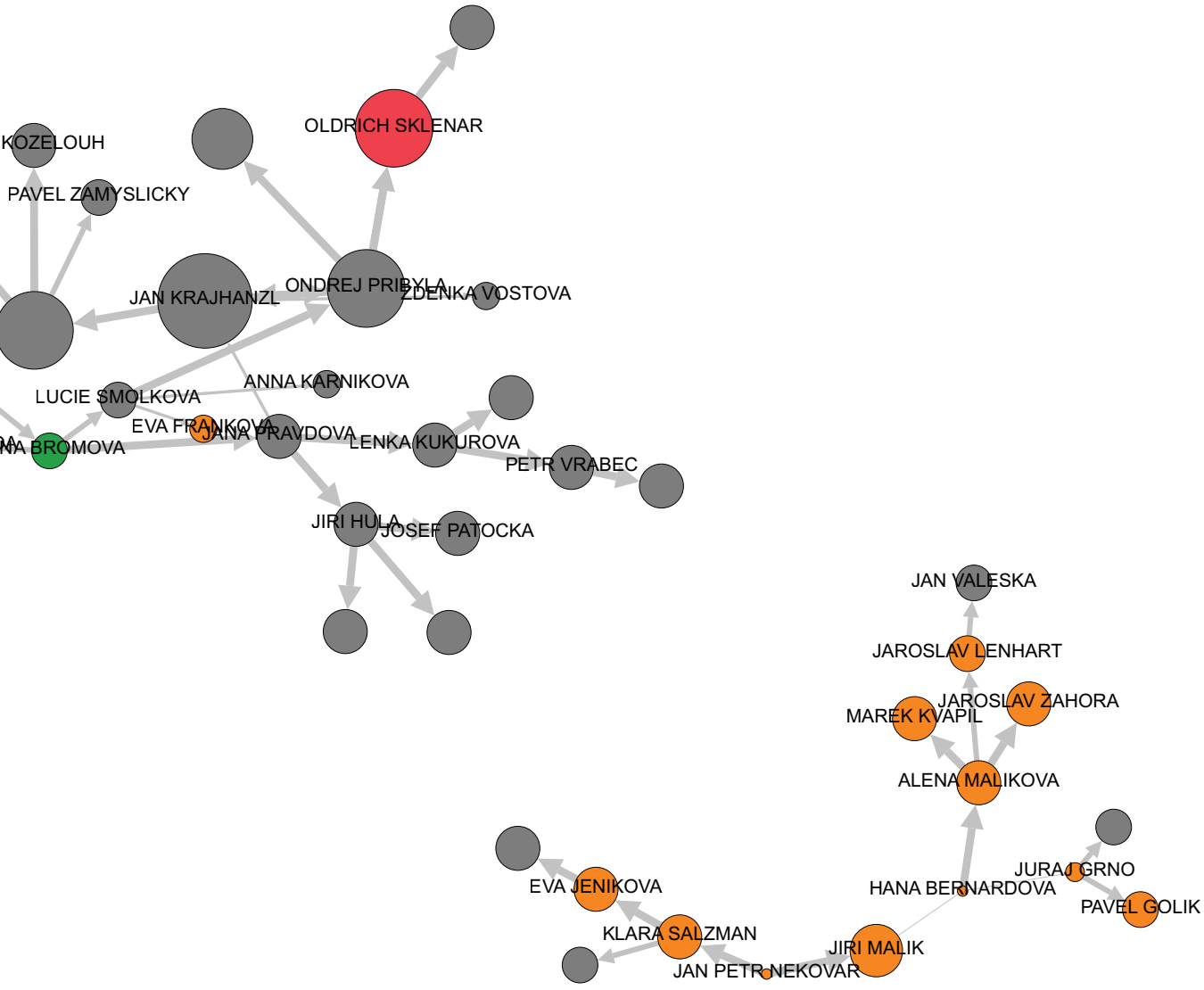
Overall social network map diagram (87 nodes / 91 edges)



Primary activity sector:

- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

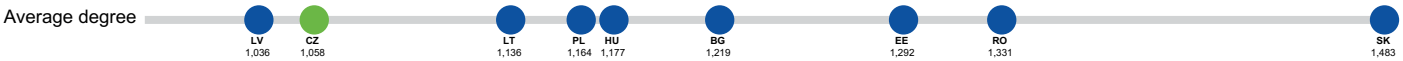
Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)


OLDRICH SKLENAR
KOZELOUH
PAVEL ZAMYSLICKY
JAN KRAJHANZL
ONDREJ PRIBYLA
ZDENKA VOSTOVA
ANNA KARNIKOVA
LUCIE SMOLKOVA
EVA FRANKOVA
JANA PRAVDOVA
LENKA KUKUROVA
PETR VRABEC
JIRI HULA
JOSEF PATOCKA
JAN VALESKA
JAROSLAV LENHART
JAROSLAV ZAHORA
MAREK KVAPIL
ALENA MALIKOVA
JURAJ GRNO
EVA JENIKOVA
HANA BERNARDOVA
PAVEL GOLIK
KLARA SALZMAN
JIRI MALIK
JAN PETR NEKOVAR

Social network statistics

Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals

Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

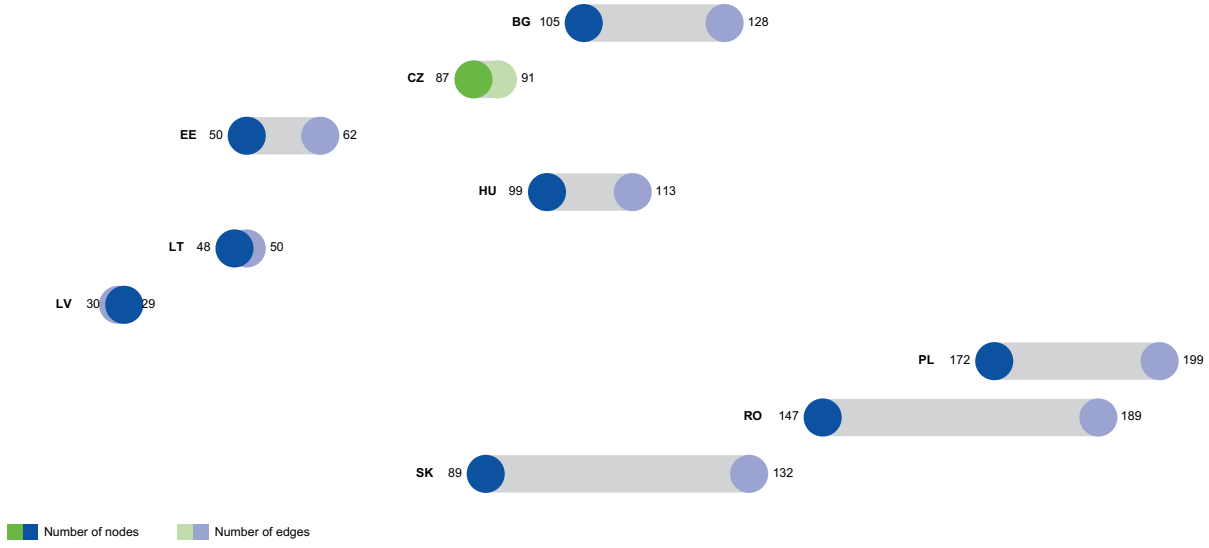
Number of discrete groups in the network

Number of nodes

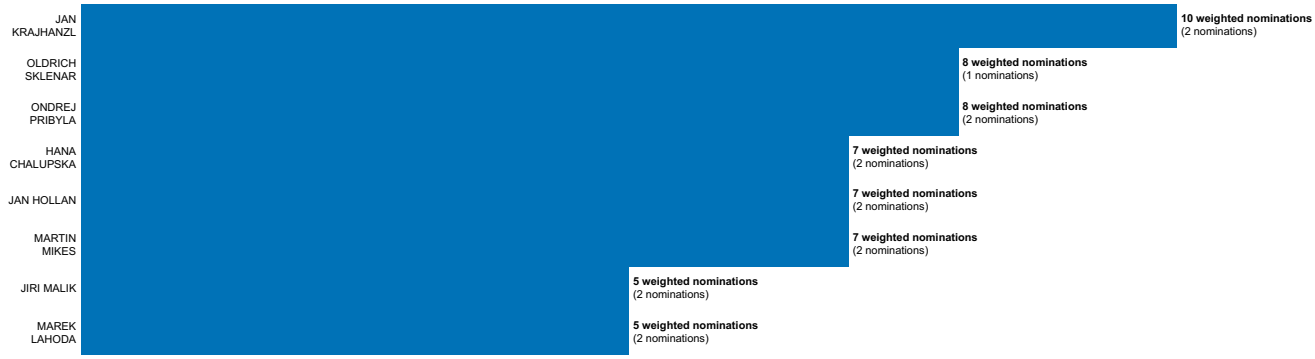
Number of individuals in the network

Number of edges (links)

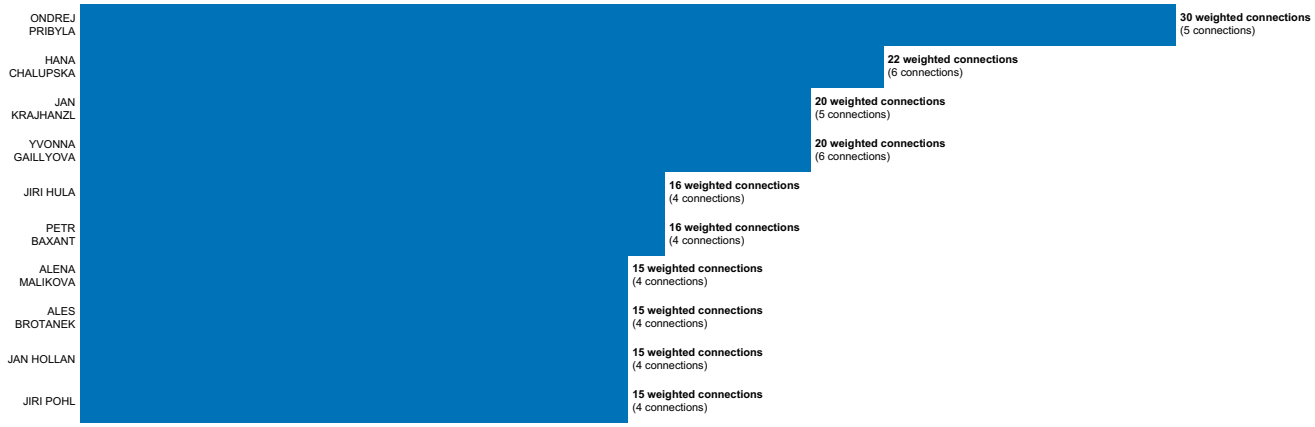
Number of relationships between individual in the network (in total)



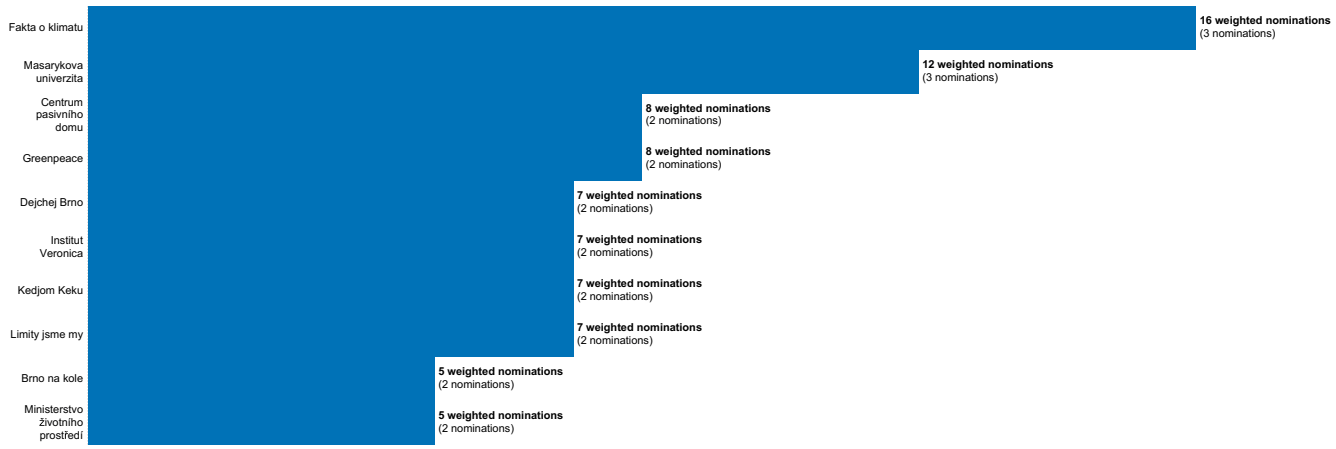
Top interviewees by the number of nominations (weighted in-degree) (* 2 or more nominations)



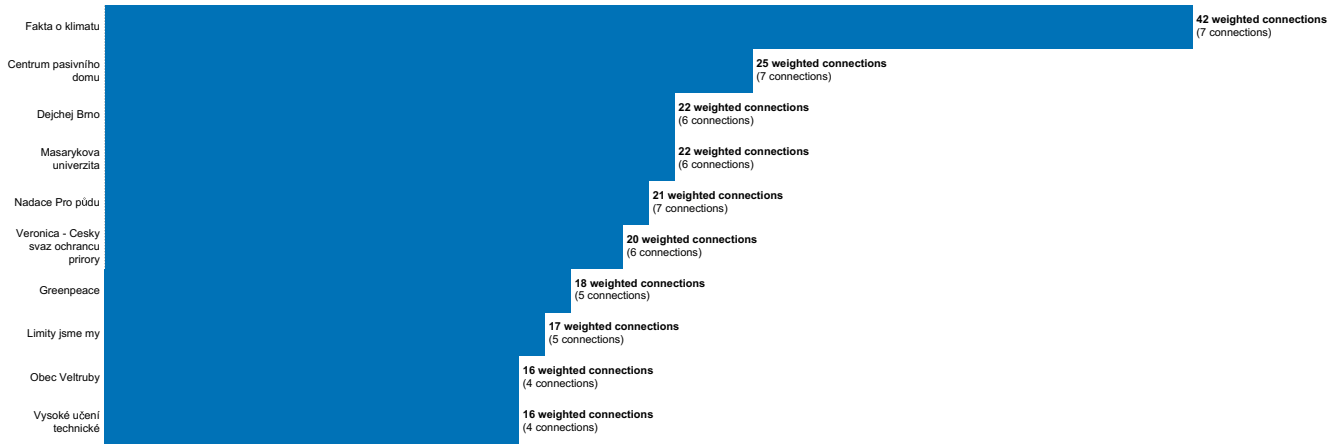
Top interviewees by the overall degree (in-degree and out-degree) (* 2 or more connections)



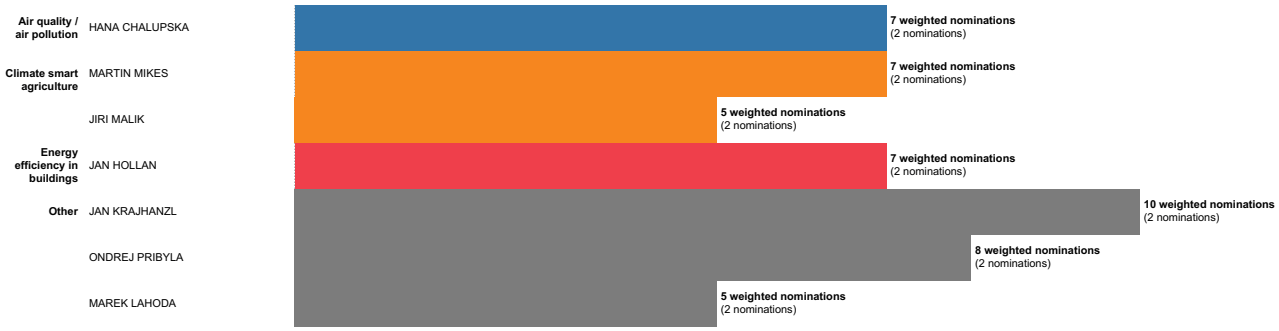
Top organisations by the number of nominations (in-degree) (* 2 or more nominations)



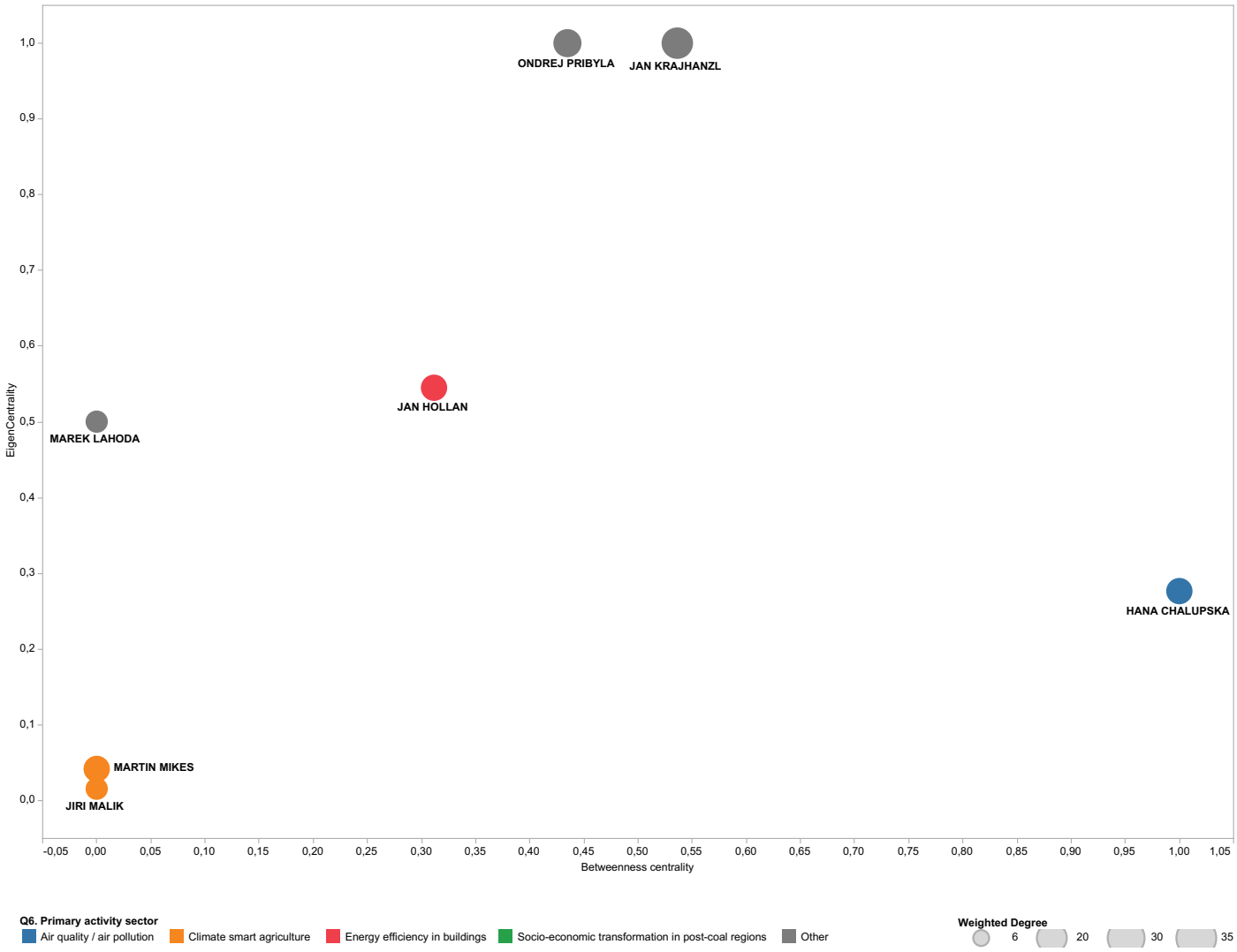
Top organisations by the overall degree (in-degree and out-degree) (* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector (* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with 2 or more nominations)



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 5: Qualitative and Network Analysis Slovakia

Energy efficiency in buildings

Progress evaluation

In the area of energy efficiency, Slovakia's target by 2020 is to achieve the cumulative energy efficiency of the SR in primary energy consumption at 16.38 Mtoe, 686 PJ and final energy consumption at 10.39 Mtoe, 435 PJ. The energy performance of buildings is key to increasing energy efficiency. The policy aims to create a highly energy efficient and decarbonized building stock that will have the effect of reducing costs, improving business competitiveness and addressing energy poverty.

So far, the EU Structural Funds have been the main financial resource in this area, with significant results in reducing energy consumption in public buildings, households and industry. However, the climate change and energy saving objectives will need to maintain the pace of recovery and step up the implementation of deep recovery of buildings. A whole set of strategic documents which relates to energy savings is adopted by the Slovak Republic. The Ministry of Economy prepared strategic documents such as the Energy Policy of 2014, Strategy for Higher Use of RES, National Action Plan for Renewable Energy Sources, Energy Efficiency Concept of the Slovak Republic or Energy Efficiency Action Plan for 2014-2016 with a view to 2020. The Integrated National Energy and Climate Plan for 2021–2030 is currently under preparation.

The updated Strategy of the Residential and Non- Residential Building Fund Refurbishment states that, at the current rate of renovation, all occupied family houses will be restored by 2043. A large proportion of family houses have been restored in the past using inappropriate materials, often of poor thermal insulation performance. Renovation will not only be much more expensive due to the stricter minimum energy performance requirements for buildings after 2020, but especially because the need to increase the necessary training and incentives for owners to renew houses properly. The construction of new family houses up to the energy level of almost zero buildings has been supported since 2018 in the form of a direct state contributions.

Stakeholders' assessment

As indicated by increasing demand for grants, loans and financial instruments, investments into energy efficiency of buildings is widely popular among the population. Projects in the field of thermal insulation of buildings are immediately feasible for implementation and funding is accessible. Practical experience from the application from programs like "green to households" so far found great interest and successful projects. There is growing coordination among products and service providers. The association Buildings for the Future (B4F) is an example of effective lobby for shaping public policies with the aim of "promoting a high-quality level of construction and renovation of buildings in terms of energy efficiency, the quality of the indoor environment and along principles of building sustainability." The Association of Energy Service Providers, the Slovak Association of Heat Producers and a growing segment of businesses active in the area. Academic research in architecture solutions and materials development is also increasing.

Key initiatives

Single-family and multi-dwelling buildings can apply for support in the form of a voucher for small installations for the use of renewable energy sources through the national project of the Slovak Innovation and Energy Agency (SIEA) called Green to Households. The national SIEA project is financed by the Operational Program Quality of the Environment managed by the Slovak Ministry of the Environment. The aid concerns small electricity generating installations with an output of less than 10 kW and heat generating installations that cover energy consumption in a family apartment building. In addition to energy efficiency, it is also considered that the equipment complies with the emission limits. Households can use the services of nearly 1,000 eligible contractors. The projects were supported by the Operational Program Environment Quality. The pilot project Green Households I provided citizens with up to 45 mil. EUR. The continuation of support under the Green Household II project will allow, by 2023, a further investment of EUR 48 million from ESIF resources to be channelled directly to households.

The project was set up to be as simple as possible for administration and to be motivating for the involvement of broad groups of households.

Supported applicants select the required device from the list of devices that contains up to 3600 types of devices. The aim of the list is to allow the installation of only high-quality technologies meeting strict technical and environmental requirements. The aim is to encourage households to purchase quality systems with adequate performance, longer lifespan and higher energy conversion efficiency.

Households applied electronically for support in pre-announced calls. At the end of 2018, 28 rounds were announced, with up to 37.473 applicants. After meeting the requirements, applicants were selected according to the order in which they applied to the system. The maximum value of the voucher obtained was 50% of the total investment, covering the delivery and installation of the entire system. The total value of the vouchers was determined by the type and performance of the equipment required by households.

By the end of 2018, households used 18,502 vouchers totalling EUR 41.183.072. As a result, the total installed capacity of renewable energy sources increased by 136.33 MW, thus reducing the annual CO2 emissions by 45.495 tonnes. The program also supported the Installation of solar collectors for 6.974 households, 5.242 heat pumps, 3.673 photovoltaic systems and 2.613 biomass boilers.

In the new programming period 2021-2017, the Green Households project is planned to continue, including in order to continue increasing the share of renewable energy sources in heat production and allowing for further energy savings.

Under the authorization of the Ministry of Economy of the Slovak Republic, the Slovak Innovation and Energy Agency carries out technical assistance in the preparation of GES projects in the public sector. Between 2013 and 2015, it implemented the national project Supporting Instruments for Implementation and Optimization of Measures in the Area of Energy Efficiency of Public Buildings, within which 250 energy audits of public buildings were processed by September 2015. The Slovak Investment Holding has started activities in energy efficiency, using an approach based on investment through financial intermediaries. There is a growing segment of bank commercial programs available to consumers.

Drivers/barriers and outlook

Supporting the renovation of existing buildings to reduce their energy performance (including the installation of intelligent metering and control systems to optimize energy consumption in building operations) should combine heat savings in the winter months with the reduction of buildings' energy performance in summer months. Large reserves remain for investment in industry and technology, reducing energy consumption in public buildings and households.

Up to 2030, the key measures will continue to be improving the thermo-technical properties of family houses, which will be financed mainly from private sources of the owners and the resources of commercial banks. However, supportive financial incentives should remain an essential part of funding.

The main challenge is to coordinate all initiatives and approaches at the regional and local level, based on quality audit of the situation, planning and implementation of measures aimed at comprehensive local approaches. Local low-carbon strategies should be prioritized as a baseline approach to reducing emissions. Experience from practice and other countries points to the importance of local anchored strategies "co-owned" by the self-government and other direct stakeholders.

Climate and smart agriculture

Progress evaluation

Slovak agriculture went through turbulent developments over the past decades. While in the 1980s it focused on self-sufficiency, reforms in the 1990s radically decreased total output and Slovakia is increasingly dependent on import. Slovakia came under greater competitive pressure from producers from other EU Member States. The development of basic indicators for agriculture in 2013-2017 indicates a slight improvement in the sector's competitiveness[1]. Yet the regeneration of crop production and the increasing use of mineral fertilizers have caused emissions to grow.

While the land in Slovakia is responsible for an estimated 90% of emissions, manure processing

1 Slovak Government (2018): Správa o poľnohospodárstve a potravinárstve v Slovenskej republike za rok 2017, Uznesenie vlády SR 493/2018 z 05.09.2018.

generates 10%. The enteric fermentation produced in 2016 estimated 34.42 Gg or 76.3% of the total of CH4 emissions. Given the fact, that methane is rather problematic as its impact is 34 times greater than CO2 over a 100-year period, and agriculture is particularly an important sector[2].

The Slovak Republic has been recently successful in organic farming, which is more climate friendly and resistant to the effects of climate change, while also providing higher added value. While the EU28 average of area under organic farming in 2017 was 7,03%, Slovakia reached 9,6% in the same year[3].

Stakeholders' assessment

The ministry of Environment and Ministry of Soil Management and Regional Development are usually in conflict with each other. E.g., forest management company is under the MoSM, nature protection under MoE. Environmental NGOs heavily criticize MoSM for hunting permissions (under the management of the ministry), where they find common interests with MoE.

Agriculture has been for a long time on the margins of public interests, but the situation has been recently changing. Economic progress in Slovakia is reflected in the growing interest in food quality. There are new food chains focusing on food quality, framers' markets and growing promotion of domestic brands using support from the government. Despite the official Eurostat statistics where Slovakia belongs to the countries with the fewest poor people in Europe[4], there is strong polarisation and further development of the organic/quality food depends on purchasing power. Slovaks are increasingly aware of food quality, yet many cannot afford to buy it.

The sector is dominated by large scale producers. Approximately 94 % of the total subsidies in the sector are going to only 20% of the farms. The retailing sector is completely under the control of international supermarket chains. Multinational companies account for about 80% of total food retail turnover. This dominance is reflected in pressure on smaller producers with lower profit rates, which leads to a push for industrial practices in production.

2 IPCC Assessment Report, 2017
3 EUROSTAT, 2019
4 According to EUROSTAST (2016), while the EU average is 22.5 percent, in Germany 19, in Belgium 20.3 percent, in Slovakia 16.3 percent.

SOCIAL AGRICULTURE is developing the hidden potential of social economy in Slovakia, being implemented by Druživa Civic Association. Socient SPAs Interreg Europe: Interregional cooperation between six public / private actors from Finland, Germany, Slovakia and Spain aims to improve the effectiveness of regional policies to actively promote the visibility, incubation and acceleration of social enterprises in sparsely populated areas as drivers of regional competitiveness and inclusive growth. Svatobor Civic Association from the district of Vranov nad Topľou strives to fulfil the vision of food and energy self-sufficiency of Roma communities.

Climate concerns are increasingly streamlining agricultural policies, but they are difficult to implement, such as in the case of green infrastructure.

Key initiatives

The biggest potential for reductions in agricultural sector is in the land management, manure processing and animal husbandry. There are several initiatives in the Slovak Republic, such as new fertilizer management introduced by the Government of the Slovak Republic by Regulation 342/2014 Coll. It changes the handling and processing of manure and introduce new animal feeding policies. The measures focusing N2O emissions (Government Regulation of the Slovak Republic 342/2014) are aimed at emission reductions. The changes should decrease production of methane emissions.

The Climate Change Adaptation Strategy (2018) and the upcoming Action Plan for Climate Change Adaptation (2020) are specifically focused on agriculture and promote new ecological management of land and the introduction of ecological measures, including organic agriculture. The main opportunities are in the re-shaping of the Common Agricultural Policy and implementation of the Rural Development Plan. In the new programming period 2021-2017 there should be more focus on agro-environmental measures and climate change adaptation approaches.

The Slovak agricultural sector is rather conservative when it comes to hi-tech innovations. Most of the applied approaches are related to changes in precise farming (technology)

that can increase yields or reduce the area under cultivation, releasing land for alternative use.

AgroBio Tech Research Center implemented with EU funds under the Operational Program Research and Development focuses on supporting applied research in the fields of agrobiology, biotechnology, agricultural technologies, as well as food and bioenergy. The project is implemented by the Slovak University of Agriculture (SPU) in Nitra. Some of their ideas include the use of waste heat from mining (part of economy transition of Upper Nitra coal mining) for vegetable (especially tomato) and fish-aquaculture.

Drivers/barriers and outlook

Compared to other sectors of the economy, the production of greenhouse gas emissions and their reduction strategies in agriculture are relatively new in Slovakia. For the future it would be important to proceed with land reform and support the development of promising segment of organic agricultural production. The 1st and 2nd pillar of the Common Agricultural Policy provides framework and measures to protect the environment with rewards for farmers for additional activities to reduce emissions or increasing carbon capture (promoting the cultivation of CO2-binding plants) and eliminating harmful subsidies in agriculture, such as those supporting excessive irrigations. There is potential in improving sowing practices, manure management/application and animal husbandry. Finally, the underutilised potential for the awareness raising and education of the population could change consumer behaviour, including a greater emphasis on the carbon footprint of food - especially dairy products and certain types of meat.

Socio-economic transformation in post-coal regions

Progress evaluation

The question of phasing out the coal mine in Upper Nitra is not if and when, but how? The Government of the Slovak Republic approved Resolution no. 580 (12 December 2018) on the Proposal for the Transformation of the Region of Upper Nitra. This mine should terminate by 2023. Brown coal and lignite produced in Upper Nitra is of problematic quality and the productive deposits are reaching their limits. The state subsidies mining of lignite with surcharges provided to Nováky TPP (ENO), owned by Slovenske elektrárne (SE). The subsidies are increasingly unpopular and are disputed by experts and the public. The rising price of emission trading permits (under ETS) and evolving emissions norms and investments to BAT/BATNEEC further undermined the present economic model. With the completion of two new blocks of NPP Mochovce and after increasing their share of RE (obligation affiliated with EU 2030 climate targets), the combustion of coal in ENO would be increasingly costly, inefficient, and obsolete. All these factors, together with increasing pressure of the public opinion lead to the mine closure, which will significantly decrease the amount of carbon dioxide (estimated 2 mil. tones of CO2 into the atmosphere annually) and contribute to better performance of the country in the climate change mitigation.

The region of Upper Nitra is considerably polluted due to mining activities, electricity production from brown coal and other industrial production. As much as 55% of the population in the region live in an environmentally degraded area. The region is also one of the largest producers of pollution in Slovakia (particulate matter, NOx, SO2). 45% of water in the district of Prievidza and 81% in Nováky is in the 3rd class of water quality. Mining activities have an impact on the health of mining employees and environmental pollution has a negative impact on the health of the entire population. The disability rate in the Prievidza district is 46% higher than the Slovak average. The pollution, together with the re-cultivation of the mining areas are to be among key priorities for the transformation.

Stakeholders' assessment

There was decreasing support for the continuation of the coal mining subsidy system among the coalition and opposition parties and for the time being, and there is practically no relevant political party or subject in Slovak Republic questioning the decision. Phasing out coal has support from part of the local municipalities and the business community[5].

5 See, for instance, Future of the Region Roundtable outcomes http://www.prievidza.sk/spravodajstvo/horna-nitra-je-zivotaschopny-region/ The roundtable was organised on September 18, 2018 by the mayor of Prievidza.

Yet the successful closure of the mines will inevitably require a gradual process, enabling structural changes in the economy affiliated with creation of new labour opportunities. The present conditions are favourable. The unemployment rates in the Prievidza district (4.6%) and Partizánske district (3.3%) are lower than the overall Slovak average (5.4%) (June 2019). Although the regional position of the mining industry has been steadily declining, it is still the economic backbone of the region. The number of mining company employees is around 3800, plus additional secondary jobs in the power plan and services.

The state and local municipalities are working now on the transition, yet the region is fragmented and besides top-down approach, there is a need for bottom up mobilisation. Local stakeholders and their involvement would be key. The fragmented regions should build a coordinated approach among the local municipalities, business associations, the education sector and NGOs.

Although there are no relevant public opinion surveys, qualitative evaluation of the public discourse indicated positive image of the coal mining closure and widespread support among the media, local stakeholders and the general public.

Key initiatives

The Action Plan for Transformation of Coal Mining Region Upper Nitra, the document guiding the post-coal transition, is currently under discussion by the stakeholders. The Action Plan is based on cooperation and discussions between the various stakeholders of the transformation of the Upper Nitra Region with the participation of representatives of the Government of the Slovak Republic (mainly IPOII, MHSR and other ministries), the Trenčín self-governing region, the European Commission and other stakeholders.

The activities of NGO Friends of the Earth/CEPA (network Život po uhlí/Life after Coal, http://www.zivotpouhli.sk) are positive examples of how to mobilise the local community and key actors (e.g., SMEs) and motivate local stakeholders through presentations and discussions. They set up and coordinate working groups – these are involved in the creation of a document that will propose specific measures at the local level for the expected transformation of the Upper Nitra Region and set their priorities. Based on the problems identified, a vision of the region's transformation has been created, which is to make Upper Nitra an attractive and self-sustaining region, where the economy will develop in symbiosis with a clean environment and good links to other economic centers. These types of regional public–private partnerships could be supported also through ESIF.

Drivers/barriers and outlook

A successful transformation and jobs offset would require the development of an industrial and manufacturing base on the principles of circular economy leading to carbon neutrality by 2050. A strategic decision on the future heating system (central heating in substantial part of the area is now based on coal) in the region would require a comprehensive technical feasibility study with cost-benefit analyses of available alternatives. For a successful transformation, the region and key stakeholders will need technical assistance through the transformation process, exploring the potential of JASPERS (Joint Assistance to Support Projects in European Regions) and/or national support schemes.

Air pollution

Progress evaluation

The air quality in the Slovak Republic is evaluated based on air pollution target values for main pollutants - SO2, NO2, CO, PM10, PM2.5, heavy metals (Pb, Hg, As, Cd, Ni), benzene, benzo pyrene and ground-level ozone concentrations O3. In 2018, the limit value for the protection of human health for 24-hour concentrations was exceeded at five PM10 monitoring stations and at two NO2 monitoring stations. There were also exceedances of the target value for health protection for benzo pyrene at 4 monitoring stations (SAŽP, 2019). Besides the region of the Upper Nitra urban concentrations such as Bratislava, Ružomberok and Košice are also struggling in this aspect. The share of transport in Slovakia in total CO2 emissions is roughly 16% (Figure 1). it is the only economic sector showing growth of greenhouse gas emissions (CO2) and between 1990 and 2012 they increased by 30.9% (EUROSTAT). Besides transportation, the main sources of air pollution are heating systems (central heating and individual households) and industry. When these sources are

combined (e.g., in urban areas), the outcome is the deterioration of local air quality.

Stakeholders' assessment

Experts from the civic association Center for Sustainable Alternatives - CEPTA analysed the situation in areas with controlled air quality of Slovak regional cities using the methodology of the World Health Organization and based on data from the official monitoring of SHMI. According to the NGO, more than 5,000 people die prematurely each year due to air pollution[6].

Public support for environmental measures related to air quality is generally increasing and local air quality is a topic in local municipal elections, mainly in urban areas. Especially Bratislava, Ružomberok and Košice suffer from poor air quality because of combination of transport, heating and industry. However, given the scope and importance of the health aspects associated with air pollution, the public debate on the topic is not sufficient and is usually narrowly connected to discussions about transport.

Key initiatives

The Strategy of Environmental Policy of the Slovak Republic until 2030 (Envirostratégia 2030) defines as air protection priorities measures focused on the reduction of coal combustion, environmentally friendly transport and more efficient and a cleaner heating systems. The polluter pays principle should also be applied more consistently and environmentally harmful subsidies for coal or biomass from unsustainable sources should be removed. Attention is currently paid to measures in three areas – medium/large sources, individual households and alternative power sources for vehicles.

Air pollution and the generation of emissions from large and medium stationary sources are identified in the European Union and the Slovak Republic as an important problem requiring solutions. This concerns both the local and national levels and represents a challenge for Slovakia. Mainly due to high costs, because the necessary changes require investments in more modern technical equipment. These are usually associated with high input costs. Yet, the effect of investments using the best available techniques is fast and significant. The state supports these investments through Operational Programme Quality of the Environment.

The second stream aims to support individual households to replace obsolete/unsuitable coal boilers with low-emission boilers. EUR 35 million has been earmarked for air quality related project from the state budget and EU funds. On September 30, 2019, the Ministry of the Environment of the Slovak Republic announced the first stage of the so-called boiler subsidies. Households will be able to receive up to EUR 3,000. At this stage, it is too early to provide numbers and evaluate impact as the first households will be able to change facilities in the spring 2020.

To address air protection issues, the Ministry of the Environment of the Slovak Republic is currently preparing an Air Protection Strategy, which will include two key documents: (i) National emission reduction program; and (ii) Strategy to improve air quality.

NGO actives are focusing on awareness raising and education. The MoE launched Environmental Technology Verification Program (ETV) which offers a validation procedure for the latest environmental technologies that would otherwise be difficult to determine their environmental added value. The verification procedure allows independent assessment and confirmation of the manufacturer's claims on the performance and environmental benefits of the technology. Verification information can be used to compare performance parameters and therefore become a useful tool to convince investors or technology buyers of the benefits of technology and can thus help increase the market value of these technologies[7].

Drivers/barriers and outlook

Slovakia is among the countries facing infringement at the Court of Justice over persistently high levels of particulate matter

6 More information at https://www.cepta.sk/index.php/en/air-quality

7 Some of them more or less related to air quality are listed at Slovak Environmental Agency web page: https://www.sazp.sk/zivotne-prostredie/environmentalne-manazerstvo/environmentalne-technologie/overene-environmentalne-technologie-energeticke-technologie.htmlhttps://www.sazp.sk/zivotne-prostredie/environmentalne-manazerstvo/environmentalne-technologie/overene-environmentalne-technologie-materialy-odpad-a-zdroje.html

(PM10). The limits set out under EU legislation on ambient air quality (Directive 2008/50/EC)[8] had to be met in 2010 and 2005 respectively. In the new programming period (2021-2027) air quality will be one of the priority areas to be supported by European Structural and Investment Funds.

The key problem of increasing emissions from transport will remain a problem, as Slovak towns and municipalities are dramatically lacking behind in promoting sustainable mobility concepts. There are now investments into alternative fuels in public transport (e.g., Bratislava and other towns) and the Ministry of Economy supports purchases of vehicles on alternative fuels through grants for individuals and companies. Yet substantial investments into changing the current transport modes to a sustainable mobility approach is missing especially in two main urban areas of Bratislava and Košice.

SWOT[9] analysis of the climate change measures political landscape

S: strengths

- Slovakia committed to the 2050 vision of climate neutrality
- Paris Agreement and clearly defined EU target of at least 40% cuts in greenhouse gas emissions by 2030;
- Developing framework of policies and legislation: Envirostrategy 2030, Upcoming Low-Carbon Strategy (2020),
- Policy and law framework worked out in the EU strategic documents and objectives is clearly defined and translated into the Slovak policies/ legislation;
– Substantial assistance provided by the Partnership Agreement 2014-2020 and foreseen stress on the topic in 2021-2027 with allocated funds and clear focus on climate change;
- Growing number of published studies and outputs allows building research and public policy on international and national expertise;
- Sufficient quantitative data help to analyse the situation with regard to technical fulfilment of the targets and objectives;
– growing number of RE producers and EE companies;
- Increasing awareness raising and engagement of the public

W: Weaknesses

- Lack of ambitious targets: In spite of commitment to 2050 climate neutrality, currently negotiated goals from 2030 lack stronger commitments;
-Generally weak perception of CC as a problem among the mainstream political parties (with very few exceptions);
-Carbon leakage problem and bad image of the EU climate policies in employment undermine public support
-Lack of RE and EE measures on employment (most technologies are imported);
– Perception of RE as expensive and not sufficient to provide enough energy;
-Recent problem with big biomass burning PP lead to critique of the development from the side of NGOs
- Weak public understanding of links among the CC and needs for adaptation;

O: Opportunities

-Experience from the 2016 Slovak Presidency of the EU may increase capacities of the state administration and awareness level;
- Increasing targets for CO2 emissions and lack of "low hanging fruits" will force for more advanced solutions;
– Improving knowledge on interlinkages between CC measures, employment and well-being;
- growing number of stakeholders interested in the problem (i.e., producers of RE, trade unions, charities);
-Increasing interest of media;

T: Threats

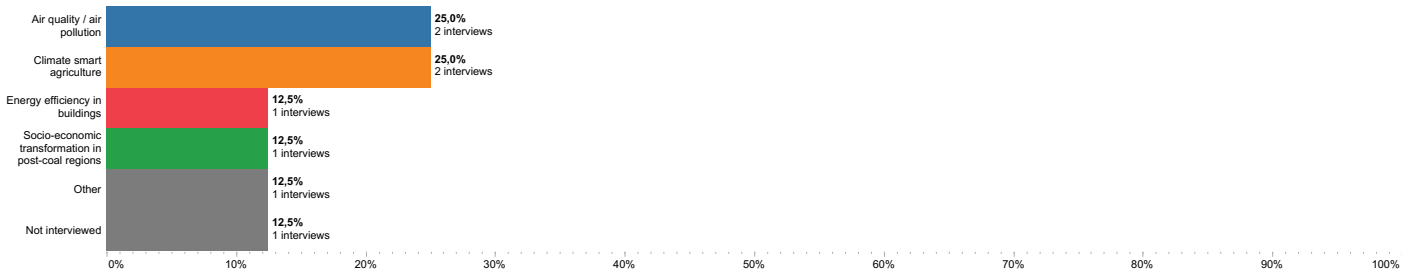
-Pressure of big companies and image of CC policies as job destroyer;
- Power of industrial lobby and image of climate change measures as expensive, non-reliable and increasing prices for households and industry;
- Fragmentation of political parties and increase of radicalism and opportunism may dysfunction future Slovak governments and endanger functioning of the state;

8 Directive 2008/50/EC available at: https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX:32008L0050
9 SWOT analysis is an analysis enabling to systematically analyse strengths and weaknesses of an approach and also opportunities and potential threats.

Facts and figures regarding the data collection process

Data collection period: 7/11/2019 - 4/12/2019
Number of initial contacts: 8
Initial distribution of contacts by gender:

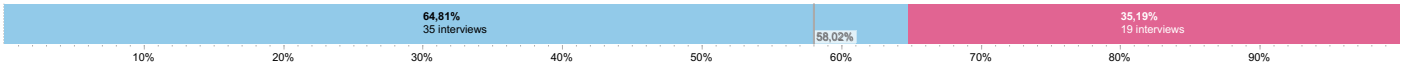
Initial distribution of contacts by thematic sector:



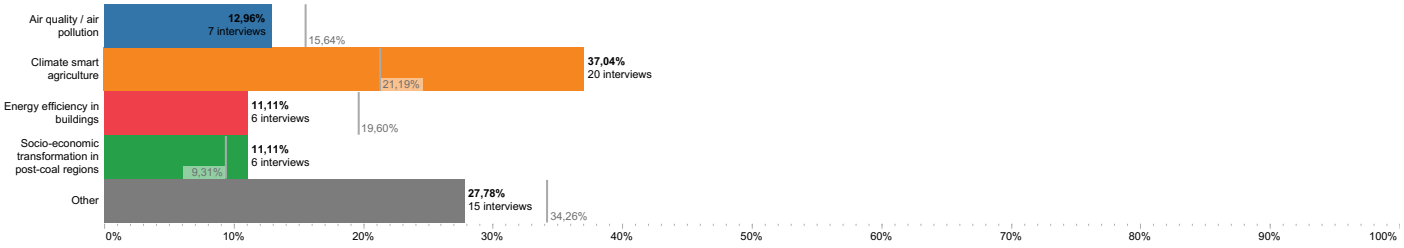
Number of contacted persons: 61
Finalised interviews: 54
Number of people not interested in participating in the study: 4
Response rate: 88.52%
Total number of nominations: 132
Total number of unique nominations: 89
Average amount of nominations by interview: 2.44

Interviewee profiles

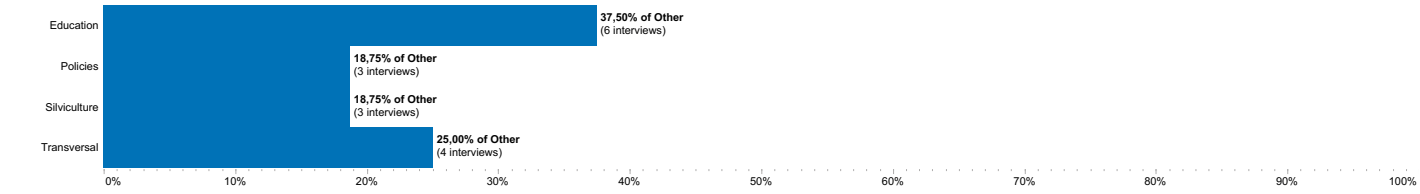
Distribution of interviewees by gender
(* data based on 54 conducted interviews)



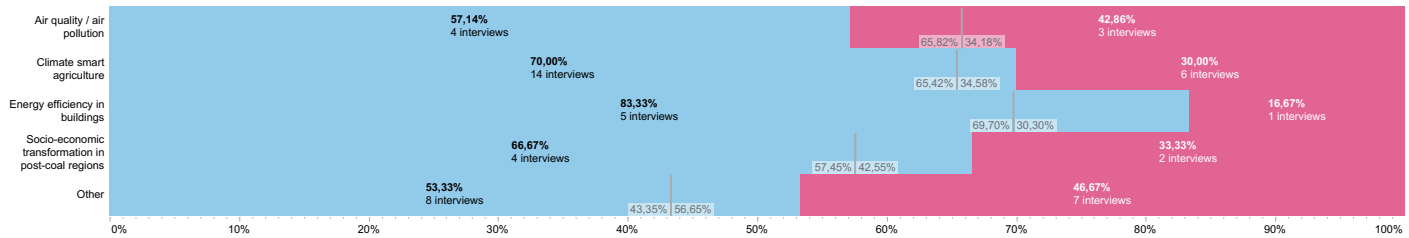
Distribution of interviewees by primary activity sector
(* data based on 54 conducted interviews)



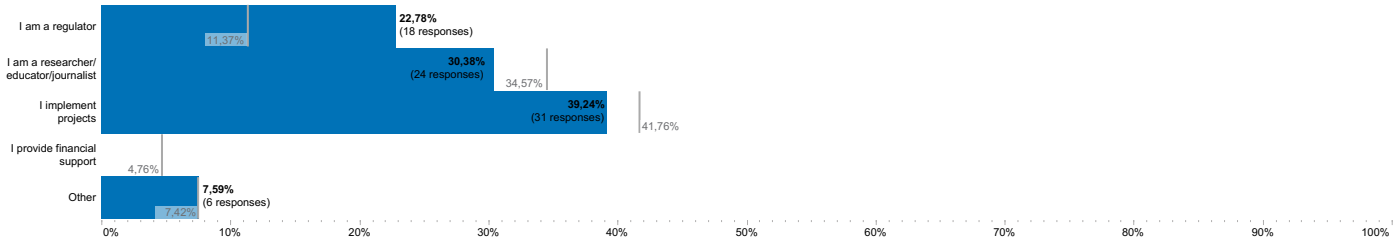
Breakdown of Other primary activity sectors
(* data based on 54 conducted interviews)



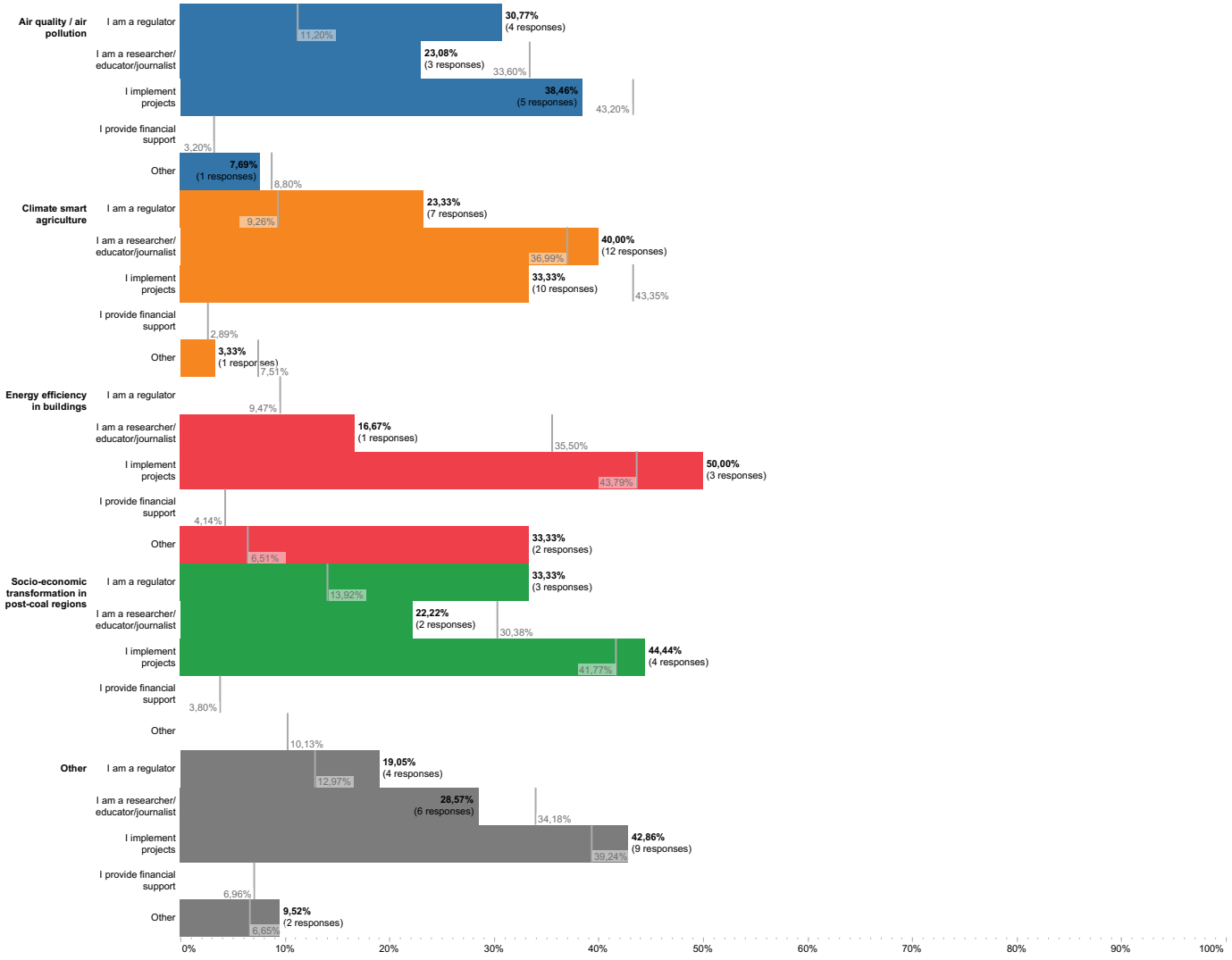
Gender distribution by primary activity sector
(* data based on 54 conducted interviews)



Distribution of interviewees by the type of role
(* data based on 54 conducted interviews)

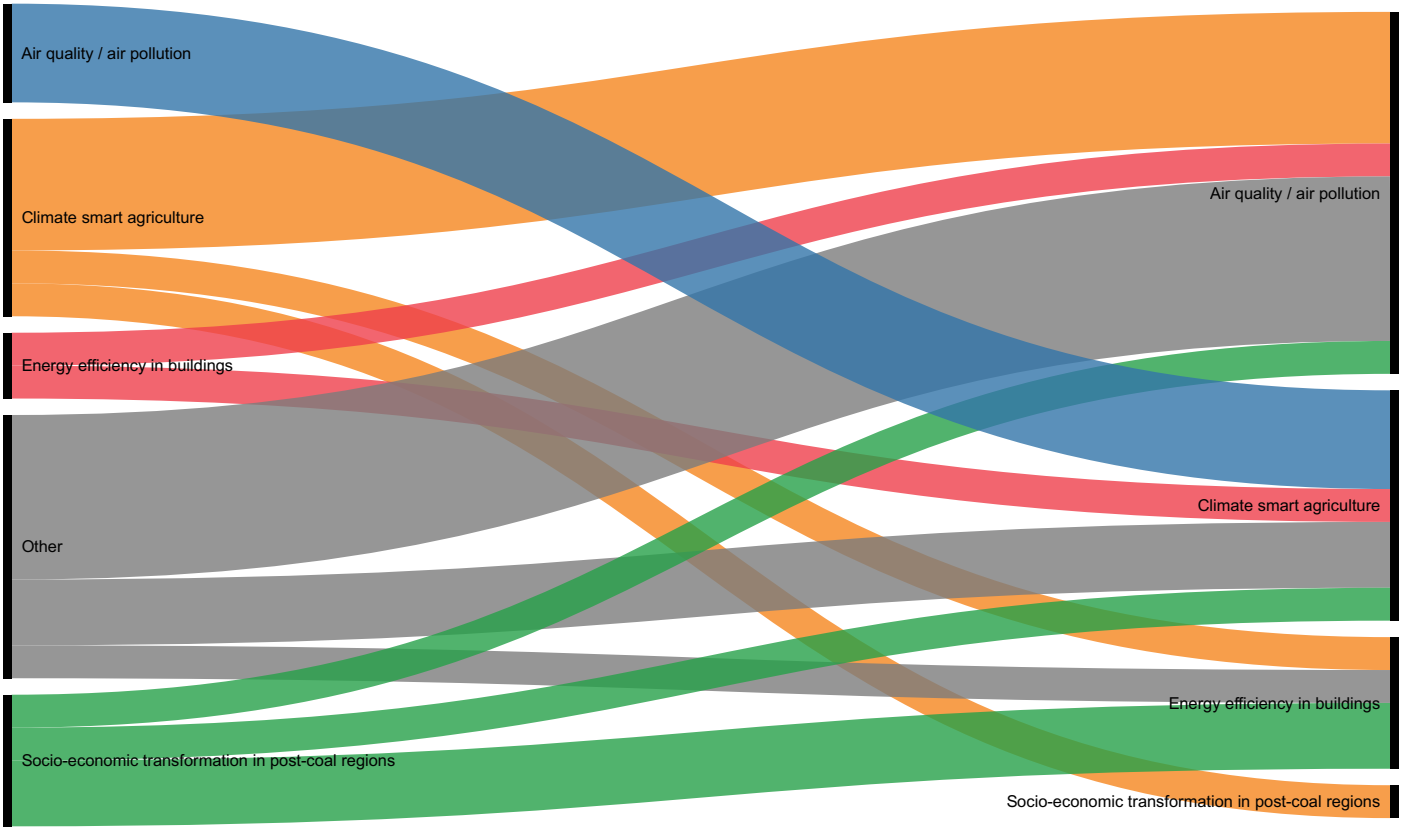


Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 54 conducted interviews)

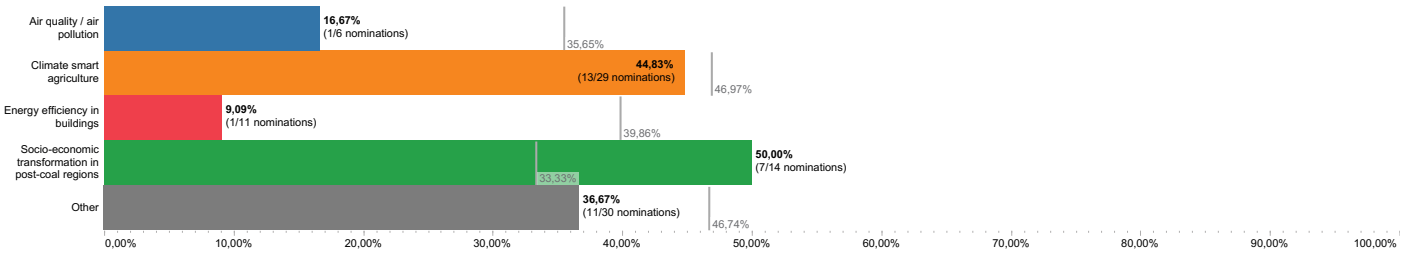


Distribution of interviews by region
(* more then 2 interviewees)

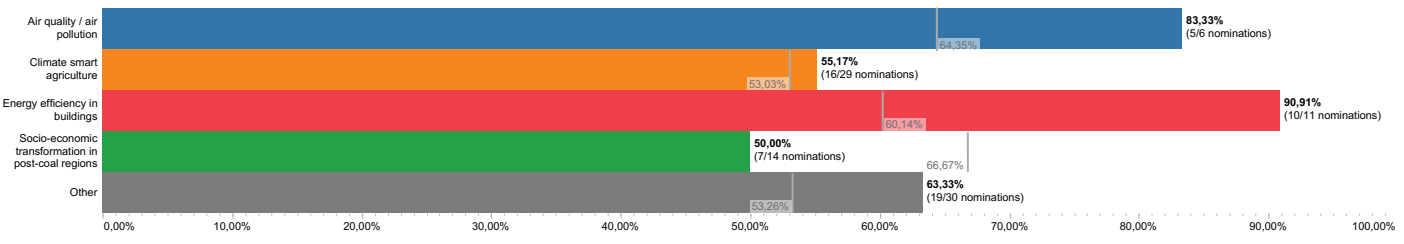
Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 54 conducted interviews)



Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 54 conducted interviews)

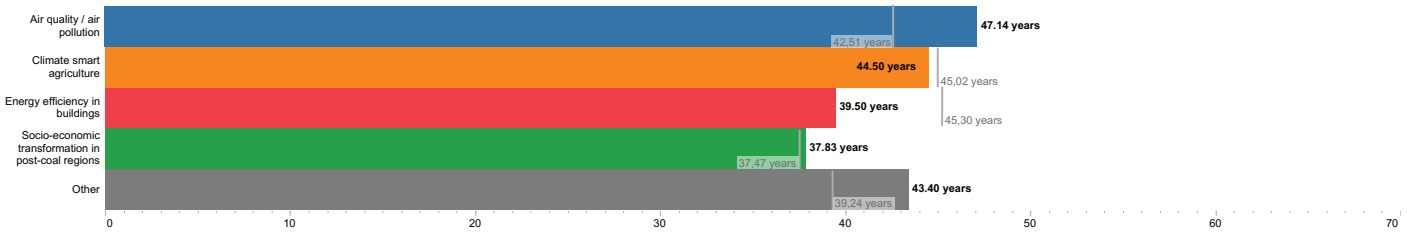


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 54 conducted interviews)

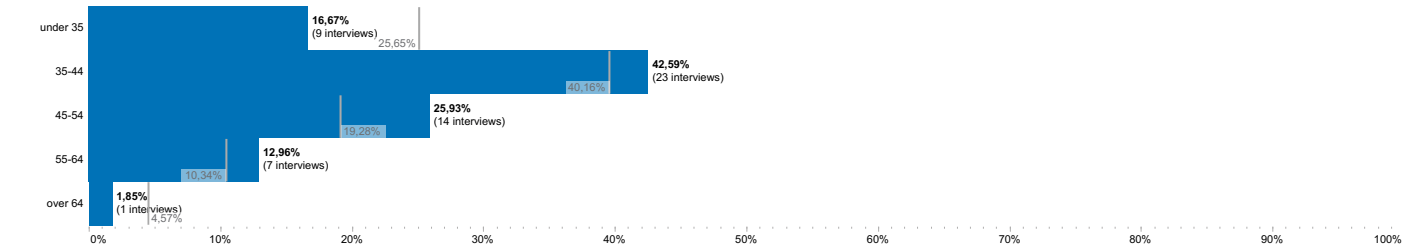


Average age of interviewees: 43.24 years (Regional average: 41.62 years)
(* data based on 54 conducted interviews)

Average age by primary activity sector
(* data based on 105 conducted interviews)



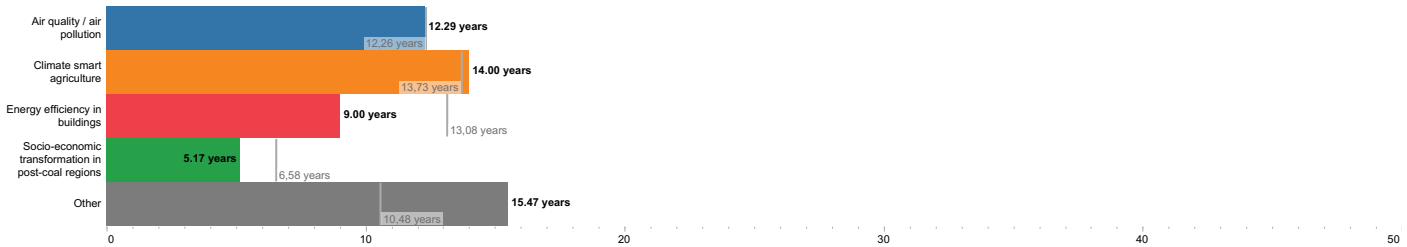
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 54 conducted interviews)



Average number of years of experience: 12.65 years (Reginal average: 11.58 years)
(* data based on 154 conducted interviews)

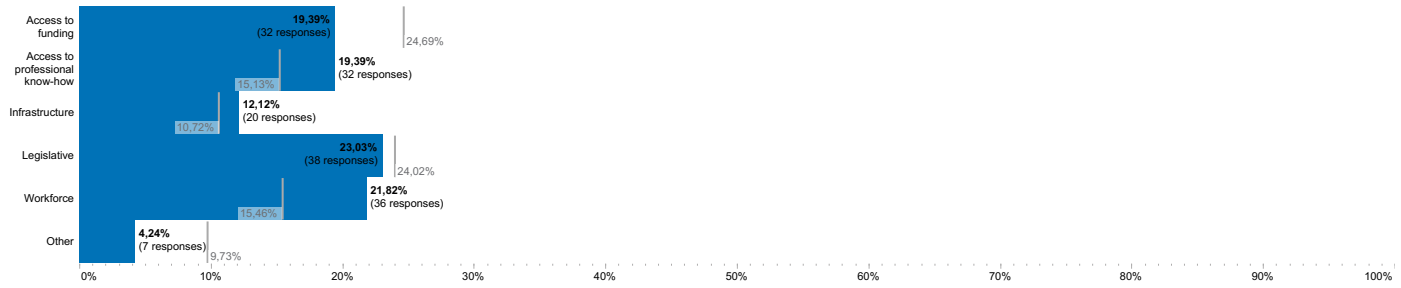
Average number of years of experience by gender
(* data based on 54 conducted interviews)

Average number of years of experience by primary activity sector
(* data based on 54 conducted interviews)

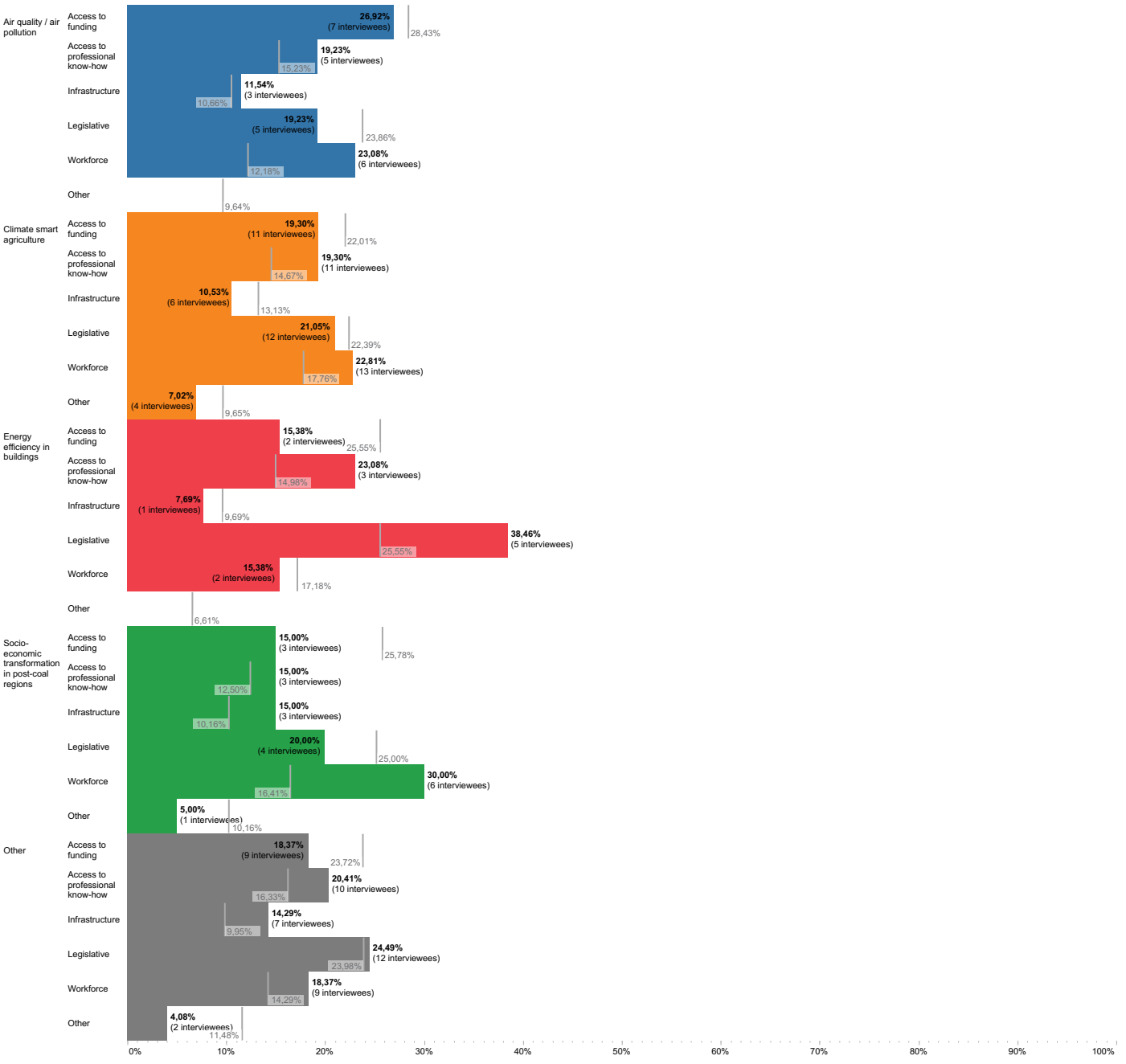


Average number of years of experience by the legal status of their member association
(* data based on 54 conducted interviews)

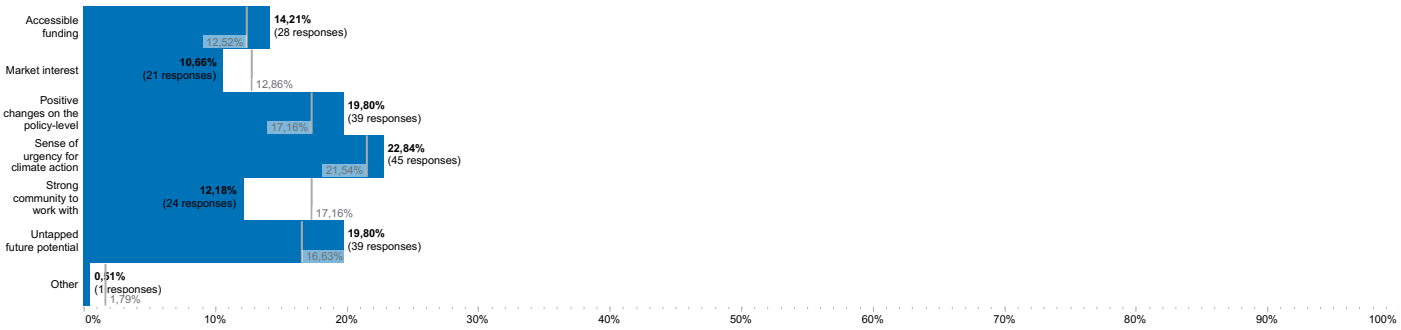
Distribution of interviewees by Barriers/Challenges category
(* data based on 54 conducted interviews)



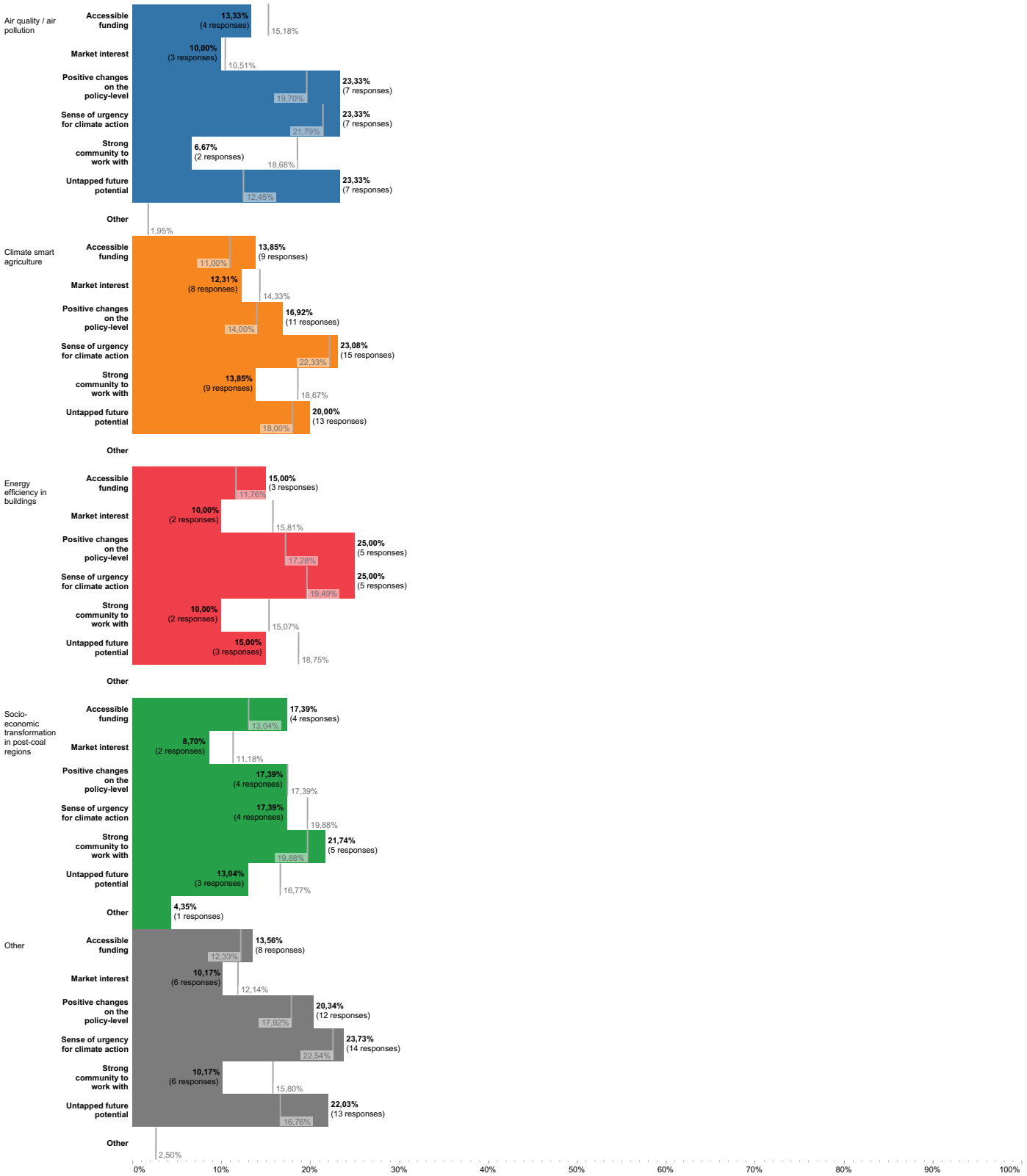
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 54 conducted interviews)



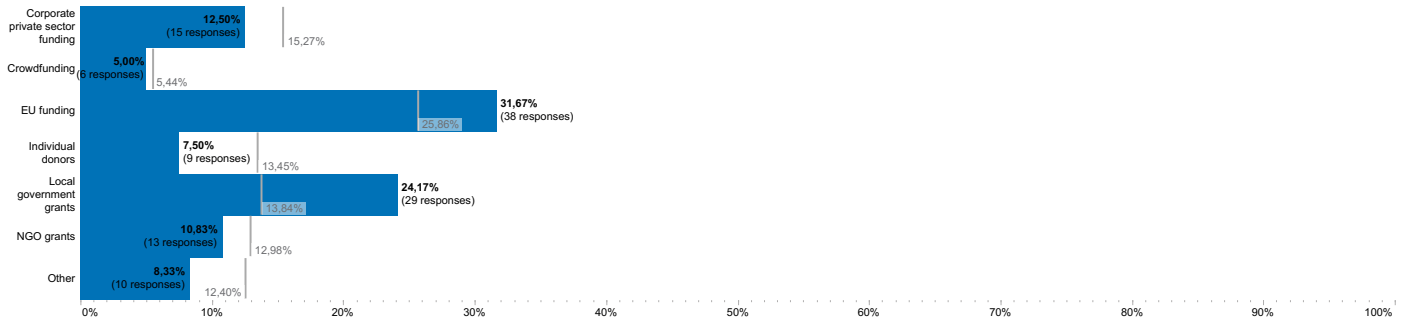
Distribution of interviewees by Opportunities category
(* data based on 54 conducted interviews)



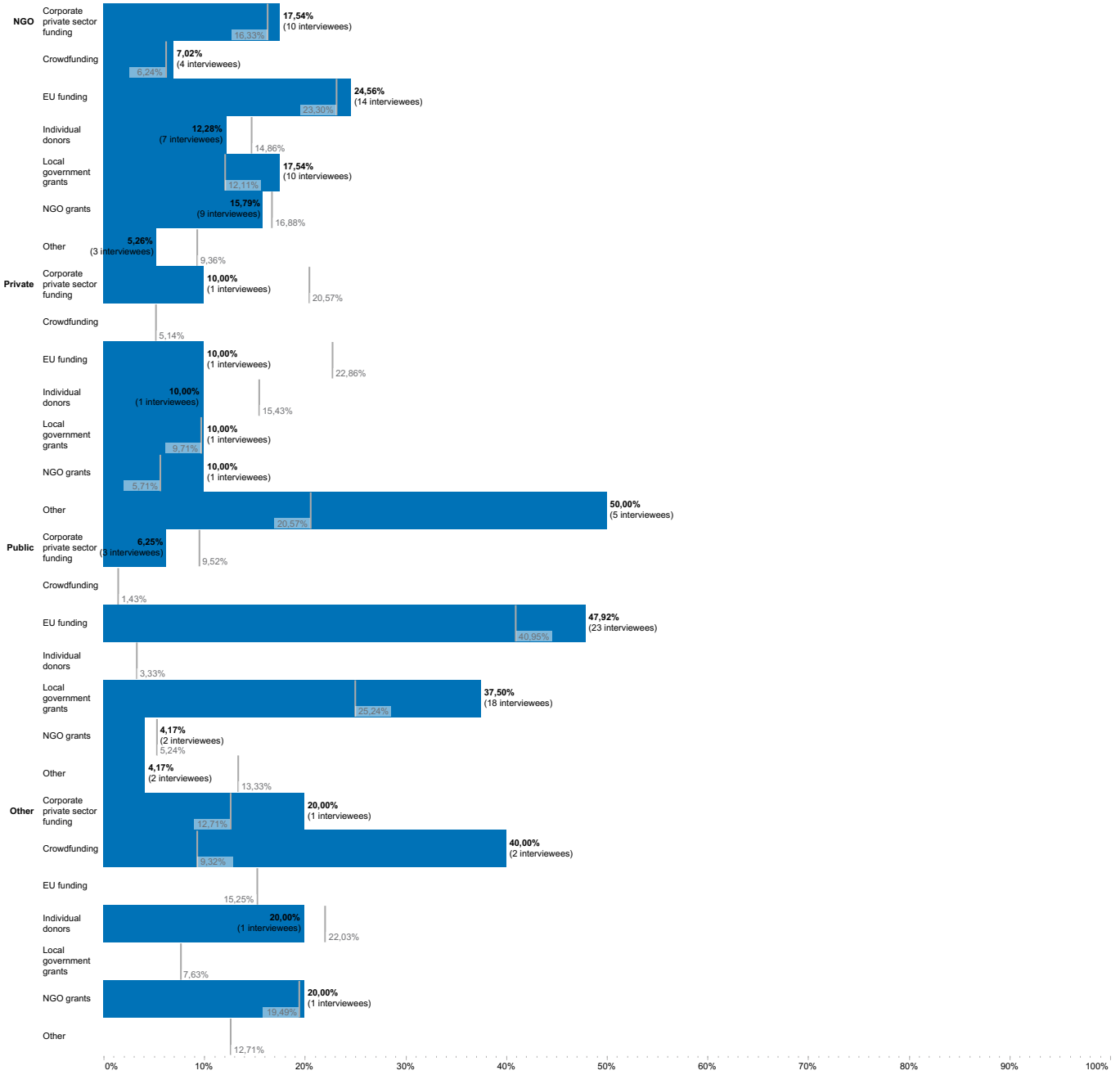
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 54 conducted interviews)



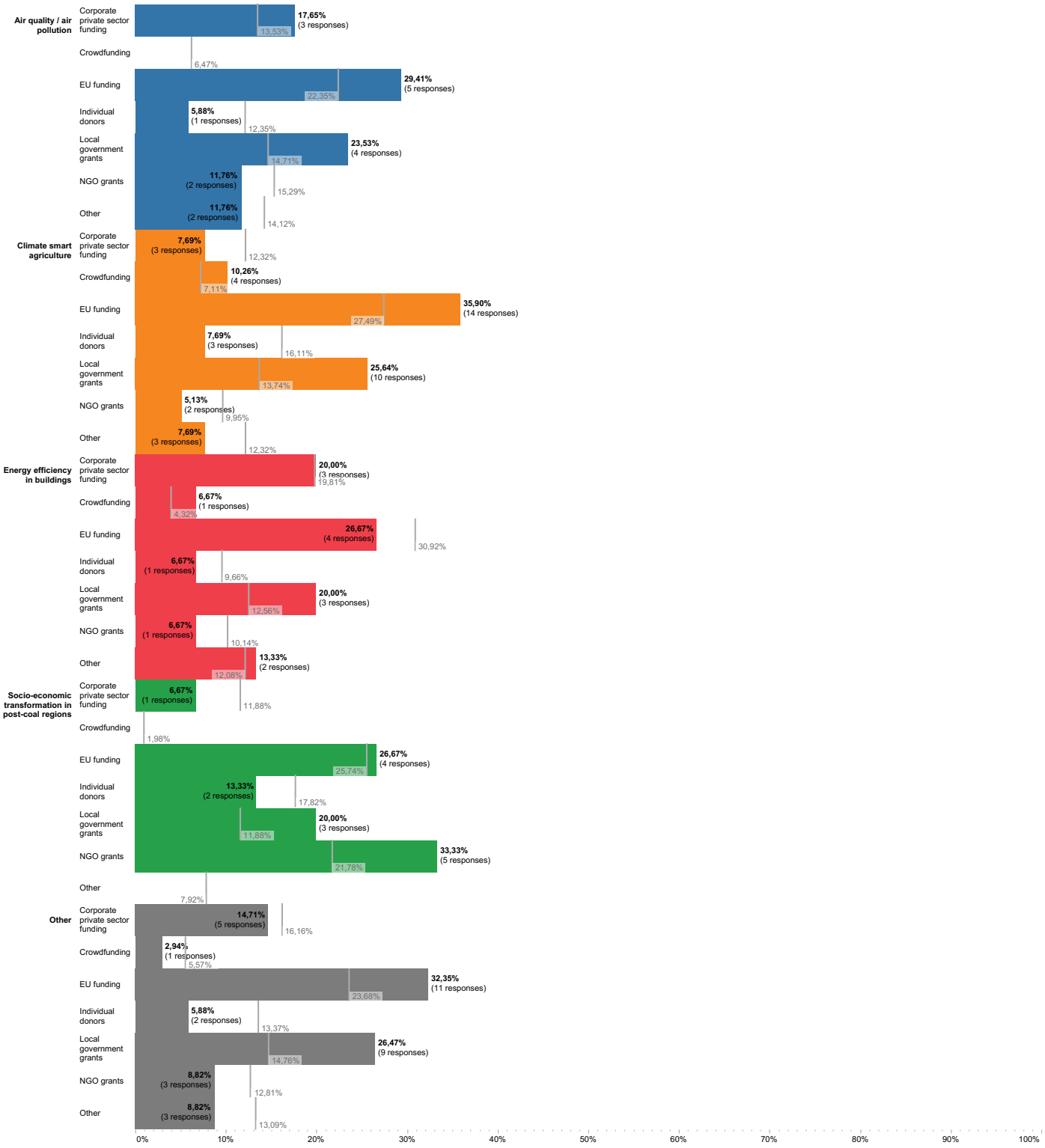
Distribution of interviewees by Funding opportunities category
(* data based on 54 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 54 conducted interviews)

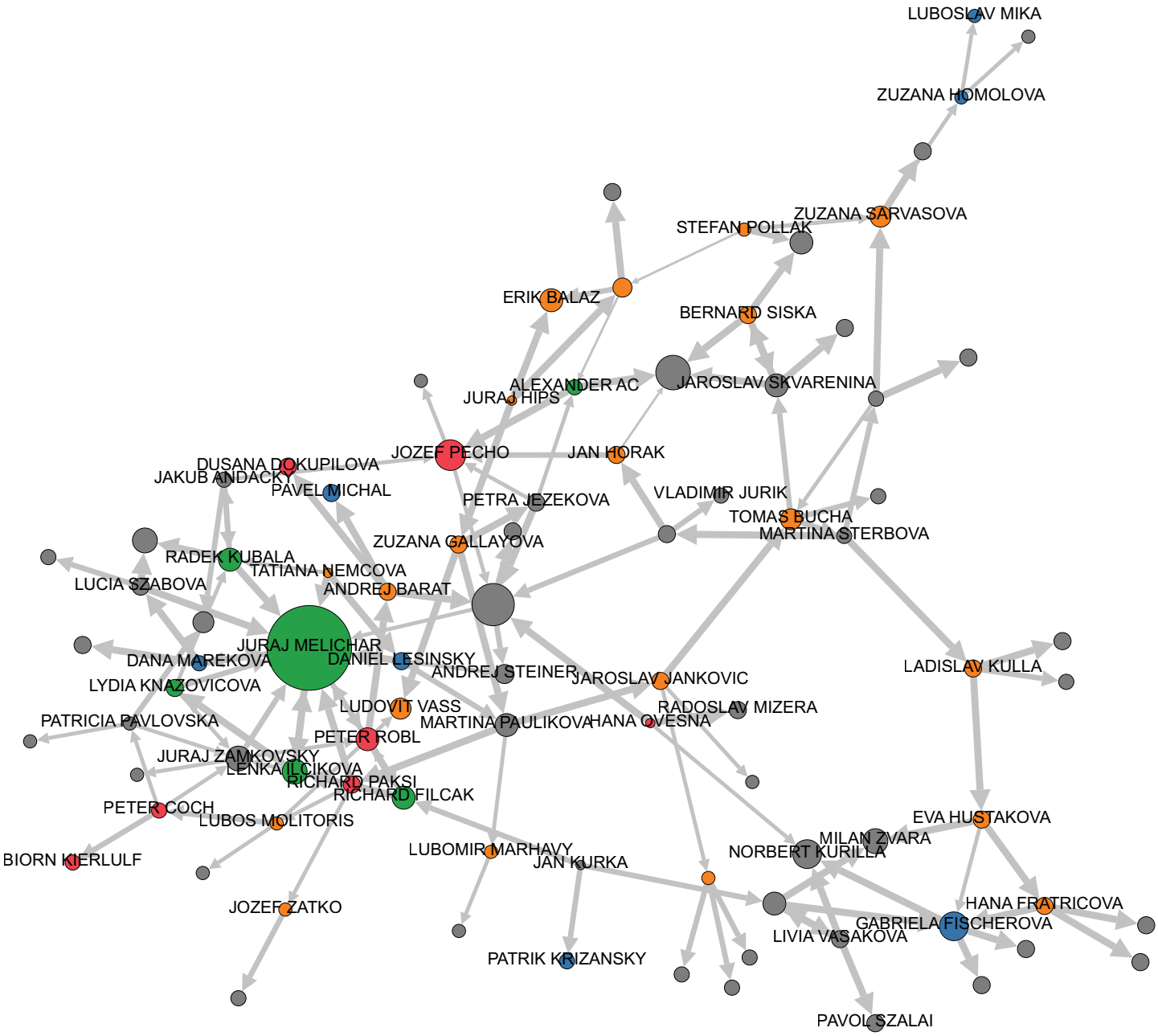


Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 54 conducted interviews)



Social network analysis

Overall social network map diagram (89 nodes / 132 edges)



Primary activity sector:

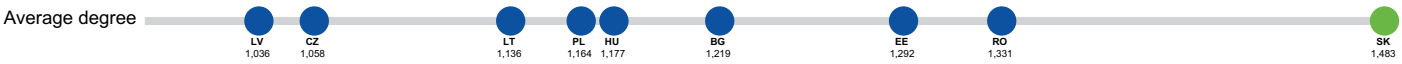
- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)

Social network statistics

Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals

Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

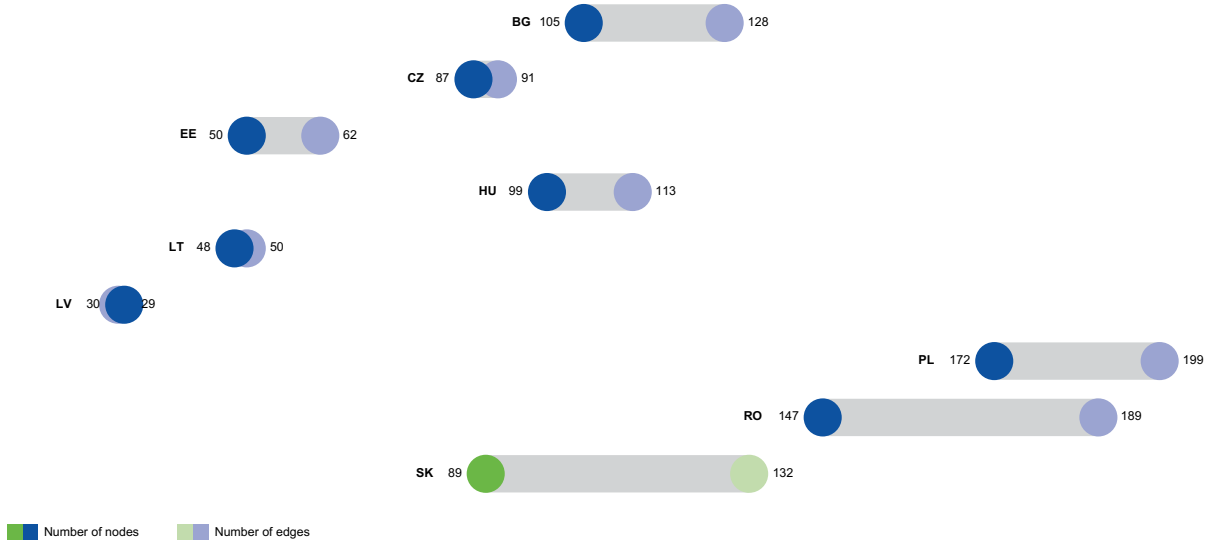
Number of discrete groups in the network

Number of nodes

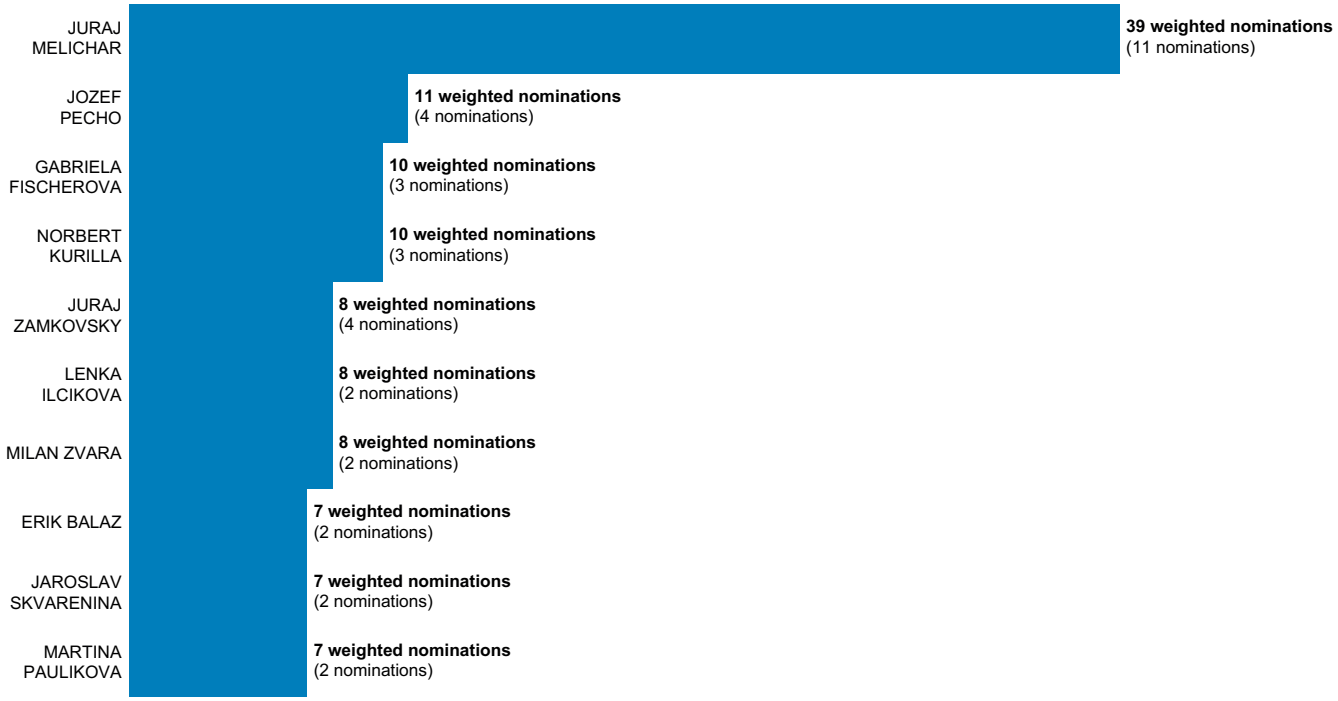
Number of individuals in the network

Number of edges (links)

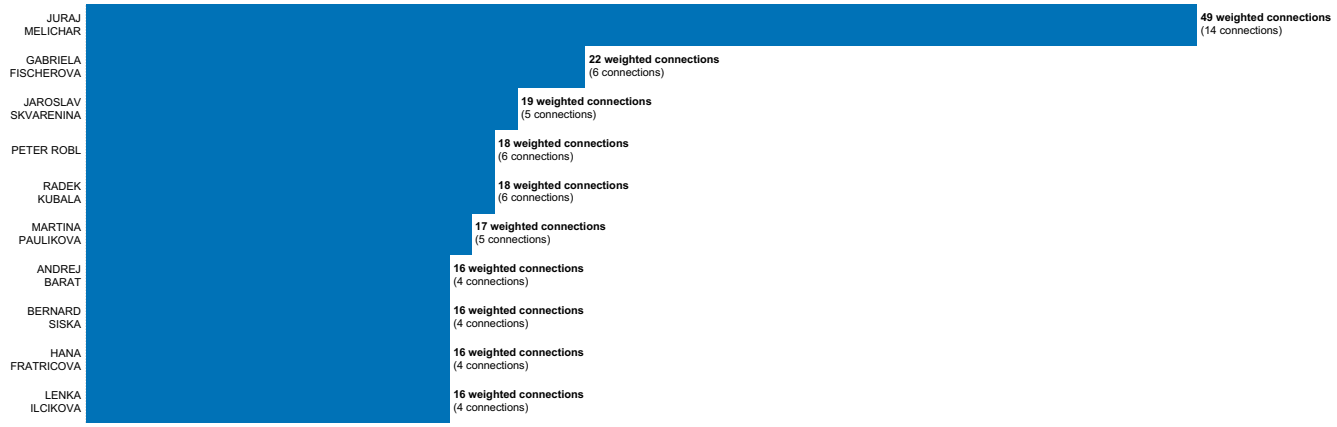
Number of relationships between individual in the network (in total)



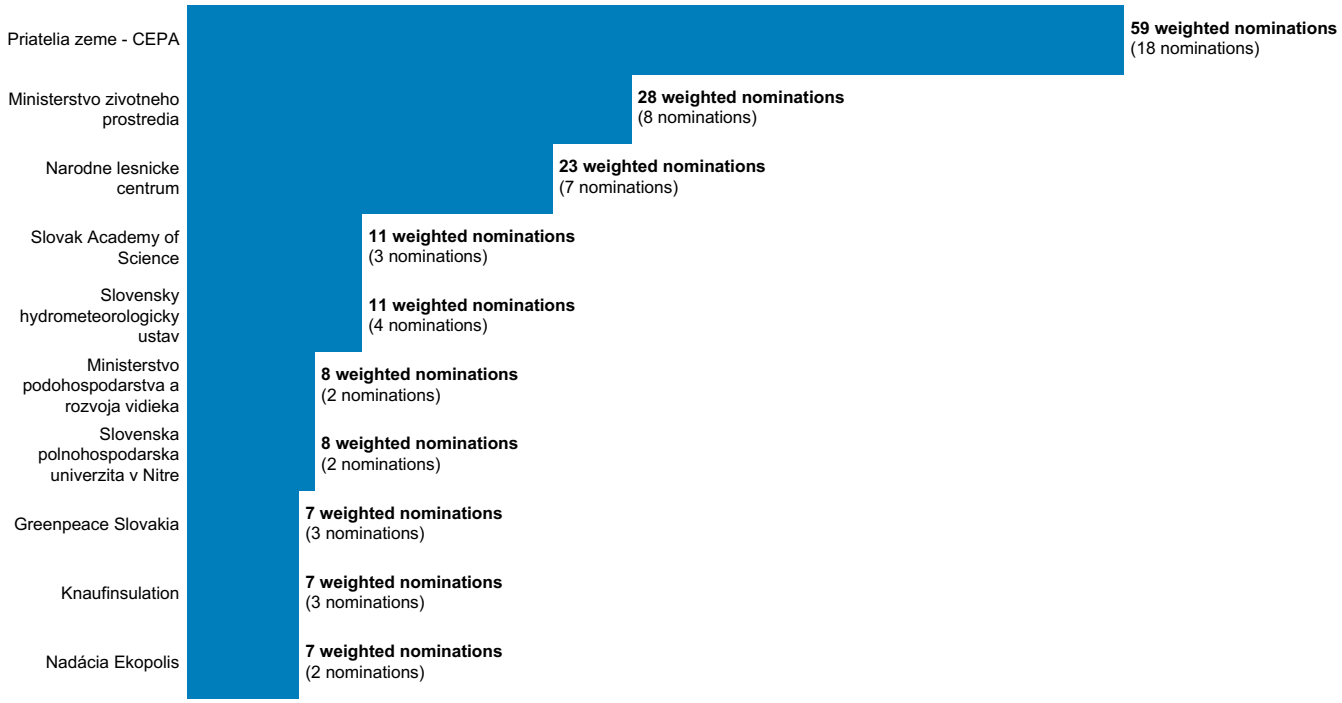
Top interviewees by the number of nominations (weighted in-degree)
(* 2 or more nominations)



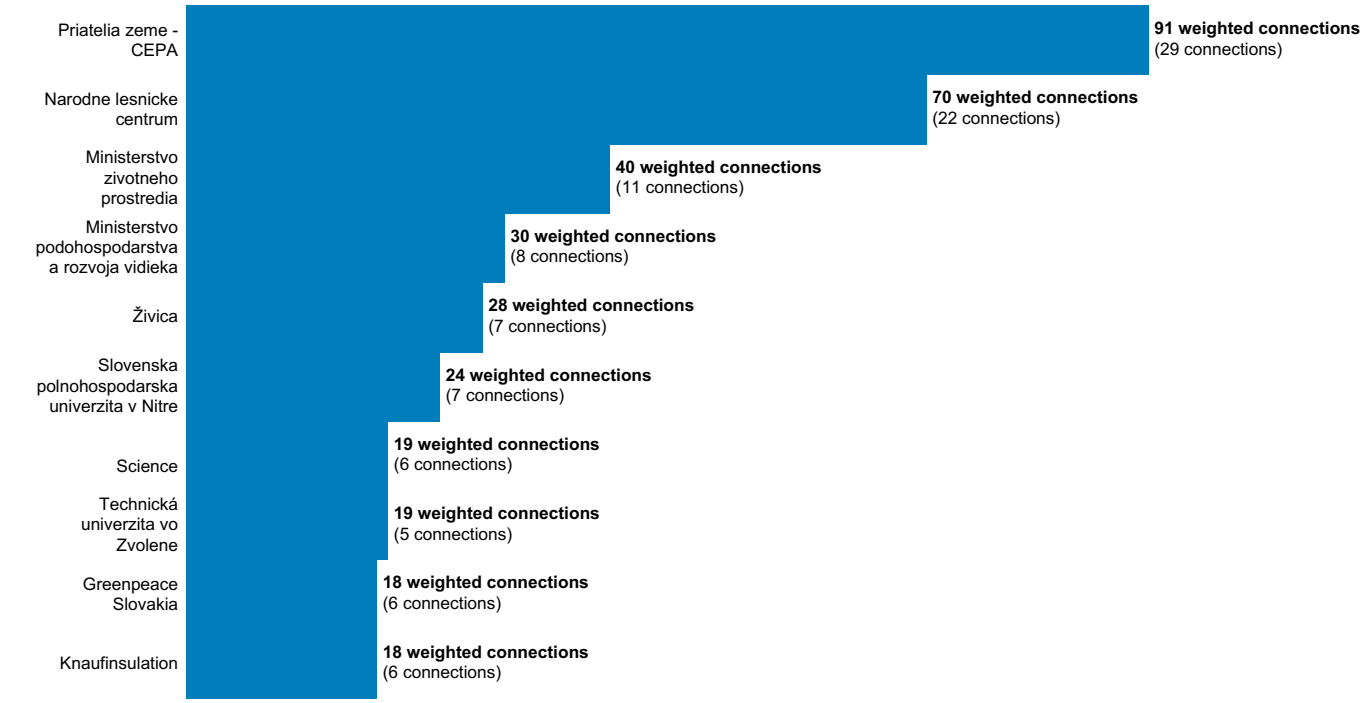
Top interviewees by the overall degree (in-degree and out-degree)
(* 2 or more connections)



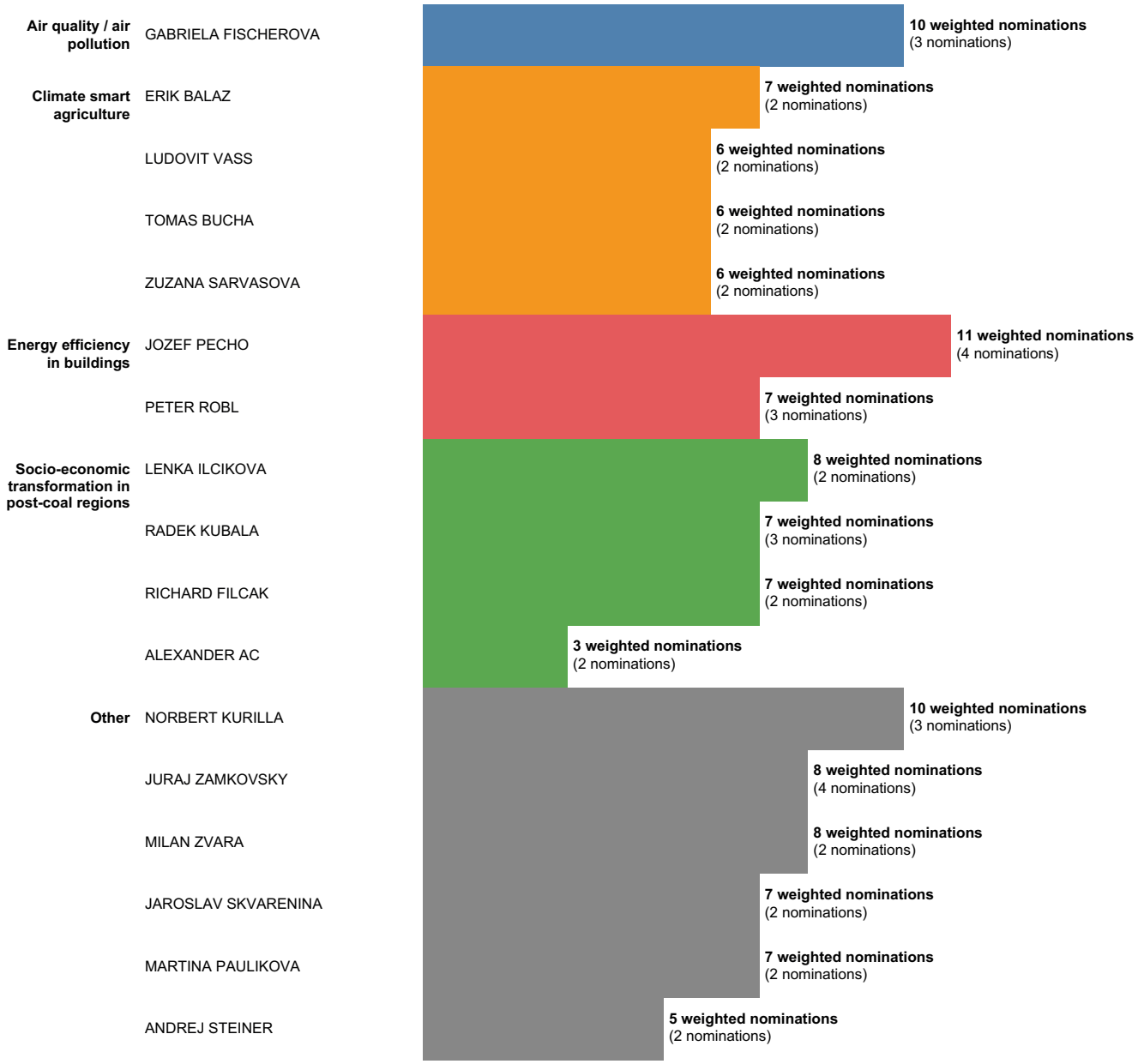
Top organisations by the number of nominations (in-degree)
(* 2 or more nominations)



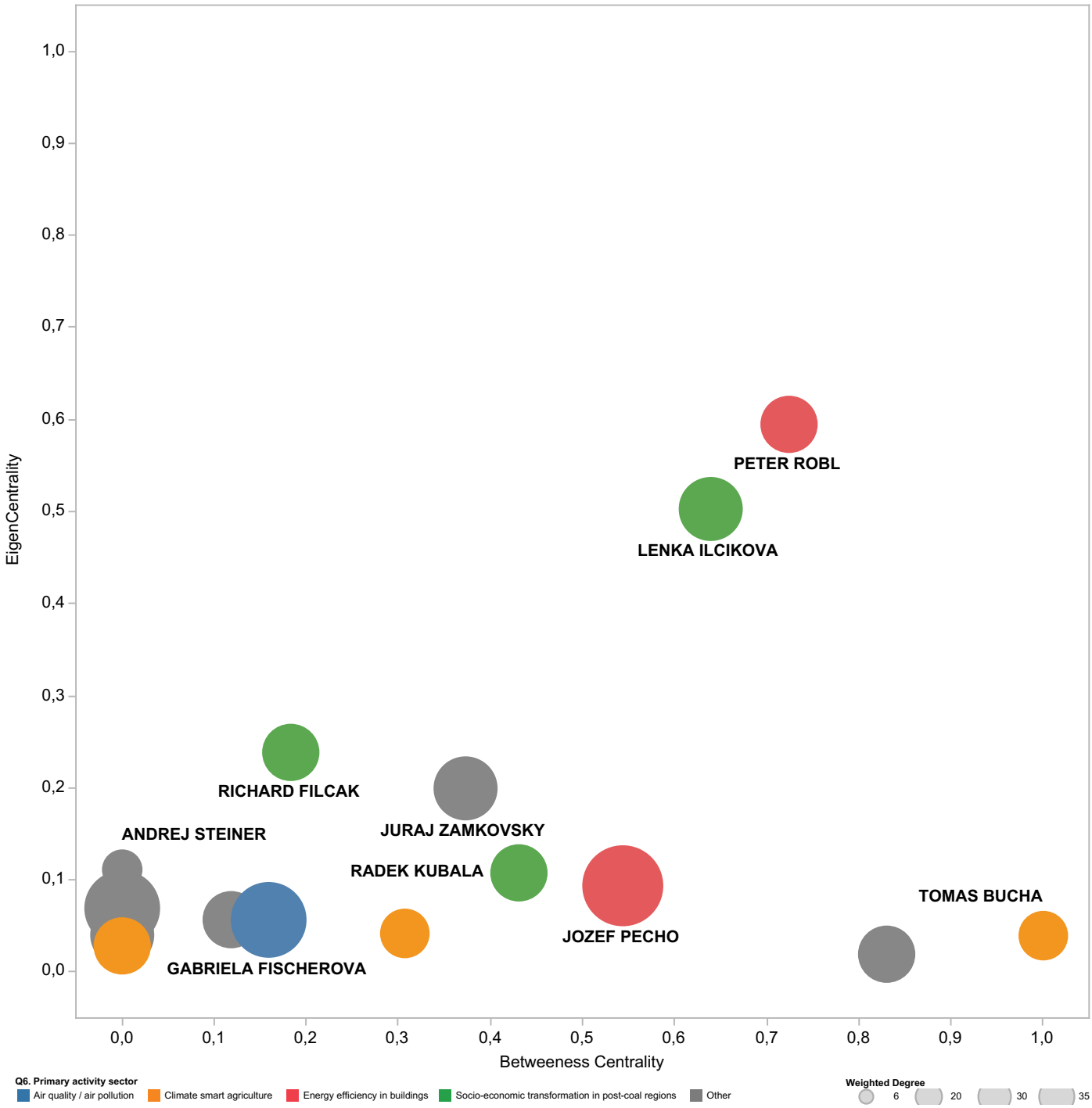
Top organisations by the overall degree (in-degree and out-degree)
(* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector
(* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with 2 or more nominations)



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 6: Qualitative and Network Analysis Poland

By **Andrzej Kassenberg**

Energy Efficiency in Buildings Operation

General Context

The largest potential for energy efficiency lies in buildings operation, especially the residential ones, where thermomodernization activities, together with an increased efficiency of consumer electronics, home appliances and lighting, can decrease the power demand by 2,800 TWh between 2015–2050[1]. The overall number of single-family houses in Poland is estimated at nearly 5.4 million, of which 72%(3.6 million) are uninsulated or very poorly insulated[2,3]. This is due to the fact that almost half of these buildings are 50 years old or older. In 29% of these buildings use outdated (over 10 years old) and highly inefficient coal boilers[4]. Only 1% of buildings can be considered energy efficient. Buildings in Poland consume about 40% of energy and account for 36% of the CO2 emissions to the atmosphere[5].

In addition to focusing on existing buildings, it is important to pay attention to the necessity to limit the energy consumption, especially thermal energy, for newly constructed buildings. Buildings with low energy demand are becoming cheaper while providing high living comfort and contribute not only to the implementation of environmental policy, but also to reducing emissions. The current primary energy demand ratios for newly constructed individual residential buildings in Poland, coming into force on 1 January 2021, are quite high and amount to 70 kWh / m2 / year while low-energy houses consume 40 kWh / m2 / year and passive houses consume 15 kWh / m2 / year, not to mention zero-energy houses or net positive plus energy houses[6]. Such a cautious policy would mean that in order to meet the requirements of climate policy, it may be necessary to carry out thermomodernization in newly constructed buildings, which will entail additional costs.

Innovation

In terms of improving energy efficiency, it is necessary to focus on thermomodernization, while the key issue is the increase of the level of financial support for single-family buildings. In particular, attention should be paid to striving for comprehensive solutions, namely to improve energy efficiency by 50–60%, which means[7]:

- total or partial replacement of the heat source, use of renewable sources;
- replacement of the central heating and domestic hot water supply systems together with their insulation (in accordance with the current technical and construction regulations);
- replacement of the external window and door frames;
- insulation of the building envelope (facades, roof, ceiling/floor);
- renovation of balconies;
- energy efficient ventilation system.

Interesting examples of both improving energy efficiency in existing building and building new highly efficient ones are[8]:

"Dom nad Wierzbami" ("House above the Willows") in Jackowo Dolne, Mazovian Voivodship, is an agritourism facility operating since 2008 that can serve as an example of the use of renewable energy and energy efficiency solutions. Since the beginning of the farm's operation, special solutions have been used to improve energy efficiency and introduce the use of renewable

1 2050.pl. Journey Towards Low-Emission Future (2050.pl podróż do niskoemisyjnej przyszłości). Edited by Maciej Bukowski. Institute for Structural Research, Institute for Sustainable Development, European Climate Foundation. Warsaw, 2013.
2 A. Kaliszuk-Witecka. Sustainable Building. Selected Issues of Building Physics (Budownictwo zrównoważone. Wybrane zagadnienia fizyki budowli). Polish Scientific Publishers PWN. Warsaw, 2017.
3 Energy Efficiency in Poland. 2013 Review (Efektywność energetyczna w Polsce. Przegląd 2013). Institute of Environmental Economics, 2014.
4 Review of Energy Efficiency in Poland 2013 (Przegląd efektywności energetycznej w Polsce 2015). Institute of Environmental Economics, 2016.
5 Technical Condition of Single-Family Buildings in Poland – Renovation Needs, Heat Sources and Energy Performance Standards (Stan techniczny budynków jednorodzinnych w Polsce – źródła ogrzewania i standardy izolacyjności cieplnej). Report from research carried out by the CEM Market and Public Opinion Research Institute. Compilation of the results by Łukasz Pytliński. May 2017.
6 Regulation of the Minister of Transport, Construction and Maritime Economy of 5 July 2013 amending the regulation on technical conditions to be met by buildings and their location (Rozporządzenie Ministra Transportu, Budownictwa i Gospodarki Morskiej z dnia 5 lipca 2013 r. zmieniające rozporządzenie w sprawie warunków technicznych, jakim powinny odpowiadać budynki i ich usytuowanie).
7 Financing Building Energy Performance Improvement in Poland (Finansowanie poprawy efektywności energetycznej budynków w Polsce). Report. Buildings Performance Institute Europe. January 2016.
8 Klimapolka – Guide to Climate Policy Benefits (Klimapolka – przewodnik po korzyściach z polityki klimatycznej). Institute for Sustainable Development. Warsaw, 2017.

energy sources: the energy-efficient building has been equipped with solar panels for heating utility water and a wood pellet fired fireplace with a water jacket. The building was insulated with mineral wool: 12 cm layer for the ground floor and 25 cm for the attic. A modern, high-quality furnace with a wood pellet feeder was used to heat the building and the water. Savings are mainly associated with energy costs.

In a newly designed passive house (15 kWh / m2 / year) near Warsaw, in Zielonki-Wieś, Stare Babice municipality, mechanical ventilation is equipped with a recuperator, heat pump, DWHR system (countercurrent heat exchanger in gray water installation, which allows to recover 75% of the heat energy from the water consumed in the house), Multi-Comfort standard (increased sound insulation, thermal and economic quality).

Public Opinion

In terms of the choices of Poles regarding various energy sources, rationalization and reduction of energy consumption found a very broad support of 89% ('yes' and 'yes, probably' answers) Increasing the share of renewable energy is also supported by 94% of the population. Other options, such as nuclear energy or energy based on various fossil fuels, fall between 35–60% of supporters[9]. However, real and not declarative behavior for improving energy efficiency is strongly conditioned by personal benefits, such as comparatively lowers costs.

Public Policies

Energy efficiency is not a significant issue for state policy despite EU support. It is more associated with reducing low emissions and energy poverty than perceived as an opportunity to build an innovative and resource-efficient economy. In accordance with the obligations imposed by the EU, Poland has a National Energy Efficiency Action Plan. In its fourth edition, it predicts a total reduction of primary energy consumption by 13.6 Mtoe in 2010–2020, with the housing sector accounting for approximately 10% of this volume[10]. According to the European Environment Agency, it will be difficult for Poland to meet its efficiency improvement commitments set by the "20-20-20" Climate and Energy Package.

Currently, Poland is working on its Energy Policy until 2040 (draft updated version 2.1 – 8 November 2019 – EPP 2040)[11] and, in accordance with the EU requirements, on the National Energy and Climate Plan until 2030 (draft from January 2019 – NECP)(12). In both of these documents, despite the declarations, energy efficiency is not considered a priority. The NECP states: "In its energy policy, Poland will continue to pursue directions contributing to an increase in the energy efficiency of the economy. On the basis of an analysis of the effects and impact on the GDP as well as potential for savings, Poland declares the national 2030 energy efficiency target at 23% with respect to the primary energy consumption as forecast by PRIMES 2007."(12) The Polish set target is much lower than the EU target of 32.5% for 2030, showing the low commitment of Polish authorities despite the fact that it is estimated that approximately 35% of energy can be saved in a cost-effective way, and the technical potential even rises to 50%. On the other hand, objectives for the long-term renovation of domestic stock of residential buildings in NECP were set as follows[12]:

- "the share of thermally insulated residential buildings in the total housing stock will amount to 70 % in 2030 (as compared with 58.8 % in 2015),
- the number of people living in sub-standard conditions due to overpopulation or the poor technical condition or absence of technical facilities will decrease to 3.300.000 in 2030 (from 5.360.000 in 2011)."

Climate-smart Agriculture

General Context

The current situation of agriculture in Poland is a result of both the historical context and processes related to political transformation, such as the adherence to the EU. The changes that Polish agriculture underwent after 1989 put it under ever increasing economic efficiency pressure,

9 K. Byrka, A. Wójcik. How to Promote Pro-Environmental Policy and Renewable Energy in Poland (Jak promować politykę pro środowiskową i energetykę odnawialną w Polsce). WWF. Warsaw, 2016

10 National Action Plan on Energy Efficiency for Poland (Krajowy plan działań dotyczący efektywności energetycznej dla Polski). Ministry of Energy, 2017.

11 Energy Policy of Poland until 2040 (Polityka energetyczna Polski do 2040). Updated, v. 2.1, 8 November 2019. Ministry of Energy

12 National Energy and Climate Plan for the Years 2021-2030. Objectives and targets, and policies and measures (Krajowy plan na rzecz energii i klimatu na lata 2021-2030. Założenia i cele oraz polityka i działania). Draft, v. 3.1, 4 January 2019. Ministry of Energy

which threatens biodiversity and contributes to the increase of greenhouse gas emissions. Emphasis on efficiency leads to an increase in production intensity, including through the spread of monocultures (large fields with homogenous cultivation), simplification of crop rotation, and abandonment of those productions that do not bring large profits. For example, the extensive use of wetlands and meadows in the mountains is being discontinued, leading to the overgrowing process, limiting the occurrence of many species, including those of birds and insects.

Agriculture is also a significant source of greenhouse gas emissions, emitting about 30.1 million tons of CO2eq in 2016, which accounted for about 8% of total Polish emissions[13]. Emission of nitrous oxide (primarily from soil as a result of nitrogen fertilization) and methane (mainly from animal production) are of the greatest importance. However, agriculture can contribute to climate protection by permanently binding carbon in agricultural soil and biomass. Unfortunately, cultivation techniques that contribute to this, (like the introduction of catch crops, use of bean plants as "green" fertilizer, no-tillage cultivation) are not encouraged in Poland and as a result are rarely used by farmers.

Innovation

Agriculture should support the stability of the natural system. The maintenance of a permanent plant cover reduces soil erosion, and the cultivation of bean plants increases nitrogen content. Proper fertilization with organic fertilizers, plowing crop residues or no-tillage improves the condition of soil and allows for the permanent storage of organic carbon. The introduction of field plantings, extensive use of meadows and leaving field margins contributes to increasing biodiversity. Agricultural land accounts for almost half of Poland's surface area, as well as a significant part of areas under various forms of nature protection[14]

The Stanisław Karłowski Foundation leads the Rural Project whichillustrates the use of biodynamic practices in agriculture. It owns 1,900 ha, including 1,600 ha of arable land, animals, buildings and machinery, which guarantees comprehensive biodynamic management. Biodynamic agriculture presupposes cultural and agrarian development aimed at restoring soil fertility. . The steppe-formation is prevented by shaping water landscapes and restoring natural water management,. Numerous hedges with various species of edible fruit, as well as single trees, are planted in the fields.This creates a microclimate that protects against wind erosion and extreme weather conditions. At the same time, a place of refuge is preserved for many species of birds, insects, amphibians and wild plants[15].

Public Opinion

Because of limited environmental education, there is low environmental awareness among Polish farmers. Few of them realize that their activities may have a negative impact on the environment or declare their readiness to work for the protection of natural resources. Mass media outlets reaching farmers lack reliable information on this subject, while Agricultural Advisory Centers and agricultural schools do not provide sufficient environmental education. On the other hand, ads and representatives of companies selling agricultural supplies, such as fertilizers, pesticides and machines, have a great impact on the worldview and activities of Polish farmers. They do not draw the farmers' attention to the negative environmental effects of their products. As a result, many farmers do not understand that there is a need to reduce the impact of agricultural production on nature.[16]

Public Policies

While in the fields of energy or transport the government's strategic documents strongly engage with the issue of climate change, agriculture and rural areas focused documents (such as the Strategy for Sustainable Rural Development, Agriculture and Fisheries 2030) only treat the issue marginally[17]. The document

13 National Inventory Report 2018.v Greenhouse Gas Inventory for 1988-2016 (Krajowy raport inwentaryzacyjny 2018. Inwentaryzacja gazów cieplarnianych w Polsce dla lat 1988-2016). IOŚ-PIB, KOBIZE, Warsaw, 2018

14 Agriculture Atlas 2019. Where is Common Agriculture Policy heading? (Atlas rolny 2019. Dokąd zmierza wspólna polityka rolna). Heinrich Böll Stiftung, Institute for Sustainable Development. Warsaw, 2019

15 https://www.juchowo.org/pl/o-nas.html

16 Agriculture Atlas 2019. Where is Common Agriculture Policy heading? (Atlas rolny 2019. Dokąd zmierza wspólna polityka rolna). Heinrich Böll Stiftung, Institute for Sustainable Development. Warsaw, 201

17 Strategy for Sustainable Rural Development, Agriculture and Fisheries 2030 (Strategia zrównoważonego rozwoju wsi, rolnictwa i rybactwa 2030). Ministry of Agriculture and Rural Development. Warsaw, 2019

only affirms the importance of creating national sustainable food production systems that increase production, strengthen the adaptability of agriculture to climate change and extreme weather phenomena, and improve soil quality. However, this Strategy does not propose any action plan to reduce greenhouse gas emissions from plant and animal production. It would be advisable, for example, to introduce incentives for application of pro-climate agricultural environmental programs or to introduce incentives to change the way of cultivation and breeding so as to reduce greenhouse gas emissions.

An issue related to agriculture is the issue of food waste and the use of a diet more favorable to climate protection(flexitarianism, vegetarianism, veganism). In Poland, approximately 9 million tons of food per year ends up on waste fields, which puts Poland on the inglorious fifth place out of 28 EU countries. The average Polish household throws away 20-30% of the purchased food, though 2/3 of it would still be suitable for consumption. It is necessary to introduce changes in consumer behavior based not only on the notion of reducing waste, but on understanding the impact of food production on climate change, water resources, animal welfare, and working conditions. As a way to counter this impact, the Act on Combatting Food Waste came into force in 2019, which, according to estimates of Food Banks, will save up to 100,000 tons of food.

Socio-Economic Transformation in Post-Coal Regions

General Context

Several regions in Poland are associated with hard coal and lignite mining. There is one example of a fully post-mining region, the Lower Silesian Coal Basin, where the transformation has largely taken place: individual hard coal mines are slowly being closed, although expansion of existing ones or even the opening of new ones is being considered. Another coal mine region located in Lublin region considers launching as many as six new mines. Contrary to the common opinion, it is estimated that the hard coal resources available today will last for 15 years. Without multi-billion replacement investments and the construction of new longwalls, shafts and mines, it will not be possible to maintain the current level of extraction. The PEP 2040 project envisages production at a high level, which entails high investment and operating costs. This leads to very high coal prices which will hurt the future competitiveness of the Polish economy, will affect energy costs for households, and will increase the energy poverty.

The situation with lignite differs greatly as the threat of mining phaseout is becoming an ever increasing problem. It is necessary to analyze the costs and benefits of early closure of mines and lignite-fired power plants, taking into account social and environmental aspects. For example, research conducted in connection with the operation of the Konin mine showed that losses in agricultural production amount to almost PLN 400 million per year due to crop losses and reduced animal production from the decrease in fodder availability[18]. The launch of the Złoczew field may result in losses from PLN 30 to 40 billion, and external costs may amount to PLN 11 to 16 billion over the entire period of operation[19].

Innovation

The World Bank report states that Silesia is much less dependent on coal than it iwas previously thought, and there is still a demand for employees in the coal industry in this region. This means that the coal sector can be reduced in a way that doesn't hurt employees. In the long run, the transition to renewable energy and the improvement of energy efficiency will create more jobs than jobs lost. If the most ambitious scenario were to be implemented as a result of withdrawing from coal extraction, 20 thousand mining jobs would be lost by 2030. At the same time, 100,000 new jobs could be created by the renewable energy sector. It is worth noting that 50% of miners are of an age that allows them to retire early, and the younger ones will be able to take up new positions after training. An interesting vision of socio-economic transformation was presented by the WiseEuropa think tank.

18 B. Pepliński, Economic Consequences of Continued Operation of Active Lignite Open-Pit Mines in Konin. Analysis of Costs for Agriculture and Agri-Food Processing (Skutki ekonomiczne dalszej eksploatacji w czynnych odkrywkach węgla brunatnego w zagłębiu konińskim – analiza kosztów dla rolnictwa i przetwórstwa rolno-spożywczego), Poznań, 2016

19 B. Pepliński. Consequences of Open-Pit Lignite Mines Construction at Bełchatów, Szczerców and Złoczew Fields. Analysis of External Costs for Agriculture and Agri-Food Processing (Skutki budowy kopalni odkrywkowej węgla brunatnego na złożach Bełchatów, Szczerców i Złoczew - analiza kosztów zewnętrznych dla rolnictwa i przetwórstwa rolno-spożywczego). Poznań, August 2019

Long-term vision of transformations in energy sector
• Acceptance of decline in mining and change management
• A new approach to employees in mining
• An ambitious plan to modernize fuel and energy infrastructure

Cross-cutting activities
• Comprehensive revitalization
• Public transport
• Diversification of the industrial and scientific base

Financing modernization
• Stable regulations for private investments
• National low-carbon investment support programs
• Dedicated support for mining regions using EU funds

Public Opinion

An interesting survey among miners was carried out by the Institute for Structural in regards with the challenges facing the coal industry transformation in Upper Silesia, showing that[20]:

• 59% of respondents believe that their professional qualifications will fully or nearly fully allow them to find a new job;
• the factors determining the choice of a new workplace on a scale of 1-8 for the respondents were: remuneration (6.4 points) and workplace stability (5.9 points);
• 46% of respondents with higher education would be willing to earn PLN 250 less if they find a new job;
• 33% were willing to spend more time on commuting to their new workplace;
• 43% considered that the best support instrument would be early retirement, with 21% (2nd place) mentioning compensatory payments;
• 20% said that the main goal of just transformation is the economic development of mining regions

Public Policies

Such government documents on the development of hard coal and lignite mining as EPP 2040 and NECP focus to a large extent on maintaining the dominant position of coal in power and heat generation, and not on carrying out a just transformation. An important role in this is played by trade unions whose strategy is to preserve jobs and not to bring move away from mining. The government willingness to sign the EU 2050 climate neutrality agreement is dependent on the allocation of significant funds for the transformation of mining regions.

A study on long-term strategy to ensure climate neutrality by 2050 prepared by WiseEuropa for Polish authorities analyzes five scenarios which all show that the share of coal will decrease by 2050[21]. Consequently, one should expect a just transformation program prepared for each coal region to establish new directions of economic development along with guaranteeing the creation of new jobs.

Air Pollution

General Context

Poland has the worst air quality in Europe. The World Health Organization data shows that 36 out of the 50 most polluted cities in the European Union are in Poland, which is also the country in Europe with the highest concentration of benzo(a) pyrene. The European Environment Agency estimates that premature deaths as a result of air pollution in Poland amount to 45,000 persons a year. An important reason for this situation is the lack of public awareness of the health effects of waste incineration, low quality fuel or old and broken cars use, as well as the scale of energy poverty in Poland.

In 2017, 10% of households in Poland suffered from multidimensional energy poverty, while about half of these households also suffered from income poverty. The groups particularly at risk of multidimensional energy poverty are those living in buildings built before 1946, people living in rural areas, and pensioners[22].

20 Just Coal Industry Transformation in Silesia. Implications for the Labor Market (Sprawiedliwa transformacja węglowa w regionie śląskim. Implikacje dla rynku pracy). Institute for Structural Research. May 2019

21 A. Śniegocki. Scenarios for Transformation to the Low-Carbon Economy KSN 2050. Analysis Preliminary Results (Scenariusze transformacji do gospodarki niskoemisyjnej KSN 2050. Wstępne wyniki analizy). WiseEuropa. Warsaw, 15 November 2019

22 Measuring Energy Poverty in Poland with the Multidimensional Energy Poverty Index (Pomiar ubóstwa energetycznego w Polsce z użyciem wielowymiarowego wskaźnika ubóstwa energetycznego w Polsce). Working paper. 18 July 2019. Institute for Structural Research

A vicious circle emerges: the buildings where such families live require deep thermomodernization and furnishing with energy-efficient equipment, but due to the poverty they are unable to carry out such works without external help.

The primary reasons for low emissions in Poland are generated by:
• using low-quality solid fuels and all types of waste to heat homes;
• using ovens that do not meet any standards to burn whatever one likes;
• poor insulation of buildings, which leads to significant energy loss;
• car exhaust fumes, especially from diesel engines;
• quite limited use of renewable energy sources.

Innovation

WiseEuropa proposed a broad thermomodernization program, combined with investments in small-scale renewable energy solutions, heat pumps and photovoltaics. Its implementation would significantly reduce emissions. It would cost around PLN 210 billion by 2030, of which various subsidies would amount to PLN 58 billion, and the whole program would contribute to GDP growth. The program would also result in a significant reduction of smog, which costs the Polish society PLN 110 billion a year, including not only the abovementioned 48,000 premature deaths, and 19 million lost working days because of medication and hospitalization time[23].

In order to counter the negative impact on human health and the environment of the pollutants emitted by transport, a clean transport zone may be established in the center of municipalities with population of over 100,000 inhabitants, with limited access for vehicles other than electric, hydrogen fueled or natural gas fueled. However, this interesting solution has a legal disadvantage that the Supreme Audit Office pointed out. According to the regulations, only 0.03% of vehicles registered in cities would have the right to enter their centers: 535 in Warsaw, 63 in Łódź, 45 in Katowice, 148 in Krakow, 212 in Wrocław. A change seems to be due and as well as a reflection on what to do with the import of diesel cars to Poland from Western Europe, especially from Germany, where they are decommissioned because of not meeting the exhaust gas standards.

The Educational Anti-Smog Network project equips schools with air quality meters, and the measurement results are made available online and presented on school displays. This enables students, teachers and the local community to monitor air quality live and plan activities accordingly. The project actively involves teachers by equipping them with the necessary knowledge and teaching materials. The city of Poznań has been very actively involved in implementing this project with as many as 160 schools joining. The total amount allocated for this purpose is about PLN 1.3 million.

Public Opinion

In 2019, nearly 45% of Poles believe that smog is a serious problem in the area where they live, with 17% calling it a very serious problem. Yet, every third Pole considers it to be a minor issue, and every fifth does not see it as a problem at all. Almost 38% of respondents check the air quality in their area during autumn and winter. However, 62% are not interested in air quality at all. Measures taken by the national and local governments are viewed in a critical light. Activities initiated by the local and national government aimed at reducing air pollution in Poland are getting very low grades from almost half of respondents[24].

Public Policies

The goal of the National Air Protection Program is to improve air quality throughout Poland, aiming to respect EU legislation and reach the objectives set by the World Health Organization by 2030[25].

The Clean Air program is a basic tool which aims to reduce or avoid the emission of dust and other pollutants released into the atmosphere by single-family houses. However, even though experts

23 M. Bukowski, J. Gąska, A. Śniegocki. Releasing Hidden Potential. Economic Impact of Investment in RES Micro Installations and Buildings Thermomodernization (Uwalniając ukryty potencjał. Gospodarczy wpływ inwestycji w mikroinstalacje OZE oraz termomodernizację budynków). WiseEuropa Institute, Warsaw, 2017

24 Poles on Smog (Polacy o smogu). Research report 33/2019. Centre for Public Opinion Research

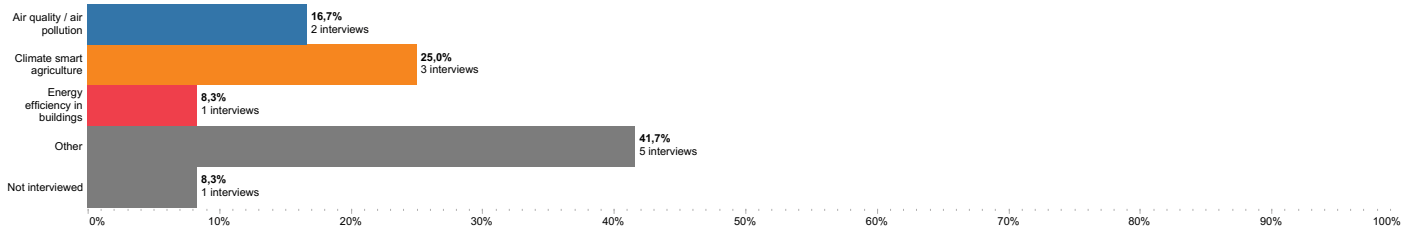
25 National Air Protection Program Until 2020 (with a perspective until 2030) (Krajowy program ochrony powietrza do 2020 (z perspektywą do 2030)). Ministry of Environment. Warsaw, 2015

estimated that 200,000 to 400,000 should be approved per year,, only 90,000 applications have been approved so far for less than a billion out of the over PLN 100 billion allocated for the implementation of this program. The program is difficult, unfriendly for beneficiaries, and, besides that, is constructed in a way that may increase the prices of low-carbon installations and thermomodernization. At the same time, NGOs point out that subsidies mostly go toward buying newer, but still polluting coal boilers. According to activists, this is not in line with EU regulations. European law allows member states to subsidize the replacement of furnaces, but only if they belong to the highest energy efficiency classes (A and A+), but there are no such boilers on the Polish market.

Facts and figures regarding the data collection process

Data collection period: 1/11/2019 - 22/11/2019
Number of initial contacts: 12
Initial distribution of contacts by gender:

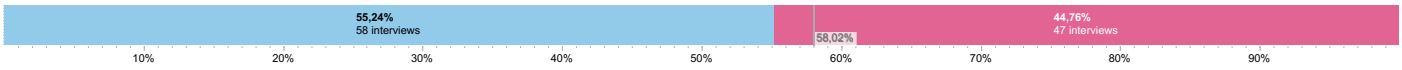
Initial distribution of contacts by thematic sector:



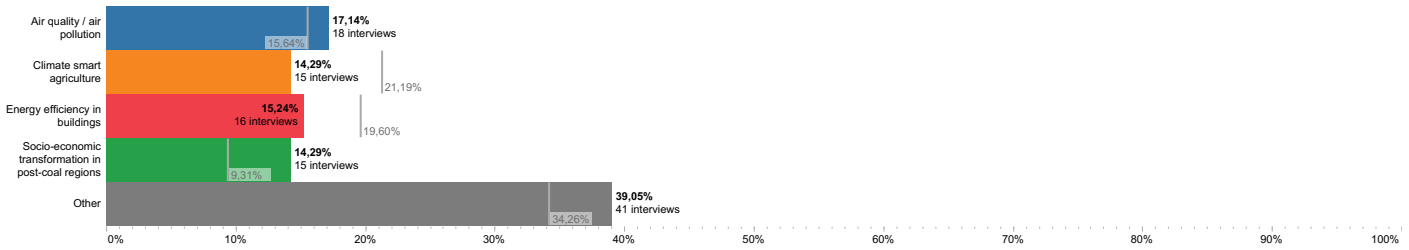
Number of contacted persons: 116
Finalised interviews: 105
Number of people not interested in participating in the study: 11
Response rate: 90.50%
Total number of nominations: 199
Total number of unique nominations: 172
Average amount of nominations by interview: 1.89

Interviewee profiles

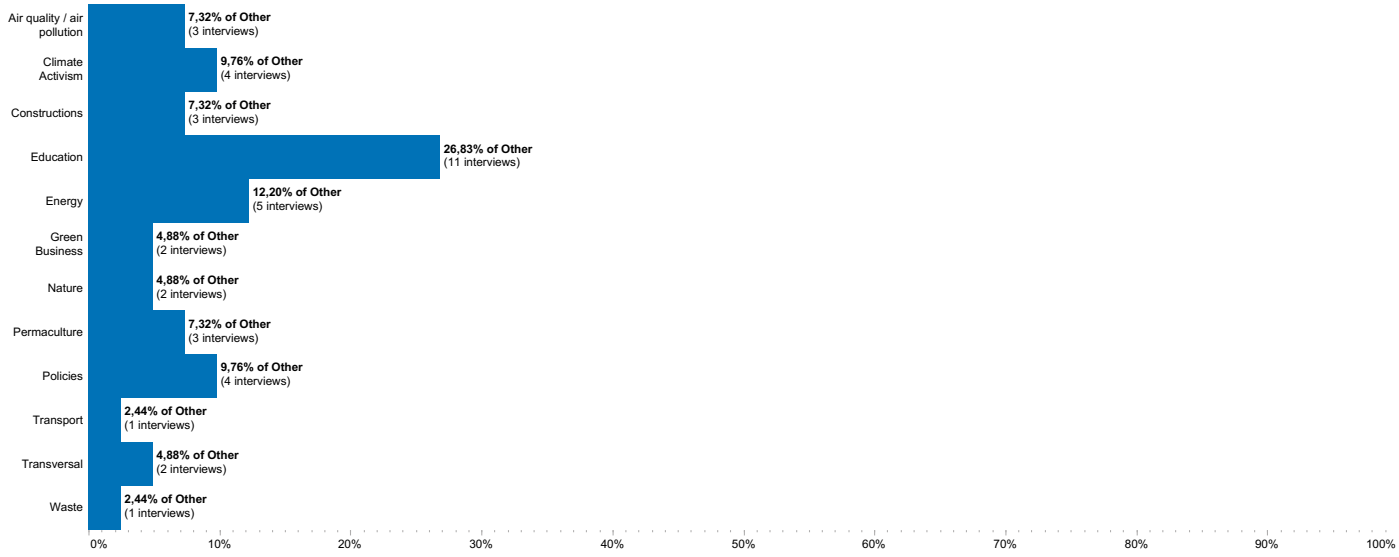
Distribution of interviewees by gender
(* data based on 105 conducted interviews)



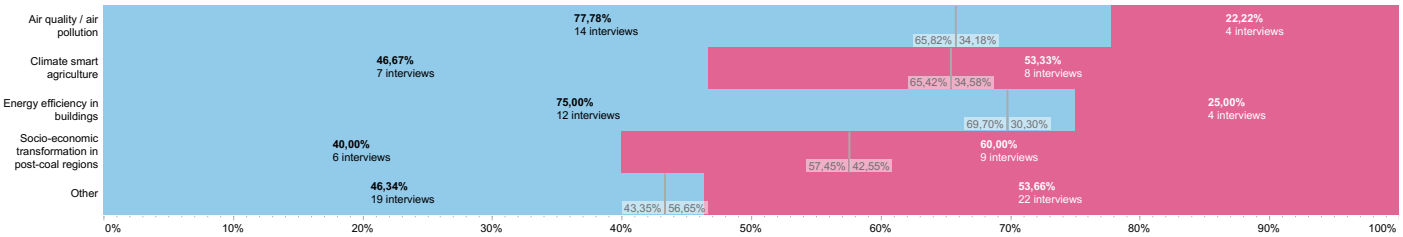
Distribution of interviewees by primary activity sector
(* data based on 105 conducted interviews)



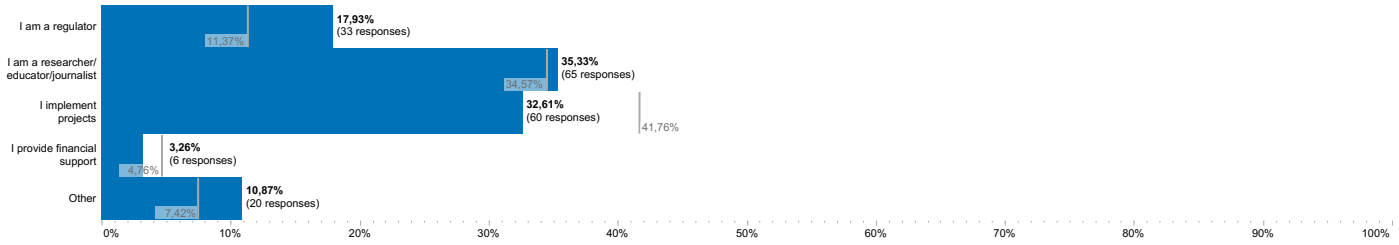
Breakdown of Other primary activity sectors
(* data based on 105 conducted interviews)



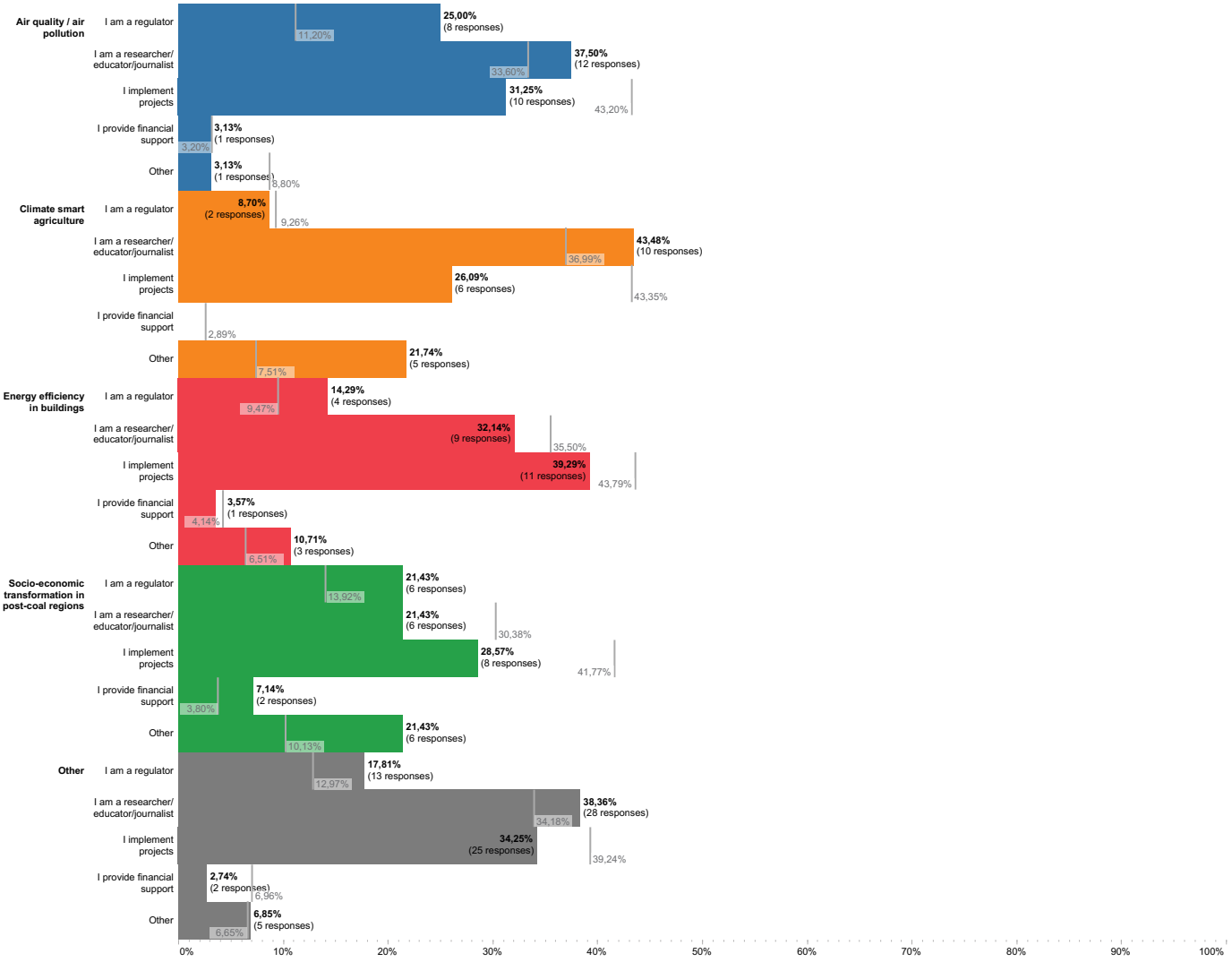
Gender distribution by primary activity sector
(* data based on 105 conducted interviews)



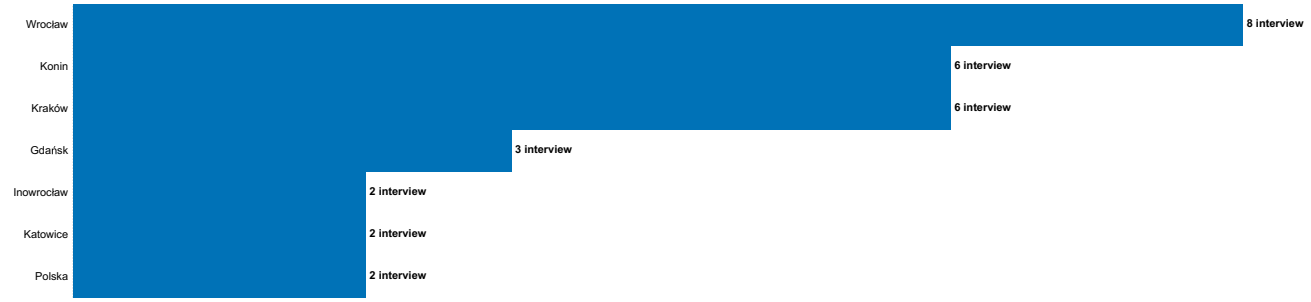
Distribution of interviewees by the type of role
(* data based on 105 conducted interviews)



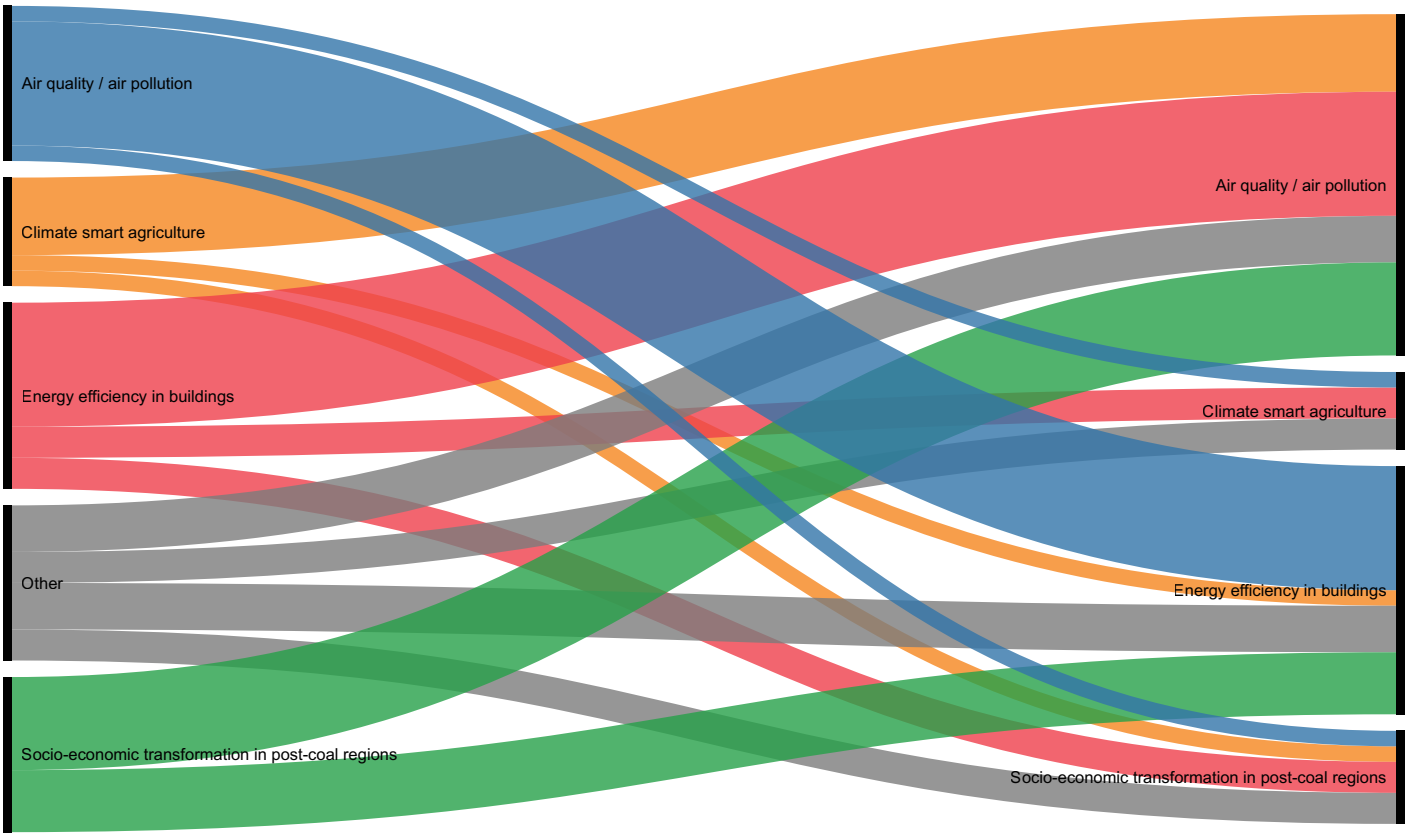
Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 105 conducted interviews)



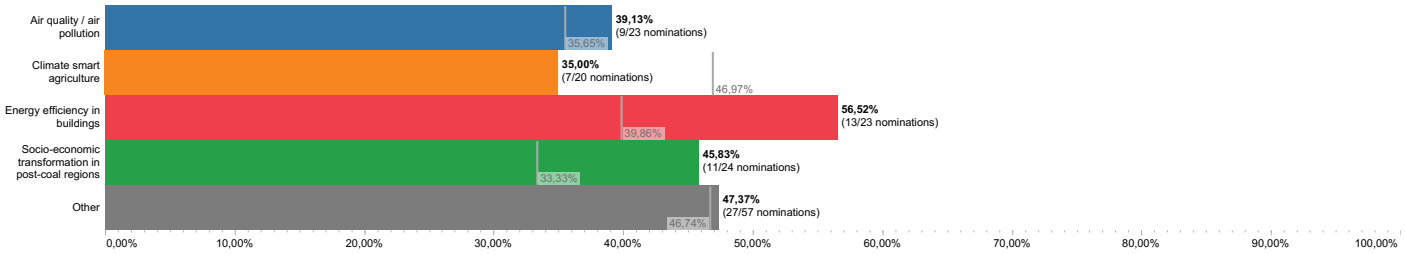
Distribution of interviews by region
(* more then 2 interviewees)



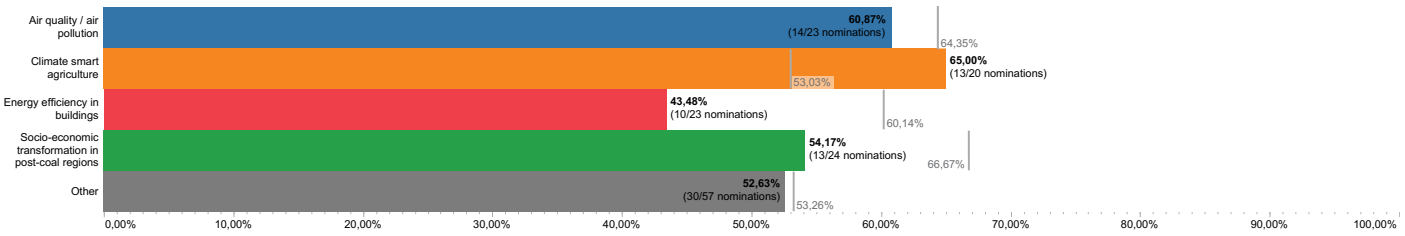
Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 105 conducted interviews)



Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 105 conducted interviews)

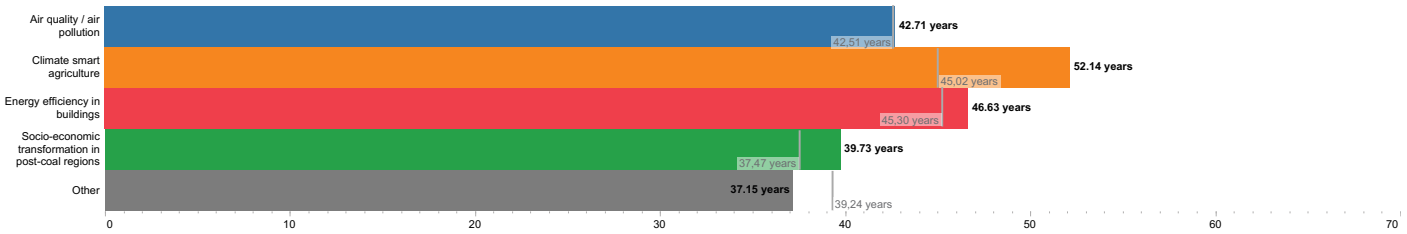


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 105 conducted interviews)

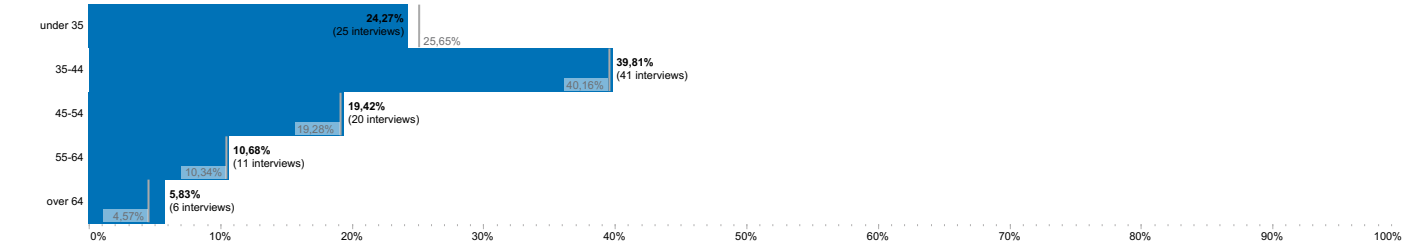


Average age of interviewees: 41.95 years (Regional average: 41.62 years)
(* data based on 105 conducted interviews)

Average age by primary activity sector
(* data based on 105 conducted interviews)



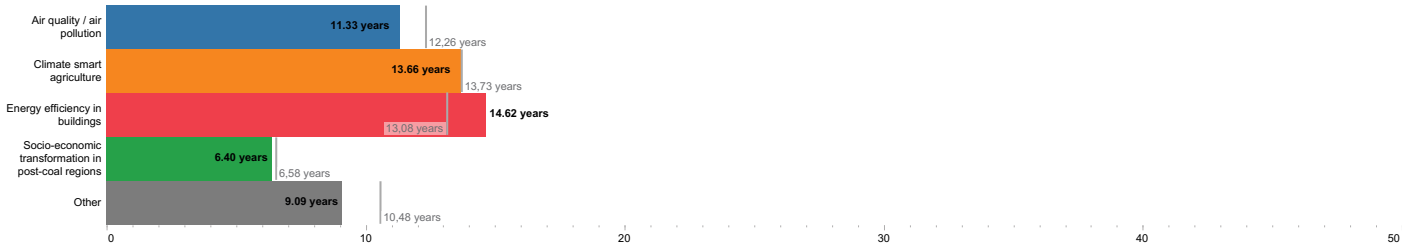
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 105 conducted interviews)



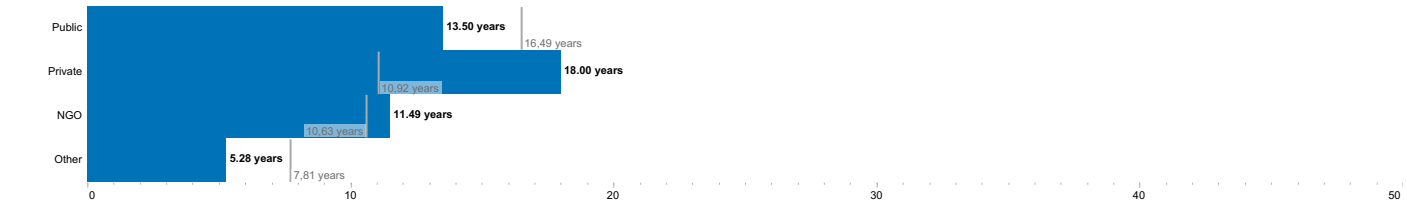
Average number of years of experience: 10.59 years (Reginal average: 11.58 years)
(* data based on 105 conducted interviews)

Average number of years of experience by gender
(* data based on 105 conducted interviews)

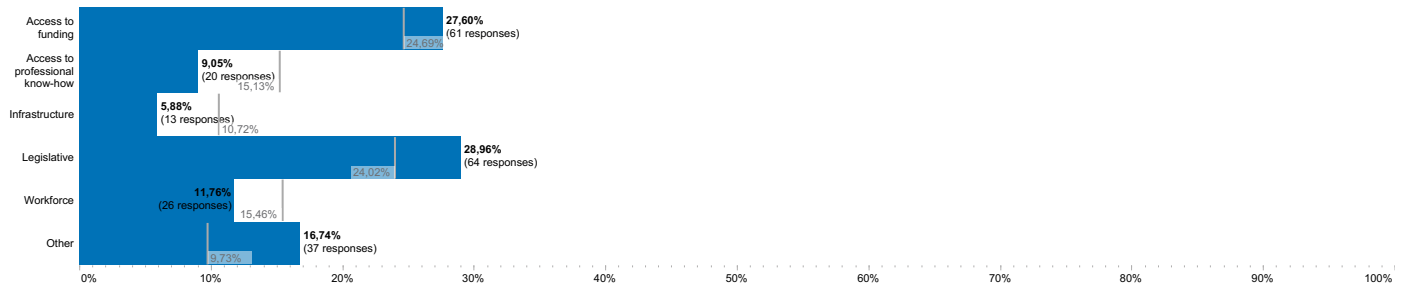
Average number of years of experience by primary activity sector
(* data based on 105 conducted interviews)



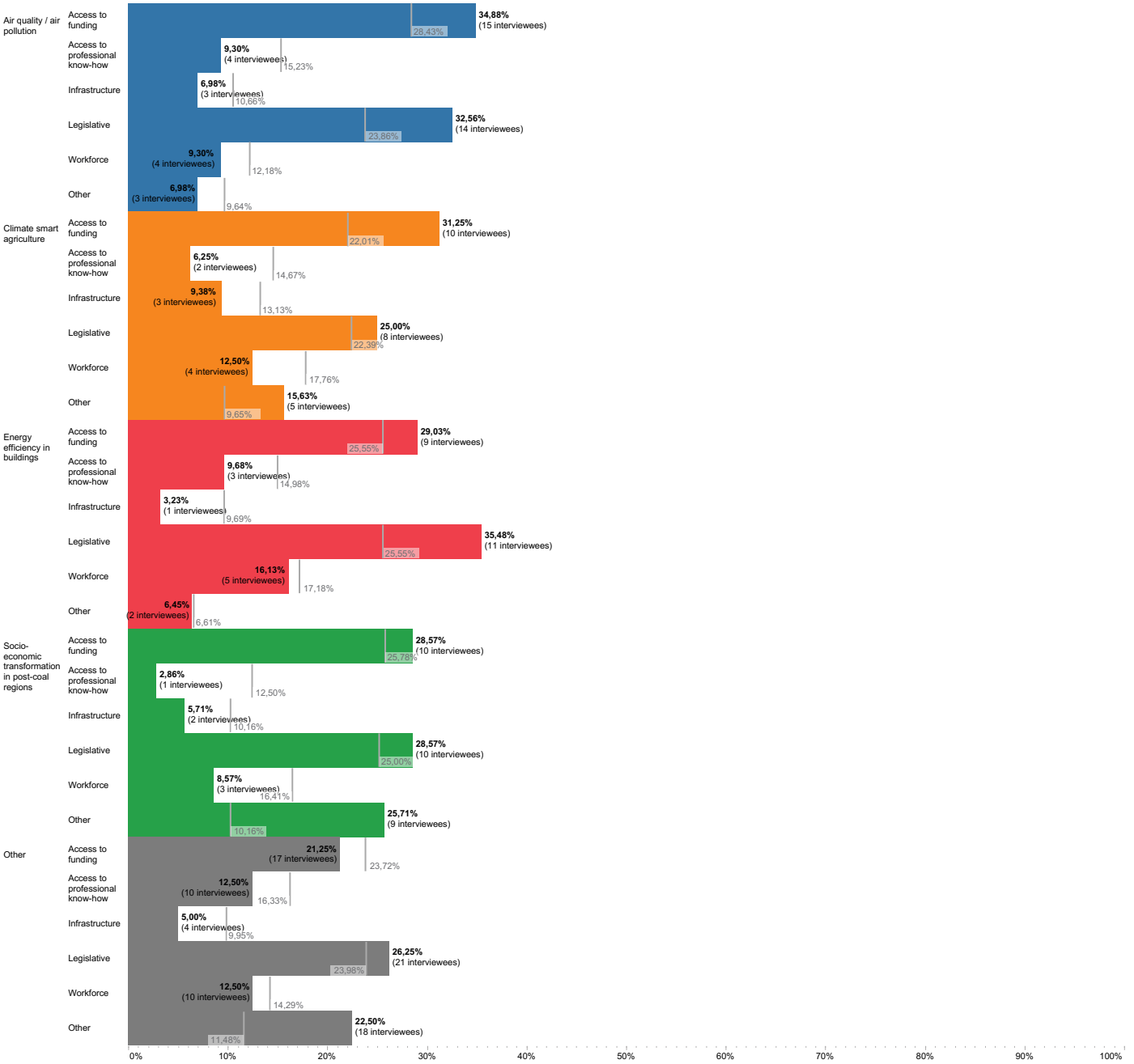
Average number of years of experience by the legal status of their member association
(* data based on 105 conducted interviews)



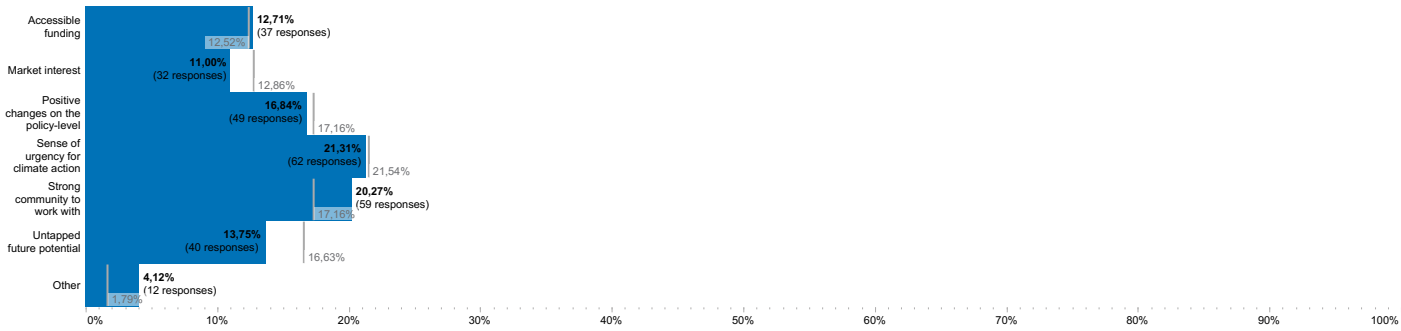
Distribution of interviewees by Barriers/Challenges category
(* data based on 105 conducted interviews)



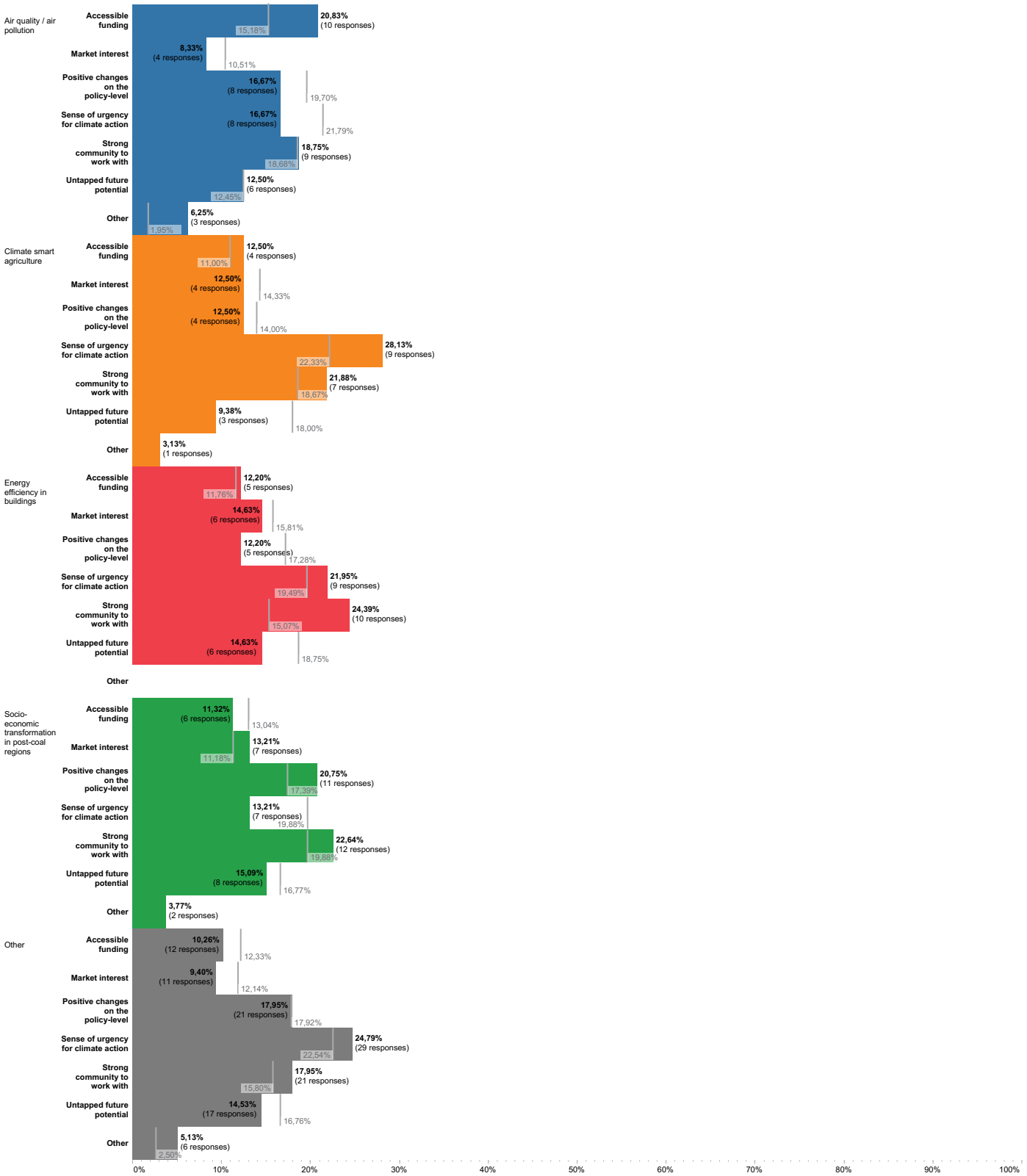
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 105 conducted interviews)



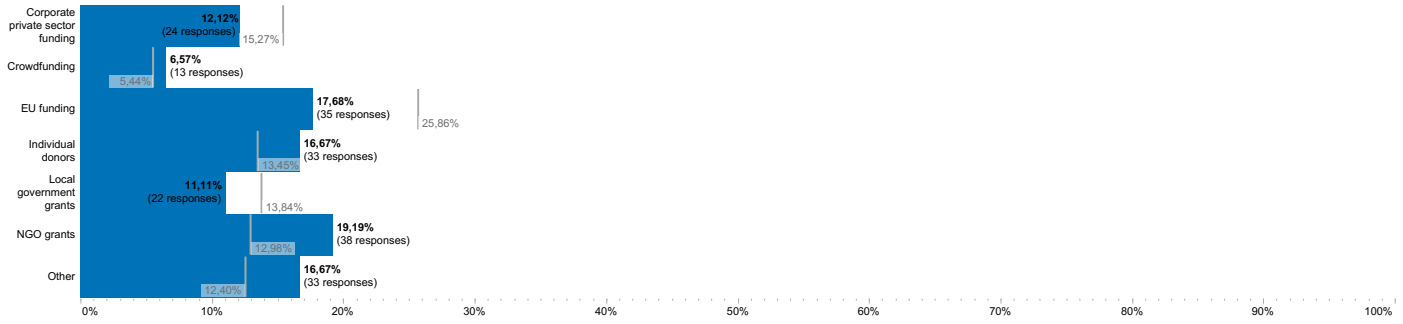
Distribution of interviewees by Opportunities category
(* data based on 105 conducted interviews)



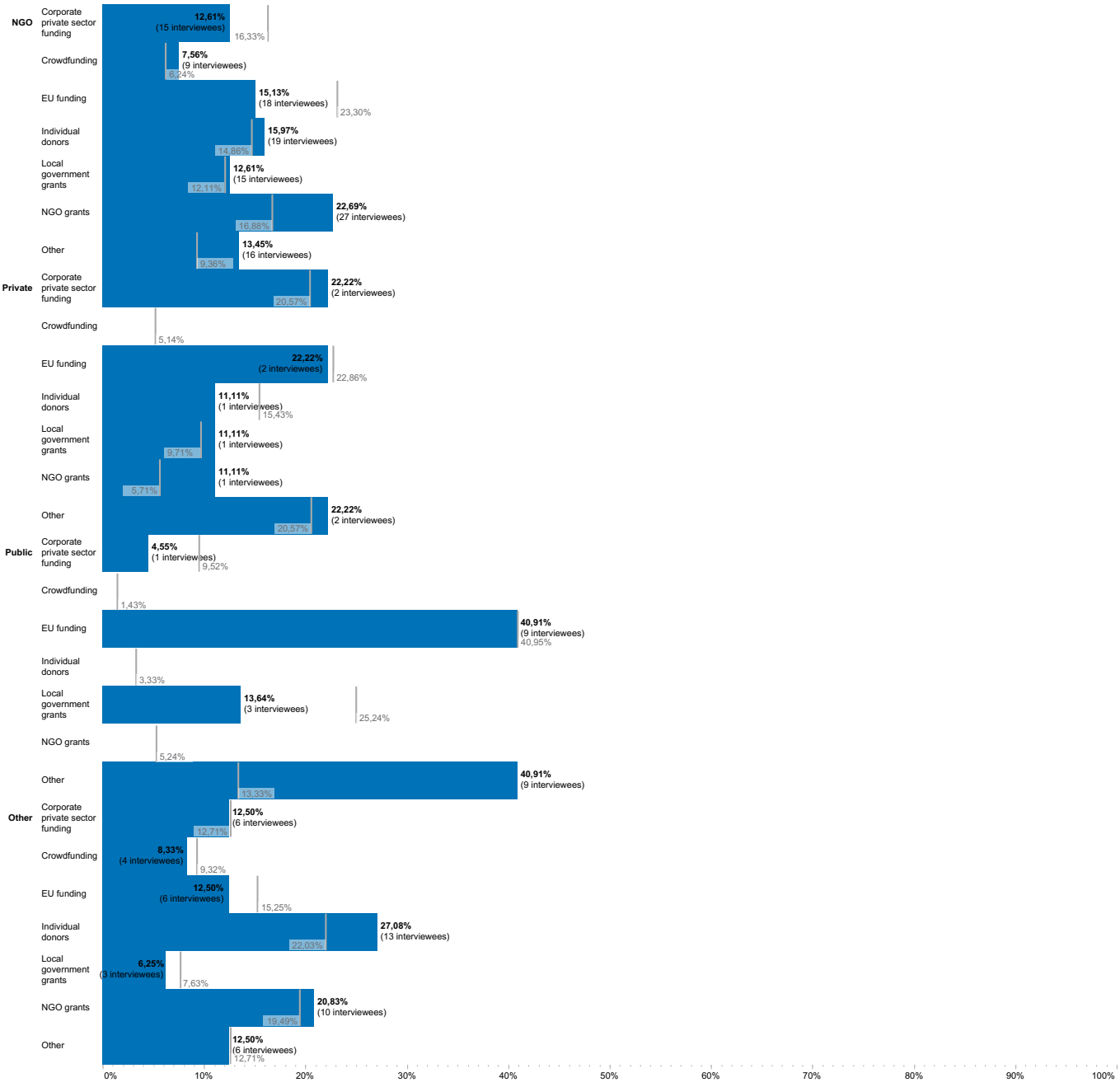
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 105 conducted interviews)



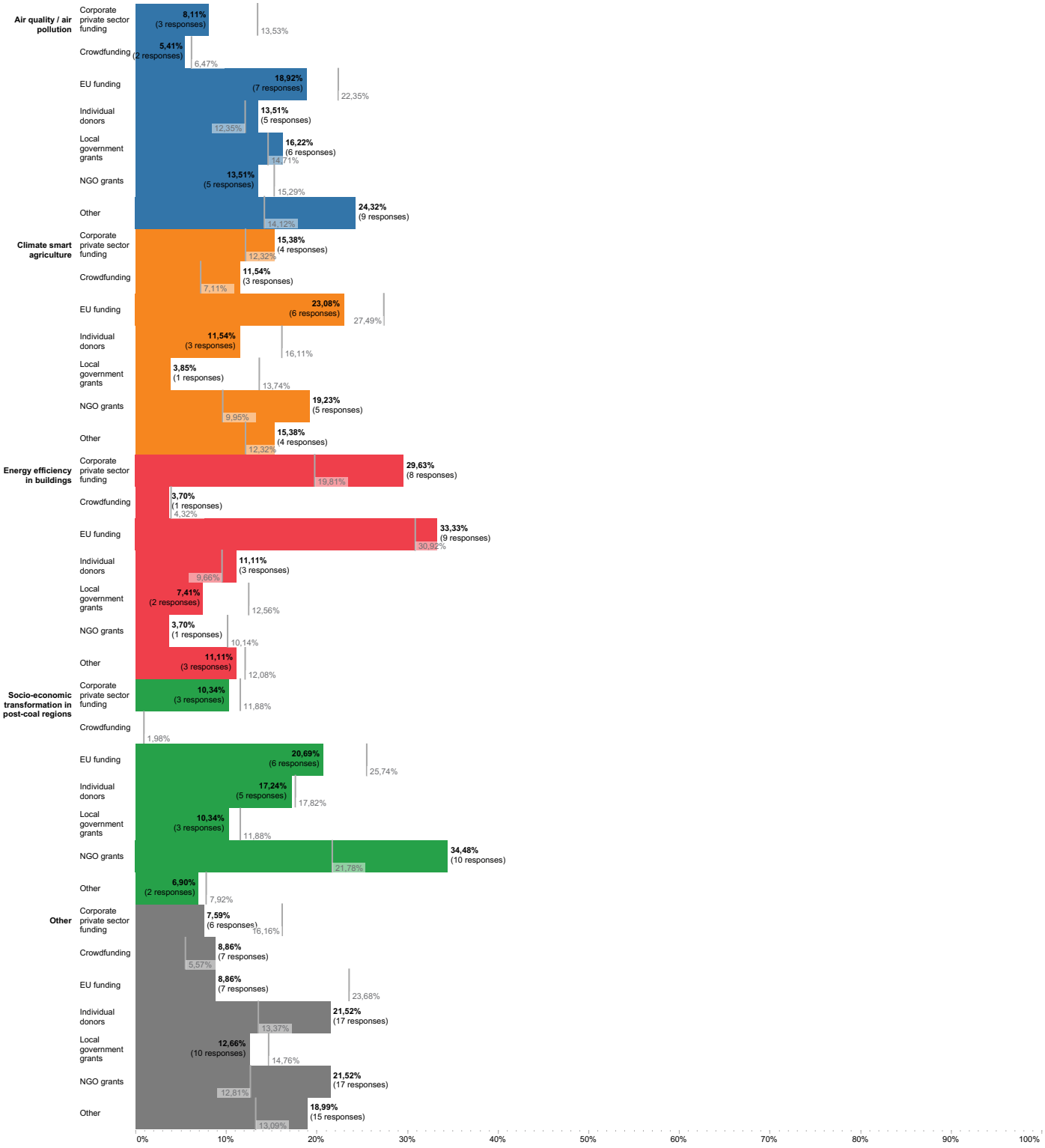
Distribution of interviewees by Funding opportunities category
(* data based on 105 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 105 conducted interviews)

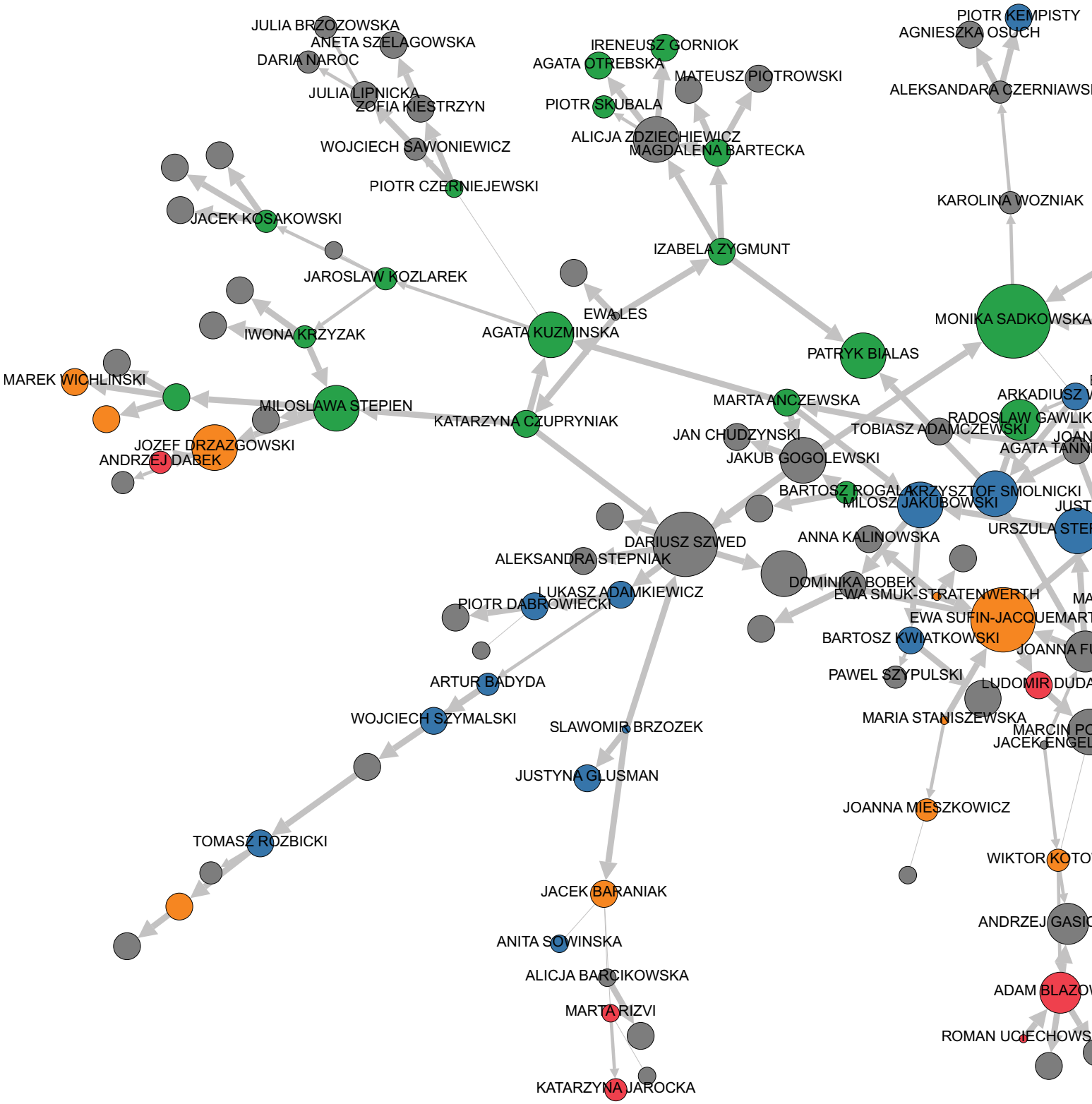


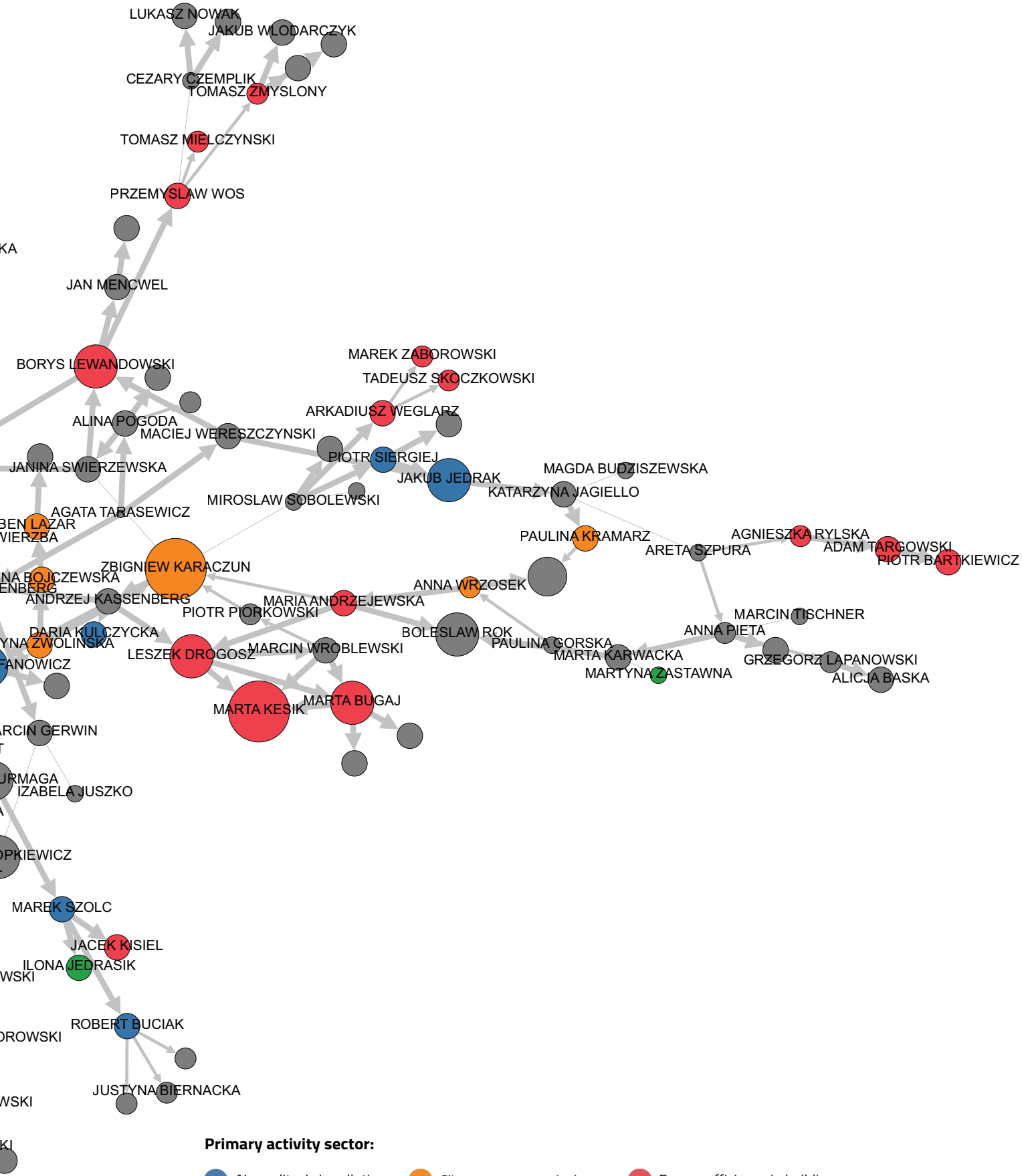
Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 105 conducted interviews)



Social network analysis

Overall social network map diagram (172 nodes / 199 edges)

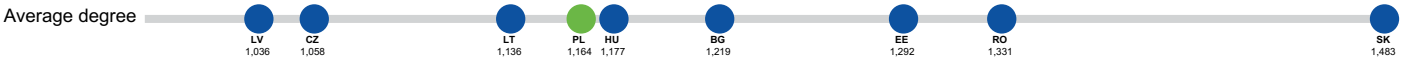



LUKASZ NOWAK
JAKUB WLODARCZYK
CEZARY CZEMPLIK
TOMASZ ZMYSLONY
TOMASZ MIELCZYNSKI
PRZEMYSLAW WOS
JAN MENCWEL
BORYS LEWANDOWSKI
MAREK ZABOROWSKI
TADEUSZ SKOCZKOWSKI
ARKADIUSZ WEGLARZ
ALINA POGODA
MACIEJ WERESZCZYNSKI
JANINA SWIERZEWSKA
PIOTR SIERGIEJ
JAKUB JEDRAK
MAGDA BUDZISZEWSKA
KATARZYNA JAGIELLO
MIROSLAW SOBOLEWSKI
AGATA TARASEWICZ
PAULINA KRAMARZ
AGNIESZKA RYLSKA
ADAM TARGOWSKI
PIOTR BARTKIEWICZ
ARETA SZPURA
ZBIGNIEW KARACZUN
ANNA WRZOSEK
ANDRZEJ KASSENBERG
MARIA ANDRZEJEWSKA
PIOTR PIORKOWSKI
MARCIN TISCHNER
ANNA PIETA
BOLESLAW ROK
PAULINA GORSKA
MARTA KARWACKA
MARTYNA ZASTAWNA
GRZEGORZ LAPANOWSKI
ALICJA BASKA
DARIA KULCZYCKA
LESZEK DROGOSZ
MARCIN WROBLEWSKI
MARTA KESIK
MARTA BUGAJ
IZABELA JUSZKO
MAREK SZOLC
JACEK KISIEL
ILONA JEDRASIK
ROBERT BUCIAK
JUSTYNA BIERNACKA
Primary activity sector:
Air quality / air pollution
Climate-smart agriculture
Energy efficiency in buildings
Socio-economic transformation in post-coal regions
Other
Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)

Social network statistics

Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals

Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

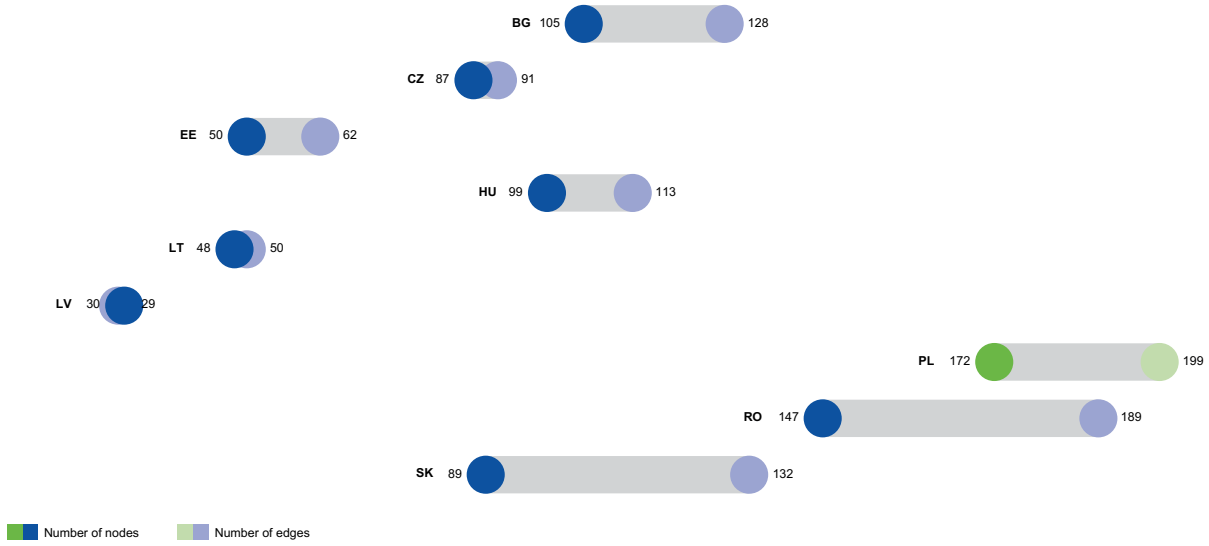
Number of discrete groups in the network

Number of nodes

Number of individuals in the network

Number of edges (links)

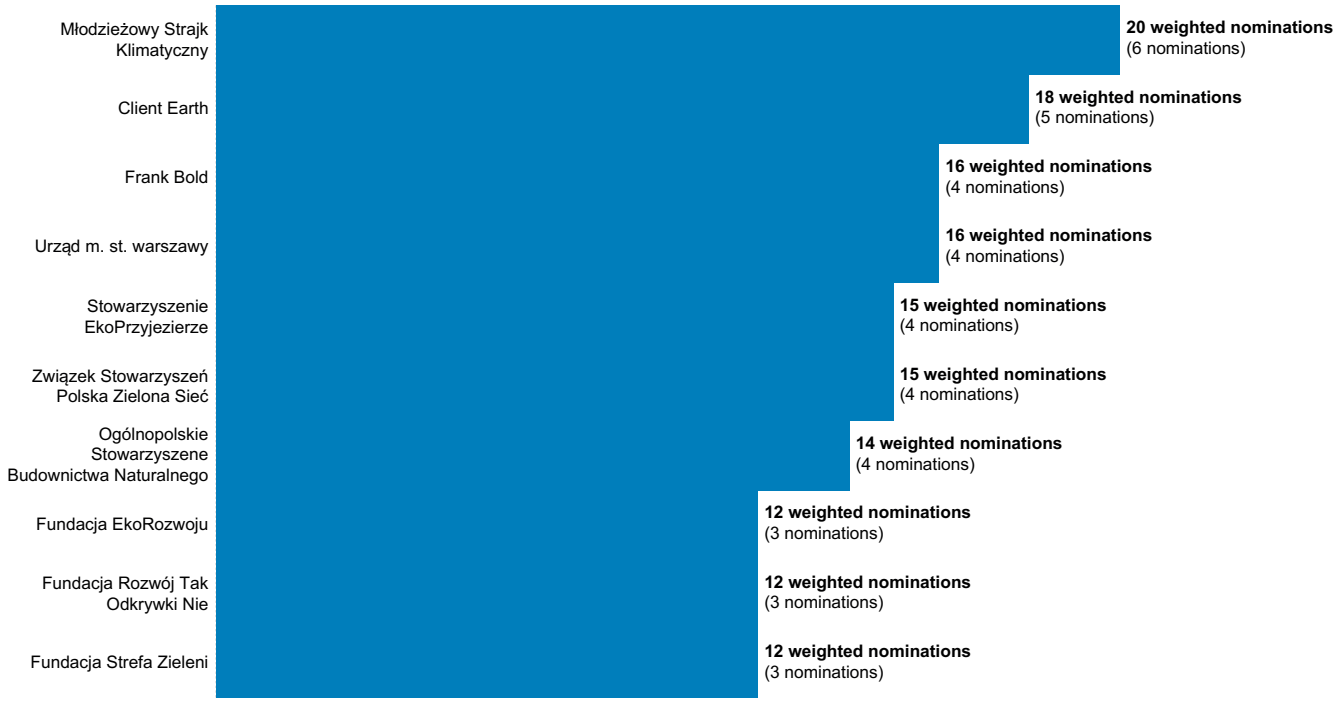
Number of relationships between individual in the network (in total)



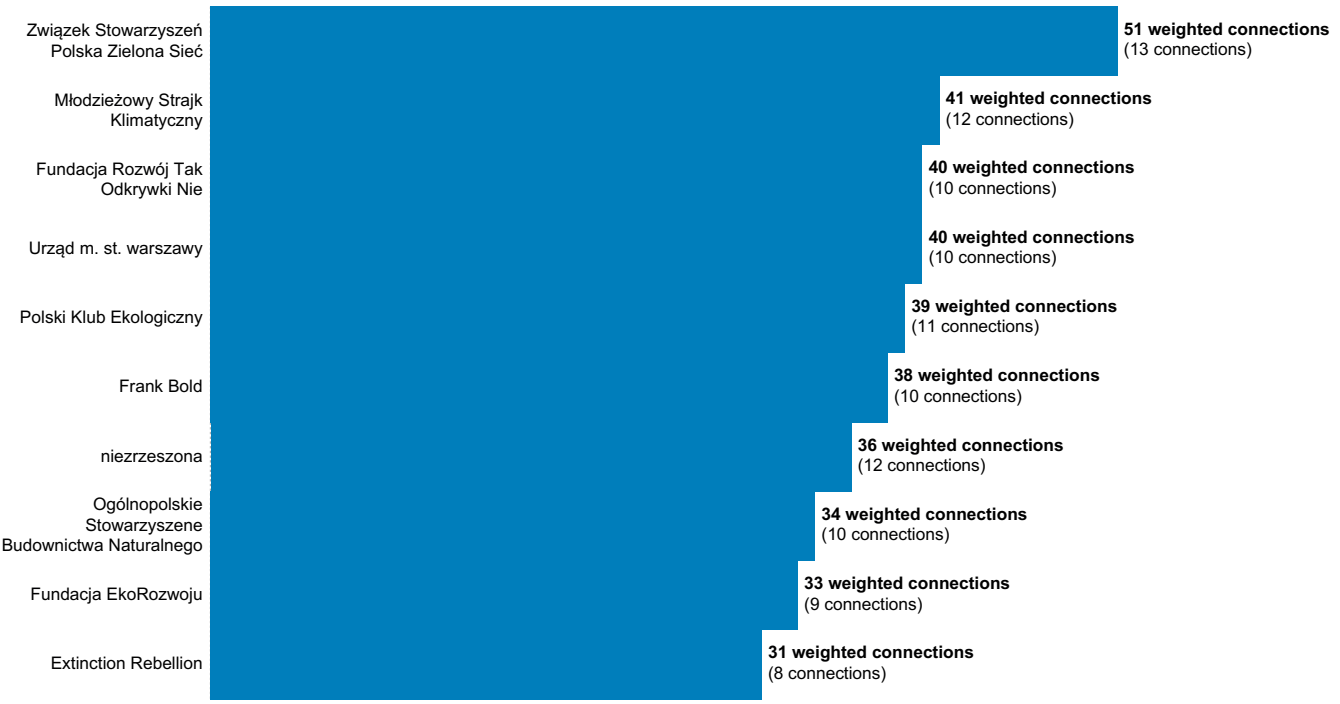
Top interviewees by the number of nominations (weighted in-degree)
(* 2 or more nominations)

Top interviewees by the overall degree (in-degree and out-degree)
(* 2 or more connections)

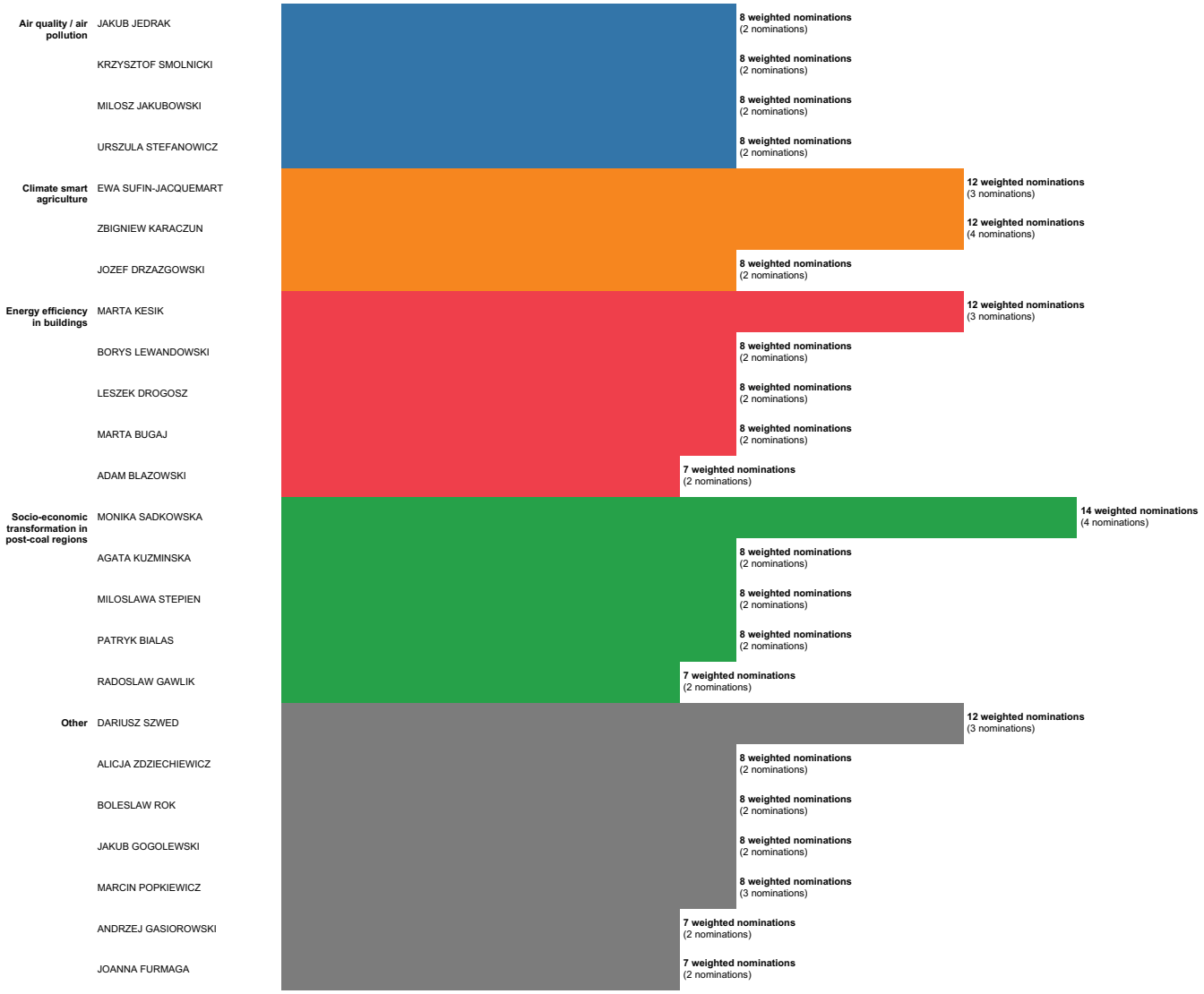
Top organisations by the number of nominations (in-degree)
(* 2 or more nominations)



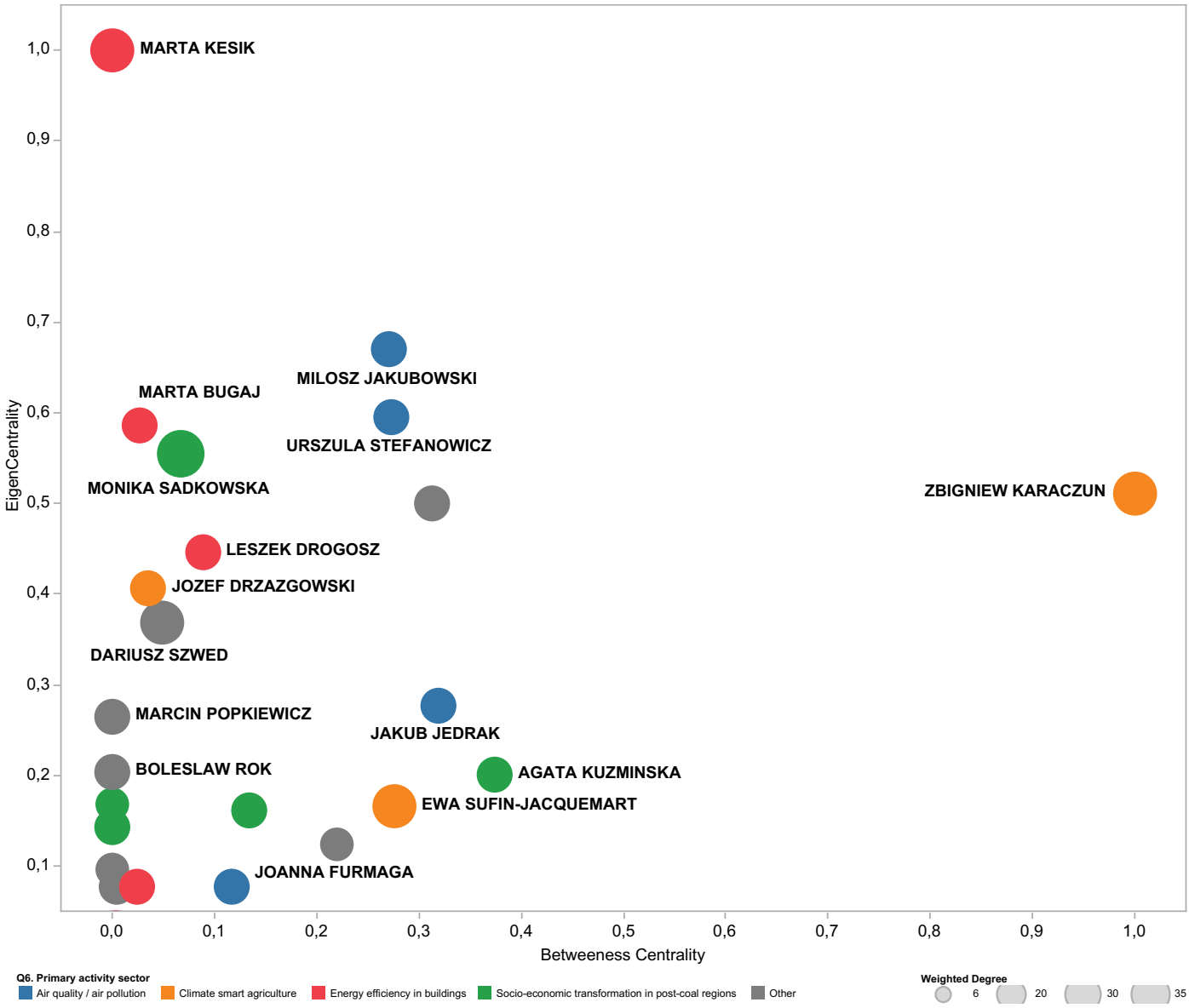
Top organisations by the overall degree (in-degree and out-degree)
(* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector (* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with 2 or more nominations)



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 7: Qualitative and Network Analysis Lithuania

Author: **Migle Grigiene**

Energy efficiency in buildings

General context

While Lithuania is committed to the EU commitment to renovate 3% of its state-owned buildings each year, 80% of the apartment buildings - which have the highest potential for energy savings - are still under renovation. According to the Lithuanian Heat Suppliers Association, renovation has gained acceleration and 500 apartment blocks are planned to be renovated every year. However, only 1,797 apartment blocks were renovated by 2017. In total, there are about 17,000 apartment buildings of this type in Lithuania, thus, if no further actions are taken, it would take more than 30 years to get all of them renovated[1].

Innovation

In regard to innovations, only public initiatives can be found in Lithuania at the moment. There are several energy efficiency awareness initiatives at present. The main program uniting such initiatives is "Green Protocol" (established by the energy company "ESO"), which has been joined by over 200 Lithuanian businesses. "ESO" organizes annual conferences and energy efficiency business awards each year[2].

"The Green Office", constructed by "Eika", is one of the winners of the "Green Protocol program" for energy efficiency. This is one of the good examples of awareness-raising that encourages the rational use of electricity in companies based in the "Eika Service Center" building. Companies are invited to join the initiative and compete on a voluntary basis to save the most electricity each month and consume the least each year (based on the office size and headcount).

Hotels also promote responsible business and energy efficiency ideas on their own initiative. "Radisson Blu Hotel Lietuva" has an eco-friendly "Green Key" status that is recognized worldwide and provide a competitive edge in attracting socially responsible travellers. The hotel started its environmentally friendly activities by doing less laundry and installing water-saving devices. The hotel also chose standby equipment and added programmable thermostats to urge users and other hotels not to waste energy[3].

In the field of energy efficiency information, the Public House Energy Saving Agency aims to assist all those involved in the apartment renovation process, supporting program administrators by developing technical tools, providing methodological material, and providing guidance to the residents. It also administers the renovation map and is the agency that has the most information about the renovation processes being undertaken in Lithuania. However, there is a focus on complete renovation, as these projects receive public funding[4].

Public opinion

In terms of public opinion, there is lack of consumer information about energy efficiency measures in buildings. People do not realize that a house is a single engineering unit, the information how much energy can be saved by installing one or another energy saving device is not accessible to the end user. In the case of savings, no clear information is provided as to what savings have been made through the implementation of one or more measures. Moreover, invoices and other information are not provided in a clear and understandable form. There is no historical comparison of energy consumption, hence, the consumer does not know what his consumption looks like compared of other consumers. Finally, people do not trust housing administrators and energy providers. Therefore, no savings have been achieved so far in the context of consumer information[5].

Meanwhile, the Lithuanian Heat Suppliers Association has a lot of public appearance advocating that not all the apartment buildings are economically profitable for a complete renovation. According to its representatives, partial renovation options must also be offered as they have quick payback and are easy to implement. Their

1 A. Kiricenko, P. Bakas. Energy efficiency promotion: outreach applying behavioural economics, 2017 [http://kurklt.lt/wp-content/uploads/2017/05/Esama-sitaucija.-10-05-2017..pdf]
2 Atsakingas verslas, "ESO" homepage [https://www.eso.lt/lt/socialine-atsakomybe_349.html?sr=RVdTSUQ9bHU3bHZrZz-J1NTNvdHVuZGhoanYwaHFycmw=]
3 Radisson Blue Hotel Lietuva homepage [https://www.radissonhotels.com/en-us/hotels/radisson-blu-vilnius-lietuva]
4 Atnaujink busta homepage [http://atnaujinkbusta.lt/apie/#page-anchor-54]
5 A. Kiricenko, P. Bakas. Energy efficiency promotion: outreach applying behavioural economics, 2017 [http://kurklt.lt/wp-content/uploads/2017/05/Esama-sitaucija.-10-05-2017..pdf]

calculations show that implementing partial modernization measures in apartment buildings would achieve all the savings set for Lithuania by 2020 by using this single measure alone, and the partial renovation can be done in just 4 hours[6]. However, there is no state funding for partial renovations yet.

Public policies

In accordance with EU directives, Lithuanian is committed to save 11,67 TWh1 of electricity energy by 2020. Hence, The Ministry of Energy has identified 7 energy efficiency policy measures that would lead to these savings. One of these measures aimed at improving energy efficiency in buildings is apartment renovation. However, after half of the commitment period, only 33.7% of mandatory energy savings were achieved.

These results were caused by the endless disagreements among the authorities regarding the key provisions of the Energy Efficiency Law, and consequently this law was passed 2 years later. Moreover, the law was only passed when the European Commission launched infringement proceedings against Lithuania. The law anticipating 7 energy efficiency measures with significant energy savings (which were set to reach 48 % of all the estimated savings) were launched 4 years later, which equals to more than a half of all the time needed to achieve the objectives of the directive. Consequently, the duration of the measures has been shortened and Lithuanian will not reach around 28% of the committed savings on time[7].

It was estimated that with the apartment renovation measure Lithuania will save 2.67 TWh. So far, this measure is the most productive and led to the largest savings. However, when calculating savings there is a significant difference between the actual consumption and the calculated savings. According to the Ministry of the Environment, this difference is caused by the fact that the energy performance of a certain buildings is assessed based on its characteristics and minimal user influence. Meanwhile, actual heat consumption depends on a variety of circumstances: consumer habits and needs, short-term environmental (weather) changes, etc. It is officially declared that the target for 2020 will be achieved, but the actual energy savings are twice as low.

Climate-smart agriculture

General context

In Lithuania the agricultural sector is the second largest sector in the Lithuanian economy and carries out very important social, environmental and ethno-cultural functions. The most important grain crop is rye, but wheat, oats, barley, millet and buckwheat are also cultivated[8]. Farmland comprises 60% of the country's territory. The country has 200.000 farms, more than 40% of which are less than 5 ha with relatively low competitiveness[9].

A study by GreenMatch has recently found that Lithuania is the country most affected by climate change in Europe. Due to the country's location in the middle latitudes and relatively close location to the Arctic, Lithuania is at the centre of climate change effects. Lithuanian farmers suffered over €90 million in damages due to extreme weather conditions in 2018 and the country's forestry services were on the highest fire hazard alert in 2019[10].

Besides that, over the last decades, the Lithuanian agricultural sector experienced a decrease in small and mid-range farms and in the number of employees working in the sector. Moreover, in recent years, the added gross value by agriculture and activities has been diminishing. Larger farms have also became a considerable challenge. Currently, 3.5% of holdings hold 50% of all the land. As big industrial farms are less prone to apply sustainable farming, precision fertilization, crop rotation and other practices, environmentally unfavourable farming practices result in reduction in crop yields due to soil erosion and degradation[11].

6 Lithuanian heat supply association homepage "https://lsta.lt/]

7 ational audit report "Energijos vartojimo efektyvumo pasiekimas", 2018

8 Agriculture in Lithuania [https://www.atostogoskaime.lt/data/ckfinder/files/Agriculture_in_Lithuania_en(1).pdf]

9 Lithiania. CAP in your country [https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/by_country/documents/cap-in-your-country-lt_en.pdf]

10 Lithuania 'at the center of climate change', article on LRT homepage [https://www.lrt.lt/en/news-in-english/19/1059338/lithuania-at-the-center-of-climate-change-crop-failures-and-extreme-weather-three-years-in-a-row]

11 Ukininkų laukia pokyčiai, article on Delfi homepage [https://www.delfi.lt/grynas/aplinka/ivertino-kaip-zemes-ukis-prisideda-prie-klimato-kaitos-ukininku-laukia-pokyciai.d?id=81871891]

Innovation

The Lithuanian Science, Innovation and Technology Agency in partnership with the Lithuanian Innovations Centre has organized an international event called "Smart digital agriculture", which aimed to connect innovators from Lithuania and abroad to introduce "AgroSpace DIH," a Lithuanian digital innovation centre[12].

Scientists from the Institute of Agricultural Engineering and Safety are working on the tillage, sowing technologies and machinery that would reduce the energy costs and environmental impact of these technological operations, as well as increase economic efficiency[13].

Moreover, scientific work has been done on precision fertilization technologies that allow to save fertilizers and to only fertilize the plants when it is necessary. These new precision farming techniques make it possible to create fertilization maps for different physical or chemical properties of the soil. The on-demand fertilization reduces the use of fertilizers, eliminates overfertilization, saves money and protects the environment[14].

Public opinion

The national authorities put a lot of efforts to communicate the reasoning behind the actions taken to mitigate climate change. Last November the Government has organized a Climate Week which included discussions on agricultural topics[15].

Nevertheless, there are still many public debates between the authorities and agricultural sector representatives on the topics concerning when to stop using certain chemicals, how to remain competitive in the market and provide the same variety of grains, the risk of increased prices and the "shadow agricultural economy"[16].

Public policy

Unlike other economic sectors the national authorities are responsible for, Lithuanian agriculture is mainly subsidized at the European level. In accordance with the new EU's Common Agricultural Policy (CAP) payment schemes, Direct Payments are to be distributed in a fairer way between Member States. The new CAP scheme includes the application of new 'Greening' rules, in order to highlight the benefits farmers provide to society as a whole on issues such as climate change, biodiversity loss and soil quality. Under this scheme, 30% of the Direct Payment envelope, paid per hectare, is linked to three environmentally-friendly farming practices: crop diversification, maintaining permanent grassland and conserving 5% of areas of ecological interest[17].

National strategic agricultural objectives for climate change mitigation as well as adaptation to climate change are set by the National Strategy for Climate Change Management, which is currently updated (the former one was adopted in 2013, aligning with Lithuanian obligations set by Paris Agreement). The new strategy will set GHG mitigation targets for Lithuanian economic sectors until 2030. Furthermore, this strategy will set medium and long-term objectives for mitigation and adaptation to climate change until 2050. A national integrated action plan on energy and climate will be developed to implement the strategy[18].

Socio-economic transformation in post-coal regions

General context

Lithuania's energy mix is dominated by fossil fuels (oil and gas). The country is becoming more and more dependent on energy imports, which is a result of decommissioning the first two units of the Ignalina nuclear power plant (in 2004 and in 2009) due to safety concerns[19].

12 https://www.15min.lt/verslas/naujiena/zemes-ukis/inovacijos-zemes-ukyje-butinybe-norint-isgyventi-313-1176508
13 Lietuviskos inovacijos moderniam zemes ukiui, MITA agency [https://mita.lrv.lt/lt/naujienos/lietuviskos-inovacijos-moderniam-zemes-ukiui]
14 Lietuviskos inovacijos moderniam zemes ukiui, MITA agency [https://mita.lrv.lt/lt/naujienos/lietuviskos-inovacijos-moderniam-zemes-ukiui]
15 Aplinkos ministerija skelbia Klimato savaitę ir kviečia į jos renginius [http://alkas.lt/2019/11/17/aplinkos-ministerija-skelbia-klimato-savaite-ir-kviecia-i-jos-renginius/]
16 Už Lietuvos nustekenimą siūlo bausti ne juokais: tai galėtų nušluoti agrooligarchus, acticle on Delfi [https://www.delfi.lt/agro/agroverslo-naujienos/uz-lietuvos-nustekenima-siulo-bausti-ne-juokais-tai-galetu-nusluoti-agrooligarchus.d?id=82326913https://www.delfi.lt/agro/agroverslo-naujienos/uz-lietuvos-nustekenima-siulo-bausti-ne-juokais-tai-galetu-nusluoti-agrooligarchus.d?id=82326913]
17 Lithiania. CAP in your country [https://ec.europa.eu/info/sites/info/files/food-farming-fisheries/by_country/documents/cap-in-your-country-lt_en.pdf]
18 Ukininkų laukia pokyčiai, article on Delfi homepage [https://www.delfi.lt/grynas/aplinka/ivertino-kaip-zemes-ukis-prisideda-prie-klimato-kaitos-ukininku-laukia-pokyciai.d?id=81871891]
19 Lithuania policy brief. Environment [https://www.oecd.org/policy-briefs/lithuania-towards-a-reduction-in-energy-inten-

The loss of Ignalina continues to impact Lithuania's energy mix. The plant provided roughly 80% of the country's power needs and enabled Vilnius to export 12 billion kilowatt-hours (kWh) of electricity in 2003 alone. Its closure transformed Lithuania from a net exporter of electricity into an importer— with no coal, oil or gas resources to fall back on.

Despite the current situation, Lithuania is among the leaders in the development of renewable energy in the EU: together with Denmark, Estonia, Spain and Portugal, it is among the five most ambitious countries in the EU to reach the renewable energy targets for 2030. By building several interconnections with the Western European electricity system, converting district heating systems to the use of biofuels, approving additional auctions for the production of solar and wind electricity and by promoting prosumer policy, Lithuania could exceed EU's overall clean energy production target by 1,5. Lithuania is projected to have 45% of its electricity coming from renewable energy sources by 2030[20].

Even though Lithuania is not a coal-dependent country, its coal imports for electricity production have been slightly increasing since 2015[21].

Innovation

One of the largest energy groups in the Baltic States "Igniti," that established the Centre for Energy Innovation, has taken a new initiative in opening its energy infrastructure by launching open datasets. Analysis and utilization of such data are expected to lead to new energy innovations and services[22].

The company's innovation strategy is based on the principle of open innovation. This strategy helped with the creation of the "Sandbox" infrastructure project from the Energy Distribution Operator "ESO", a member of the "Ignitis" group. Its main idea is to open free access for start-ups so that they could use the infrastructure available at "ESO" and test technological solutions and equipment.

Furthermore, "Ignitis" organizes "#SWITCH!," the largest technology and entrepreneurship event in the Baltic region , which hosted its fourth consecutive edition in 2019."Smart energy", a hackathon which is part of this annual event, brings together teams of programmers, designers, business developers and energy professionals to explore new ideas and develop real solutions for the new energy challenges[23].
Other than that, the Lithuanian National Energy Association has decided to establish an Innovation Committee. The Committee will promote the development of renewable energy production and integration into the energy system, energy storage systems, smart grids and other new energy technologies in Lithuania[24].

Public opinion

The public opinion about the transformation towards renewable energy is very positive. As a result, the number of electricity generating consumers in Lithuania increased by 2,5 and approached 2 thousand this year. If these numbers continue increasing, it is forecasted that in the near future there will be 10.000 consumers who have installed solar power plants. Moreover, 30% of consumers are very likely to become producers by 2030. This trend is supported by simpler regulation and financial aspects, as well as by steadily increasing trends in ecological responsibility[25].

Public policies

According to the plan drawn up by the Government in close consultation with social and economic partners, associations and the public, the planned measures will require EUR 14 billion, with possibly EUR 9.6 billion coming from public funds. Most of these funds will come from EU. Around EUR 10.8 billion will be allocated for the implementation of the national energy independence objectives and Lithuania's commitments to the EU on mitigating the impact on climate change and thereby promoting cross-sectoral technological and operational changes. The plan provides for the construction of resilient road surfaces and

sity_EN.pdf]
20 Lithuania's ambitions to combat climate change, article on Lrt [https://lrv.lt/en/news/lithuanias-ambitions-to-combat-climate-change]
21 Lithuania Coal Consumption [https://www.ceicdata.com/en/indicator/lithuania/coal-consumption]
22 "ESO" homepage [https://www.eso.lt/lt/ziniasklaida/lietuvos-energijos-inovaciju-centras-plecia-veikla-rinkai-qxqd.html]
23 24 valandu issukis: hakatonas [http://switchit.lt/24-valandu-issukis-hakatonas-energetikos-inovaciju-paieskai/]
24 Nacionaline Lietuvos energetikos asociacija [https://nlea.lt/naujienos/nlea-skatins-naujosios-energetikos-ir-inovaciju-pletra-lietuvoje/56]
25 Renewable energy in the Baltic countries, article on Delfi [https://www.delfi.lt/projektai/eko-energetika/kostas-dryzas-atsinaujinanti-energetika-baltijos-salyse-lietuva-pirmune-tarp-pirmuniu.d?id=82220923]

projects for the resilience of electricity distribution infrastructure and rainwater management[26].

Air pollution

General context

Although Lithuania enjoys a relatively good quality of air, the levels of Particulate Matter are a cause of concern, thus indicating that there are still serious challenges to be faced. 2017 data from the European Environment Agency reveal that the annual average level of PM 2,5 emissions in Lithuania exceeds the EU average. This results in 3,350 premature deaths each year. However, the political will of the national government to reduce the level of emissions is not enough to tackle air pollution, as the pollutants might reach Lithuania from the neighbouring countries. For example, Poland, Lithuania's biggest neighbour, has 33 out of 50 of the most polluted cities in Europe, according to the World Health Organization's Global Urban Ambient Air Pollution Database 2016. According to 2017 Eurostat statistics, 34,1% of Lithuanians are vulnerable to the effects of poor air quality, a figure which will only rise as the Lithuanian population continues to age[27].

Innovation

Although Lithuania is considered to be the fastest growing European innovator, its eco-innovation performance still remains way below the EU average. A targeted approach and policy measures, as well as more funding, could help Lithuania further boost its eco-innovation performance and resource productivity[28]. Nevertheless, air pollution abatement technologies are developed mostly by the scientists such as the Lithuanian professors E. Baltrėnaitė and P. Baltrėnas, who created a biofilter with a biologically activated substance designed to clean the air polluted with chemical pollutants[29].Assoc. R. Bleizgys states that one of the most important problems of air pollution is ammonia emission. These are the main gases that acidify precipitation and, thus, damage the entire ecosystem. Animal husbandry accounts for about 90% of total ammonia emissions to the environment. Therefore, R. Bleizgys and his team created environmentally friendly stocking technologies based on slower evaporation of ammonia using a variety of biological agents (probiotics, coatings, etc.)[30].

Public opinion

According to experts, information on air quality in Lithuania is sufficient, but a large part of the public is simply not interested in it[31]. In accordance with the conventions of the EU, the public must be constantly informed about environmental changes[32]. That information is collected and published on the ongoing basis. However, no public debates over the issue were found online.

Public policies

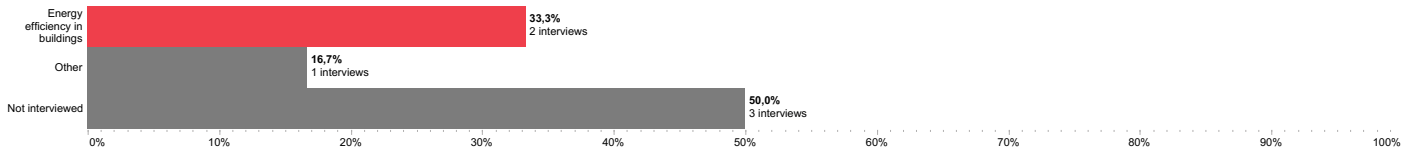
In 2019 the Lithuanian government has approved he National Air Pollution Control Plan to reduce air pollution. If the plan gets approved by the European Commission, the targets will have to be met by 2030. Lithuania does not plan to introduce any taxes on polluting cars. Instead, drivers will be incentivized to buy cleaner cars with cash payments of EUR 1,000. Additional measures will encourage people to use public transport or share rides. The plan also envisages large payments to Lithuania's major cities for cutting diesel fuel emissions. The local governments will be encouraged to ban diesel car traffic in city centers or at least limit it to some days or hours. The cities will also receive subsidies to exchange diesel-powered public buses with electric ones. The clean air plan also targets the cargo industry. It proposes a new road tax system where lorries will no longer be able to buy seasonal permits, but will pay according to the distance travelled on Lithuanian roads. Moreover, Lithuania will fight air pollution by planting more trees alongside high-traffic roads[33].

26 Lithuania's ambitions to combat climate change, article on Lrt [https://lrv.lt/en/news/lithuanias-ambitions-to-combat-climate-change]
27 Lithuania: air pollution and growing inequalities [https://epha.org/lithuania-air-pollution-and-growing-inequalities/]
28 The Environmental Implementation Review 2019 [https://ec.europa.eu/environment/eir/pdf/report_lt_en.pdf]
29 Air pollution and innovations [https://www.15min.lt/verslas/naujiena/geronomika/oro-tarsos-mazinimo-in-ovacijos-nuo-technologiju-karviu-fermoms-iki-biofilt-ru-129-505626]
30 Air pollution and innovations [https://www.15min.lt/verslas/naujiena/geronomika/oro-tarsos-mazinimo-in-ovacijos-nuo-technologiju-karviu-fermoms-iki-biofilt-ru-129-505626]
31 Air pollution is increasing in certain regions [https://www.lrt.lt/naujienos/lietuvoje/2/1052312/oro-tarsa-lietuvoje-ne-tik-nemazeja-bet-ir-auga-keliuose-regionuose-labai-aukstas-lygis]
32 Air pollution effects for health [https://www.lrt.lt/naujienos/mokslas-ir-it/11/1111668/sveikata-luosinanti-oro-tarsa-kaip-ji-yra-nustatoma-ir-ka-padaro-musu-organizmui]
33 Lithuania approves a plan to cut air pollution [https://www.lrt.lt/en/news-in-english/19/1050320/lithuania-approves-plan-to-cut-air-pollution]

Facts and figures regarding the data collection process

Data collection period: 6/11/2019 - 6/12/2019
Number of initial contacts: 6
Initial distribution of contacts by gender:

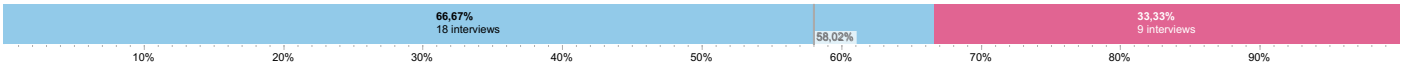
Initial distribution of contacts by thematic sector:



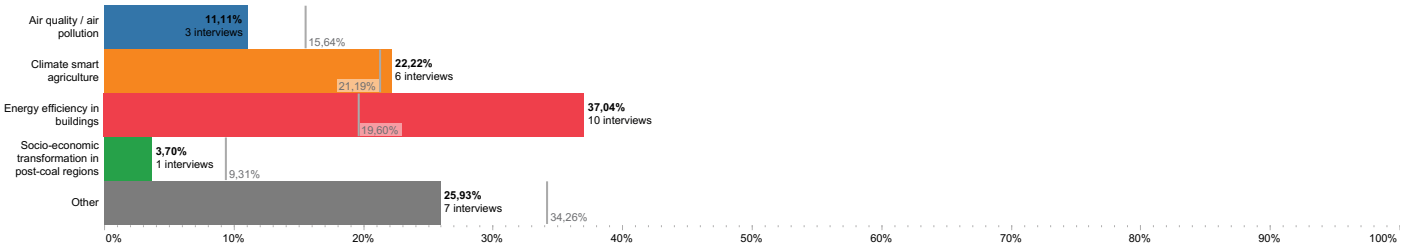
Number of contacted persons: 31
Finalised interviews: 26
Number of people not interested in participating in the study: 5
Response rate: 83.8%
Total number of nominations: 50
Total number of unique nominations: 48
Average amount of nominations by interview: 1.64

Interviewee profiles

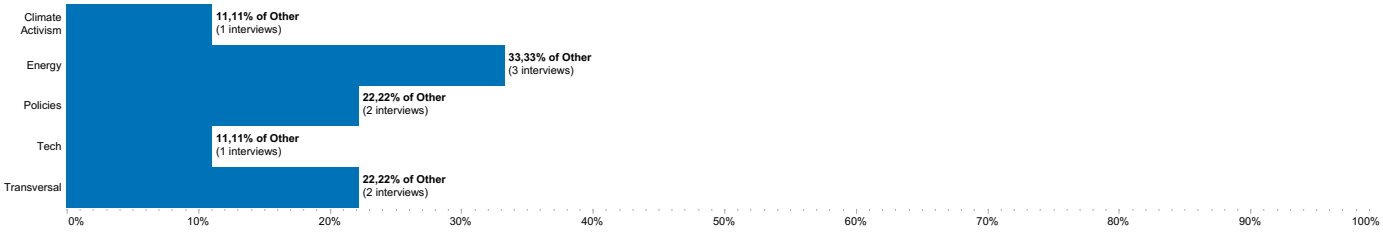
Distribution of interviewees by gender
(* data based on 26 conducted interviews)



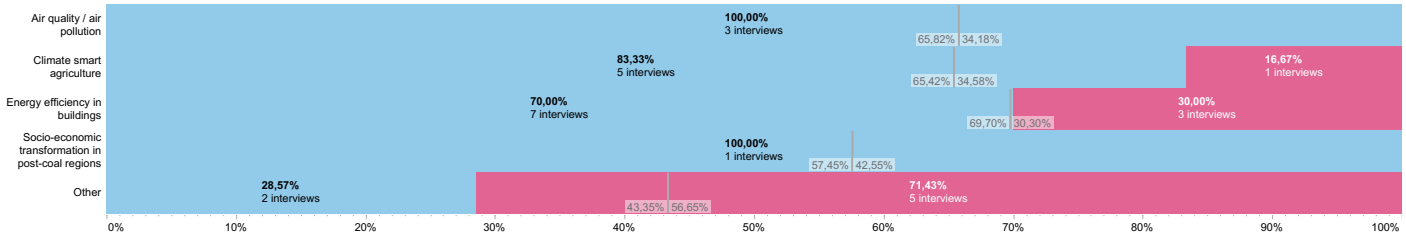
Distribution of interviewees by primary activity sector
(* data based on 26 conducted interviews)



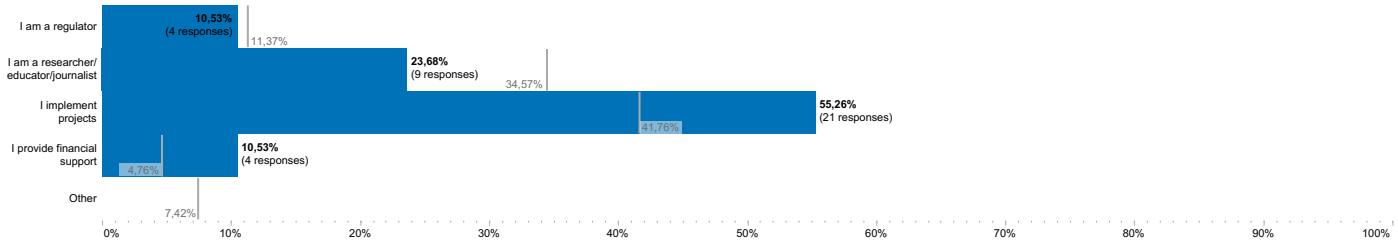
Breakdown of Other primary activity sectors
(* data based on 26 conducted interviews)



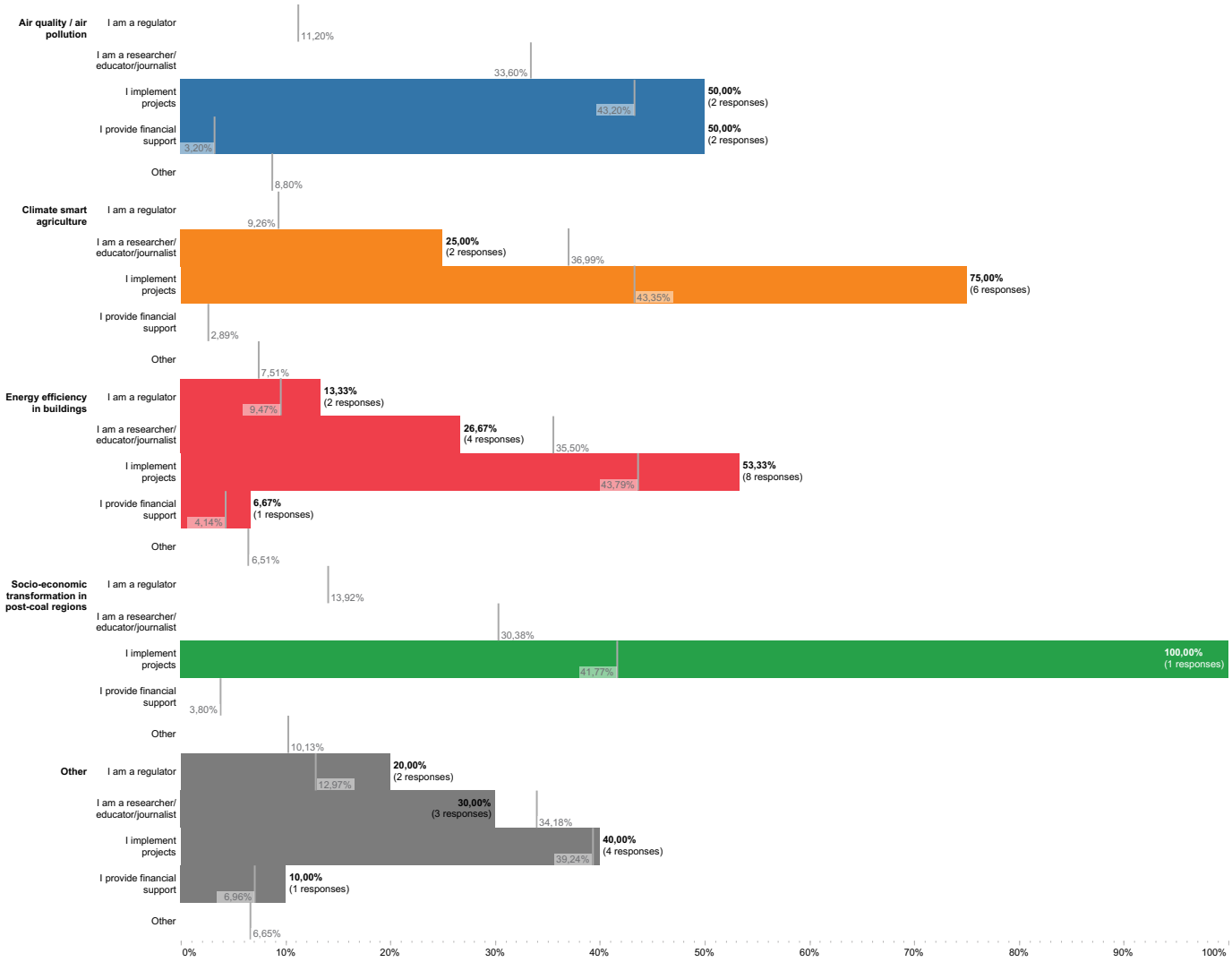
Gender distribution by primary activity sector
(* data based on 26 conducted interviews)



Distribution of interviewees by the type of role
(* data based on 26 conducted interviews)



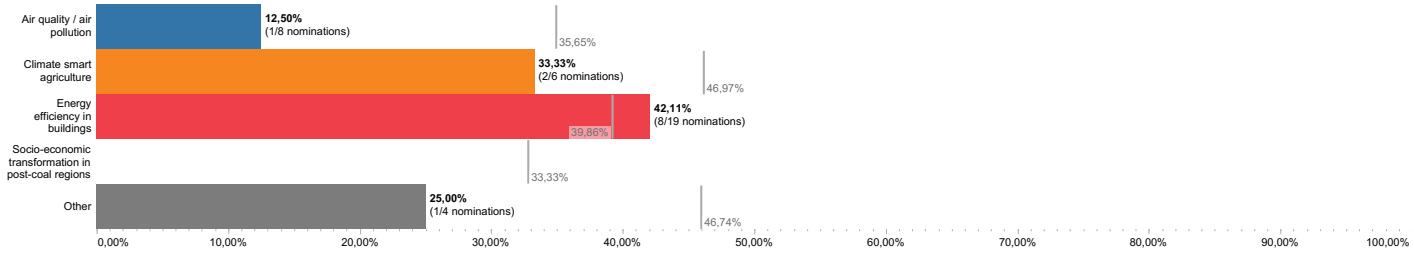
Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 26 conducted interviews)



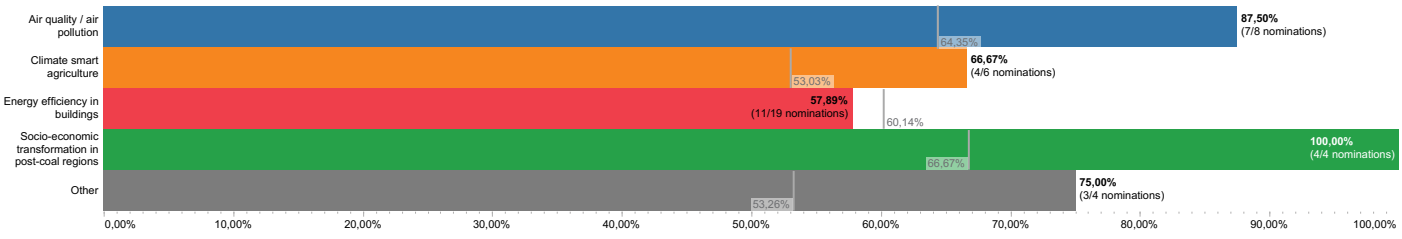
Distribution of interviews by region
(* more then 2 interviewees)

Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 26 conducted interviews)

Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 26 conducted interviews)

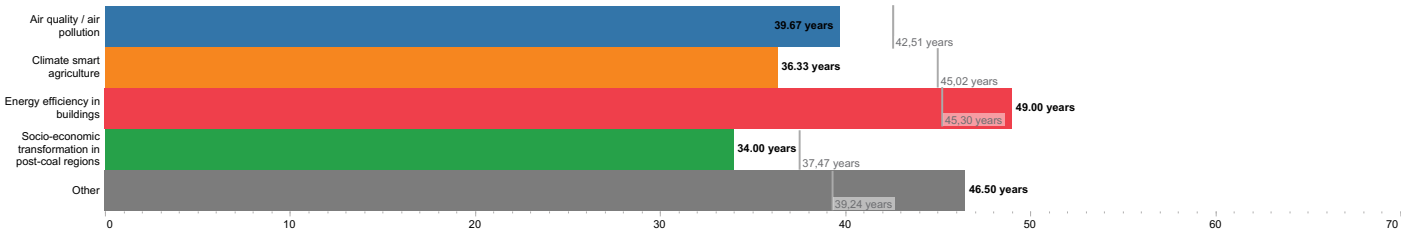


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 26 conducted interviews)

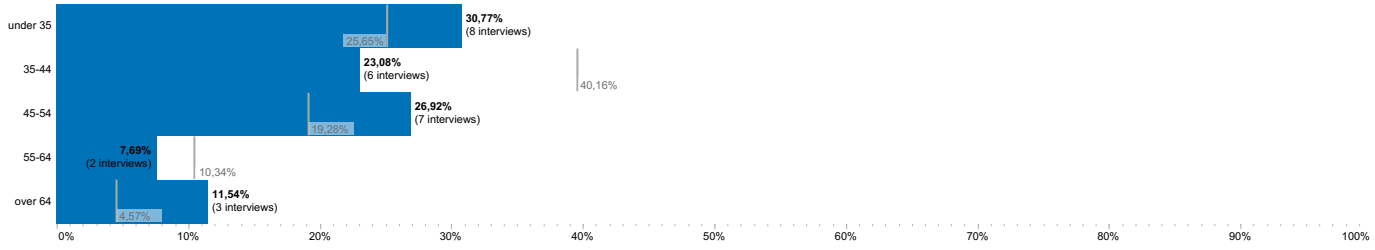


Average age of interviewees: 43.85 years (Regional average: 41.62 years)
(* data based on 26 conducted interviews)

Average age by primary activity sector
(* data based on 26 conducted interviews)



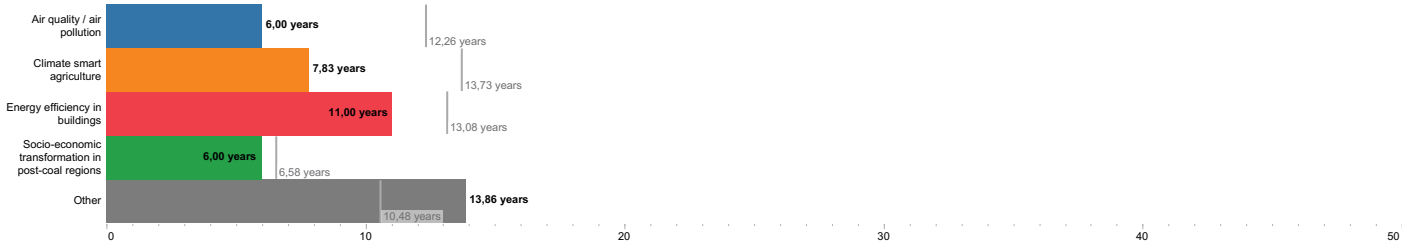
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 26 conducted interviews)



Average number of years of experience: 10.30 years (Reginal average: 11.58 years)
(* data based on 26 conducted interviews)

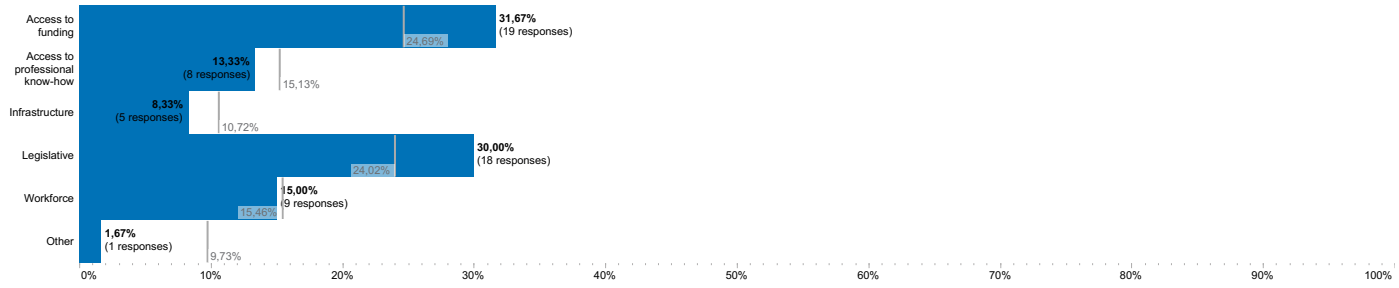
Average number of years of experience by gender
(* data based on 26 conducted interviews)

Average number of years of experience by primary activity sector
(* data based on 26 conducted interviews)

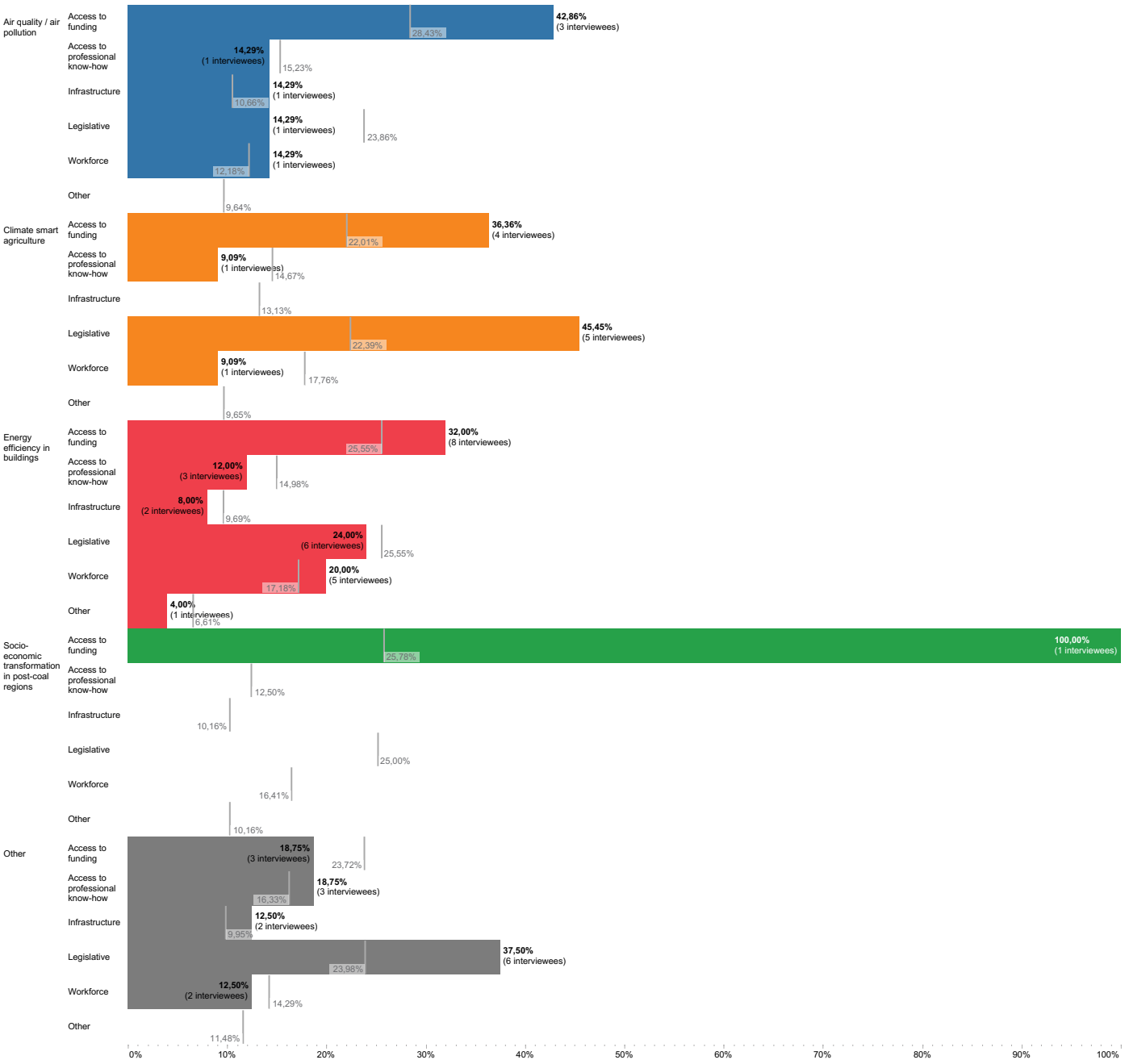


Average number of years of experience by the legal status of their member association
(* data based on 26 conducted interviews)

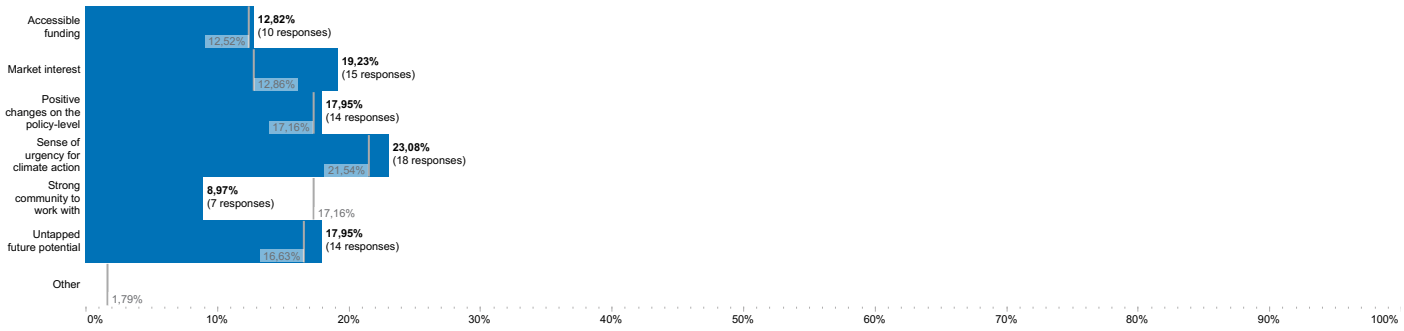
Distribution of interviewees by Barriers/Challenges category
(* data based on 26 conducted interviews)



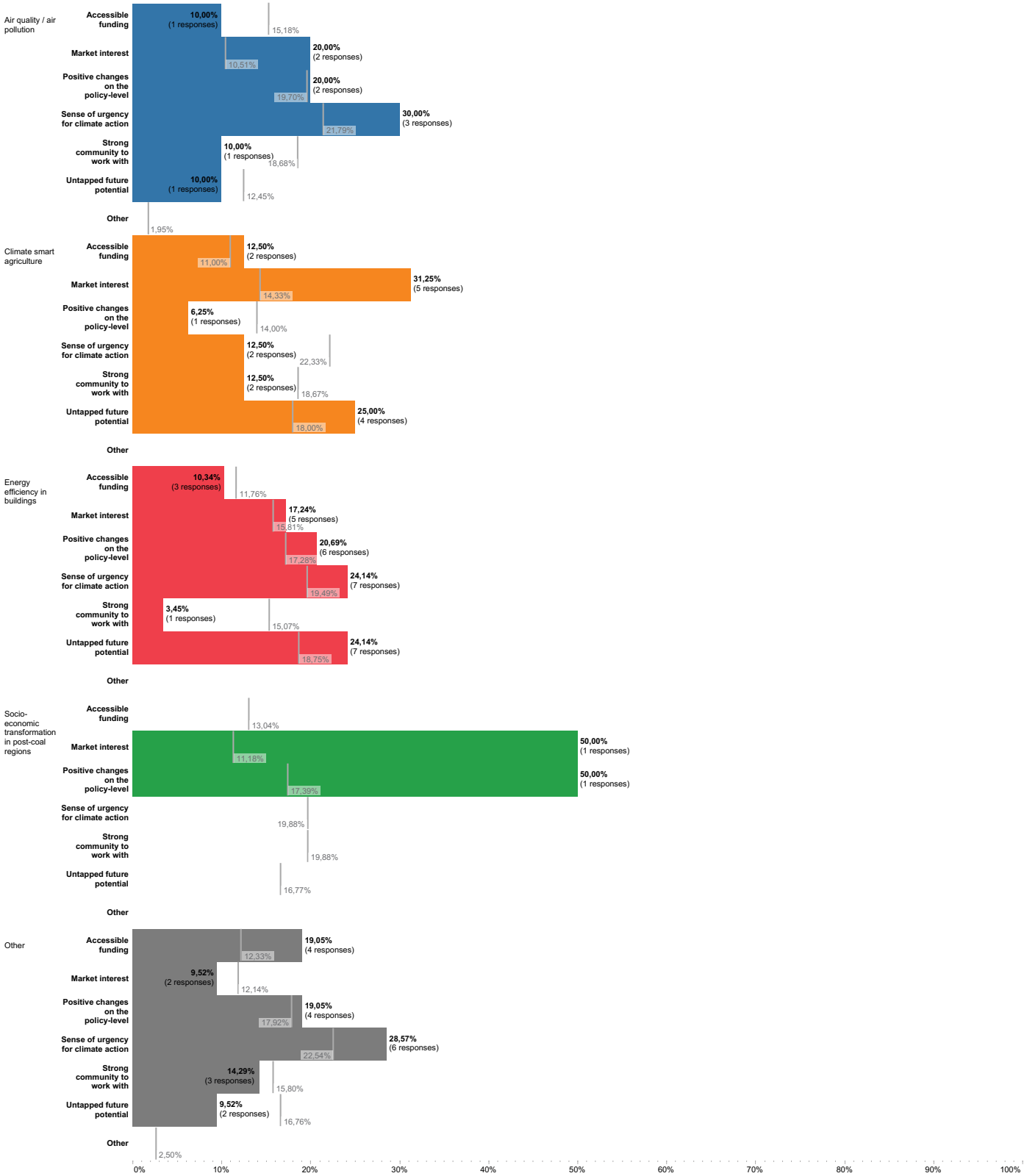
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 26 conducted interviews)



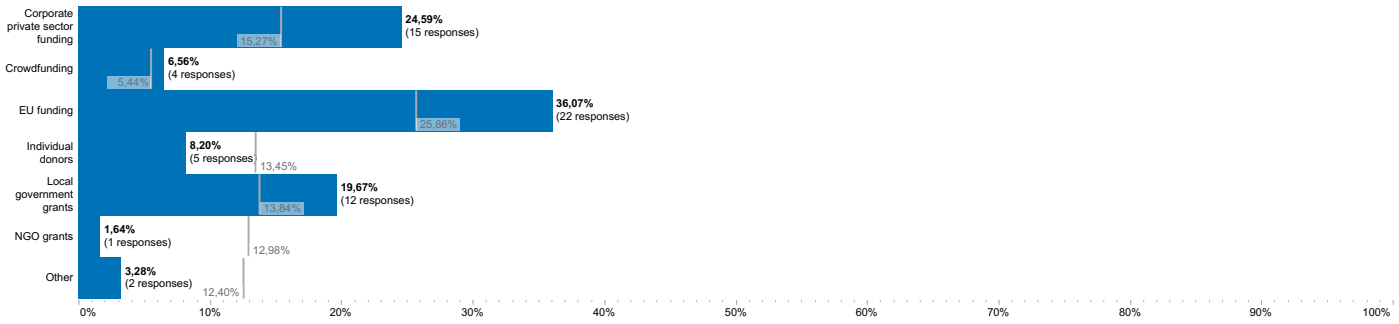
Distribution of interviewees by Opportunities category
(* data based on 26 conducted interviews)



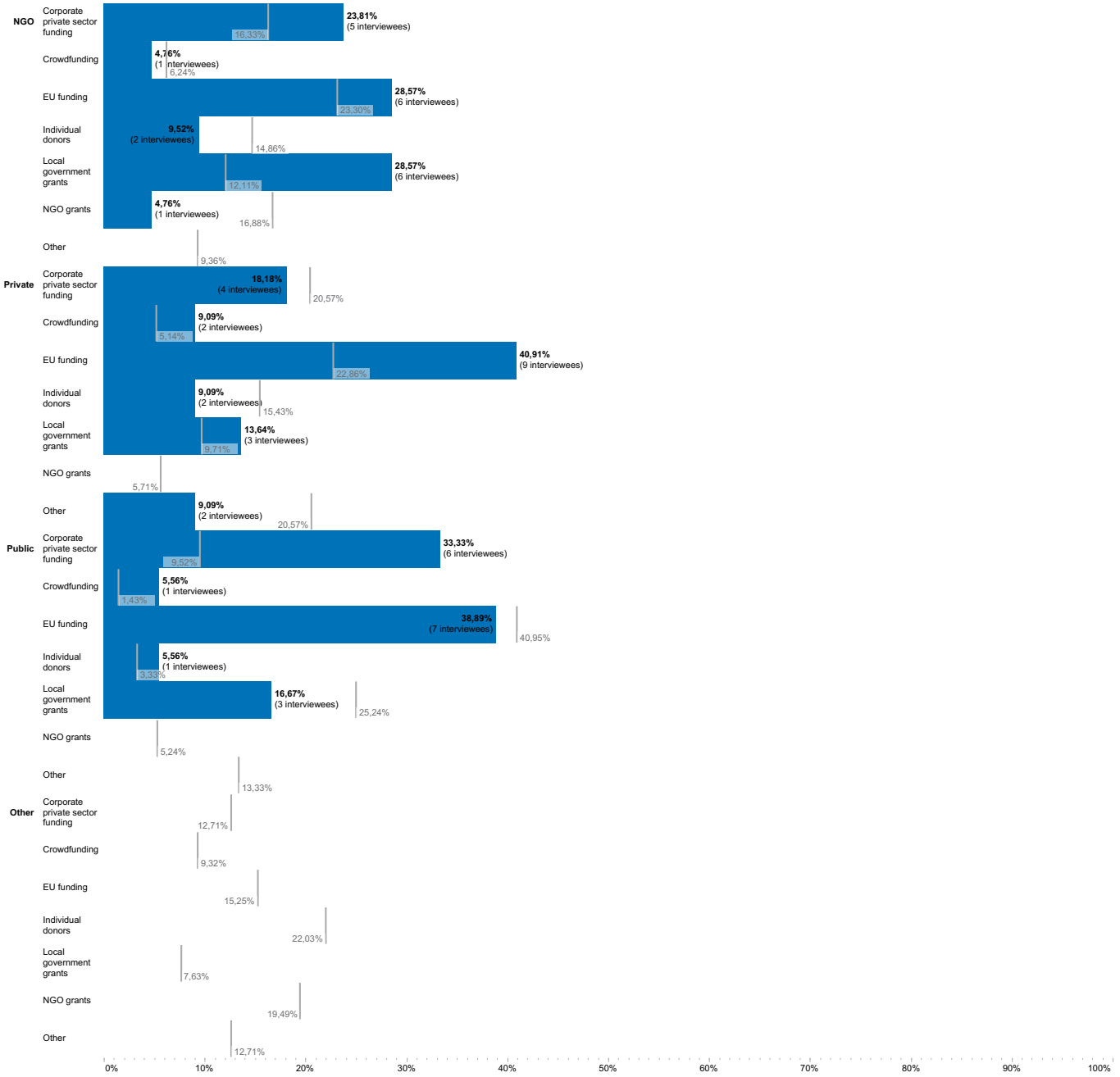
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 26 conducted interviews)



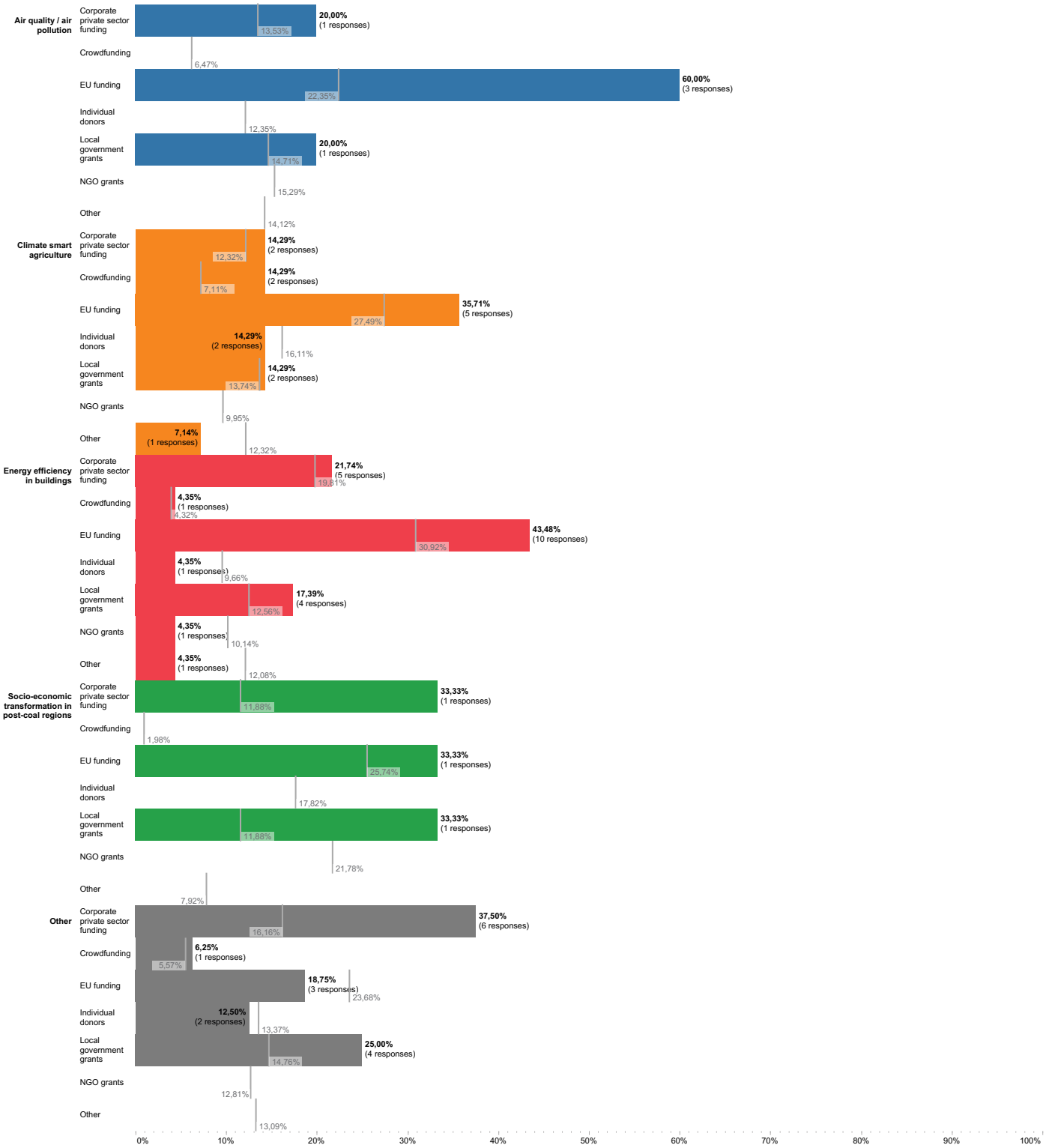
Distribution of interviewees by Funding opportunities category
(* data based on 26 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 26 conducted interviews)

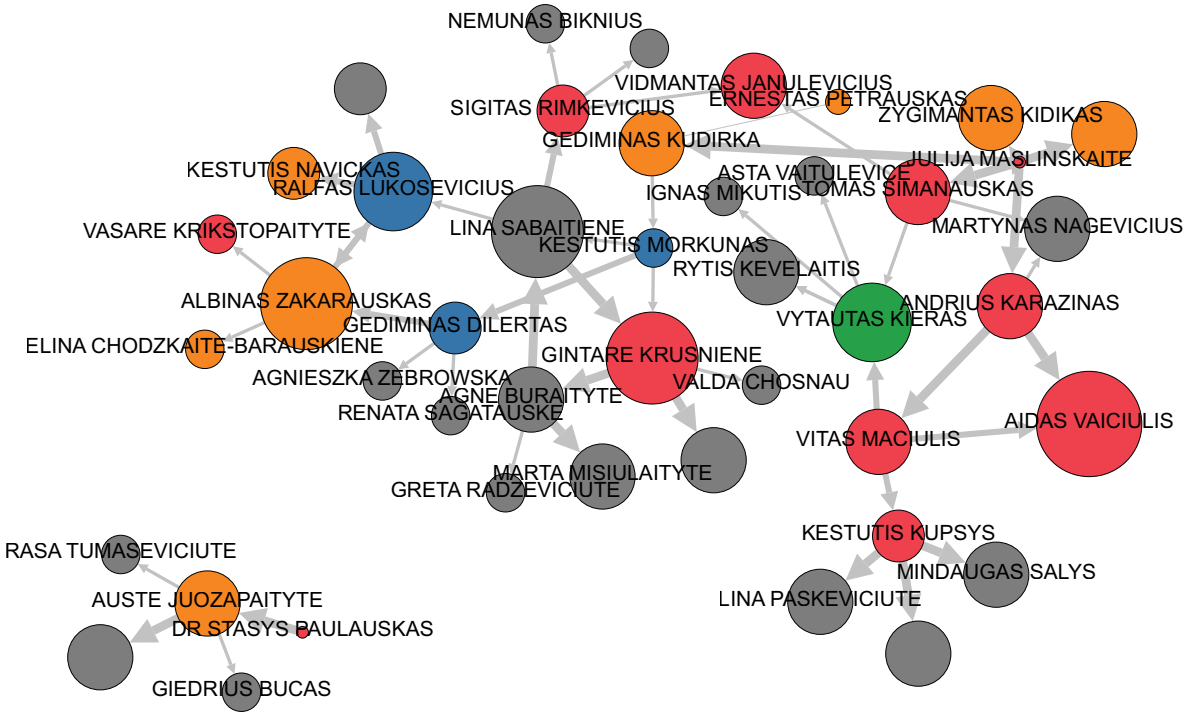


Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 26 conducted interviews)



Social network analysis

Overall social network map diagram (48 nodes / 50 edges)



Primary activity sector:

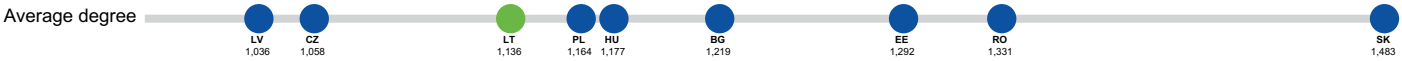
- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)

Social network statistics

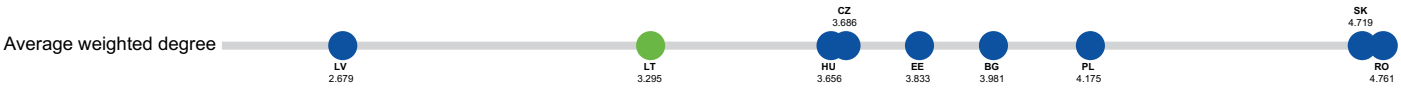
Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals



Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

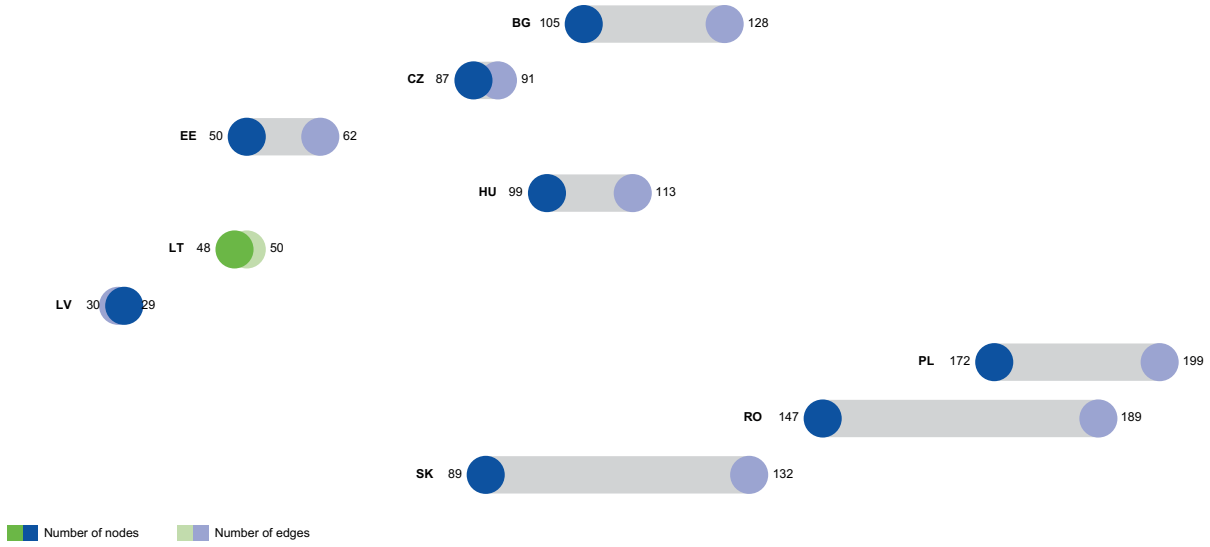
Number of discrete groups in the network

Number of nodes

Number of individuals in the network

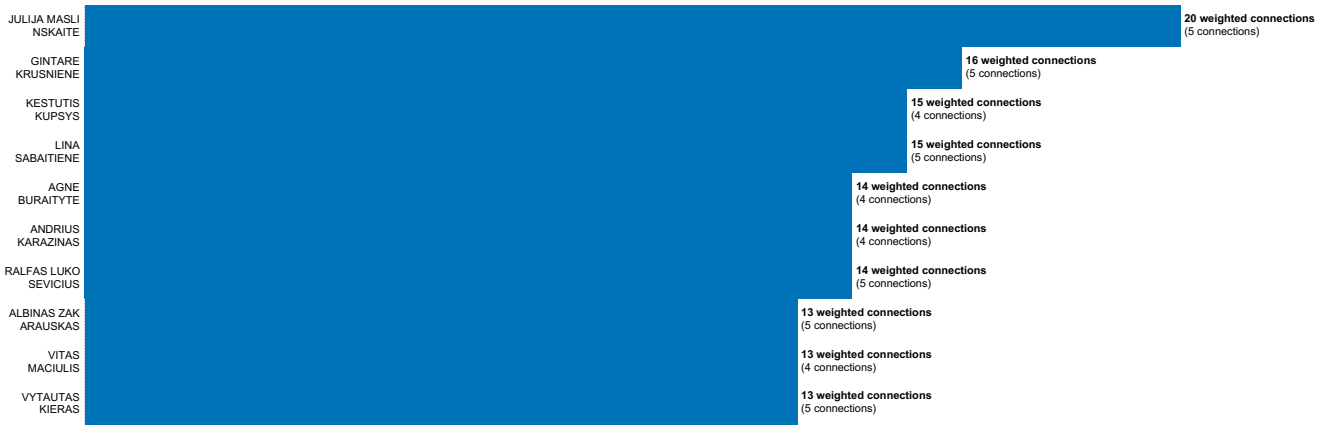
Number of edges (links)

Number of relationships between individual in the network (in total)

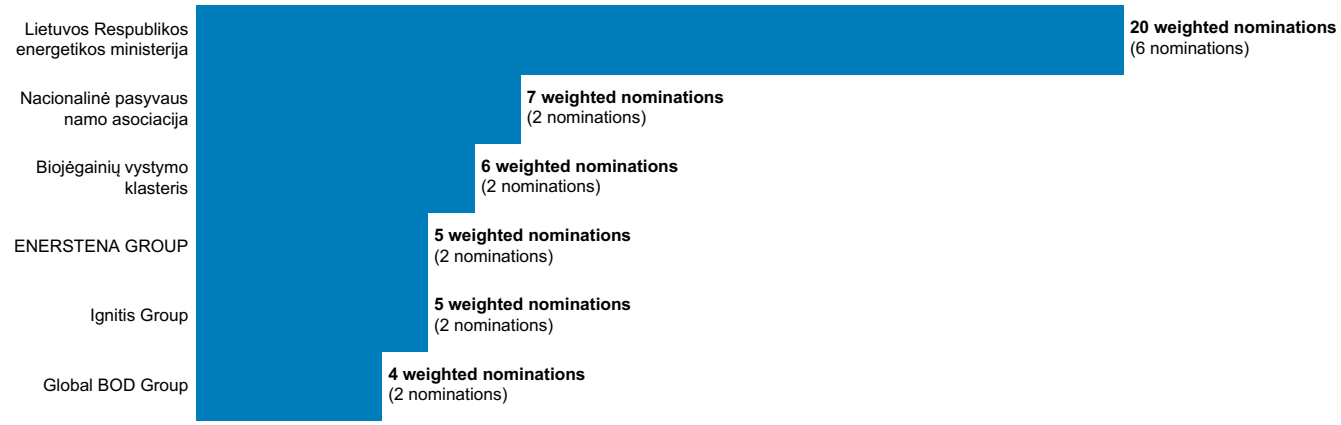


Top interviewees by the number of nominations (weighted in-degree)
(* 2 or more nominations)

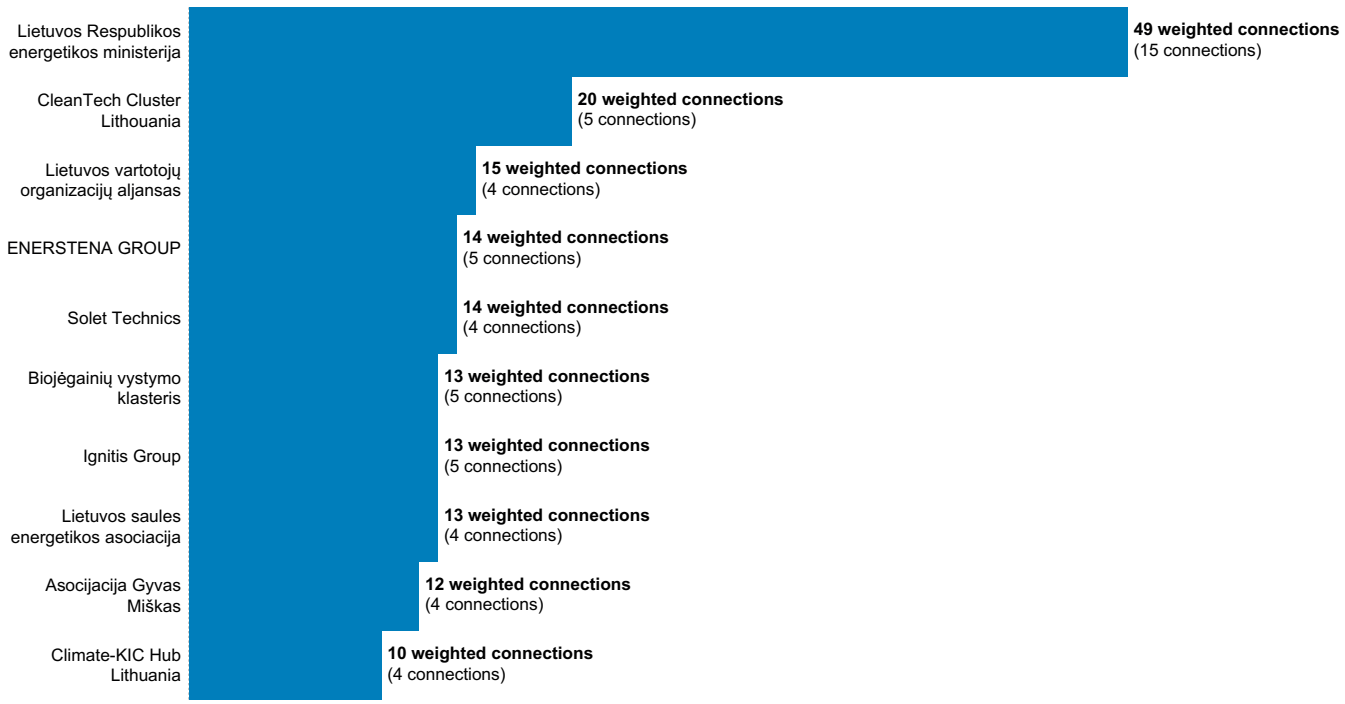
Top interviewees by the overall degree (in-degree and out-degree)
(* 2 or more connections)



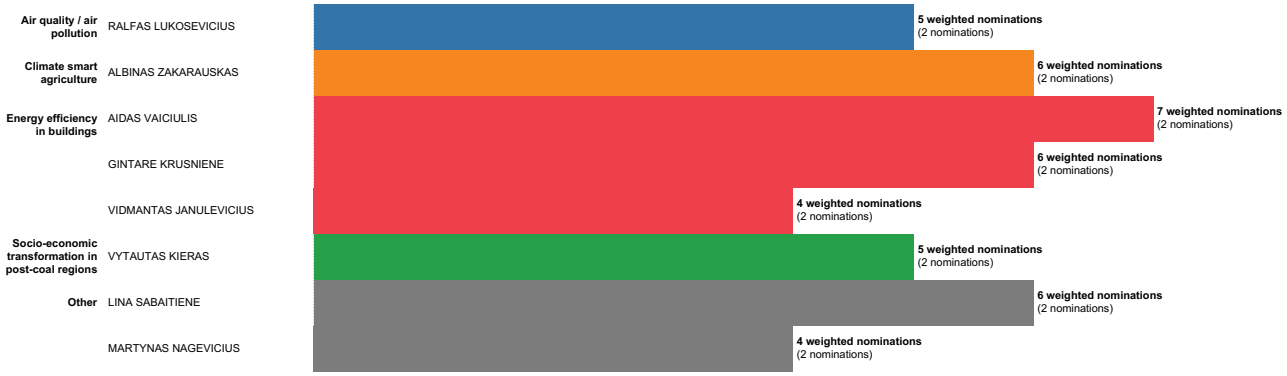
Top organisations by the number of nominations (in-degree)
(* 2 or more nominations)



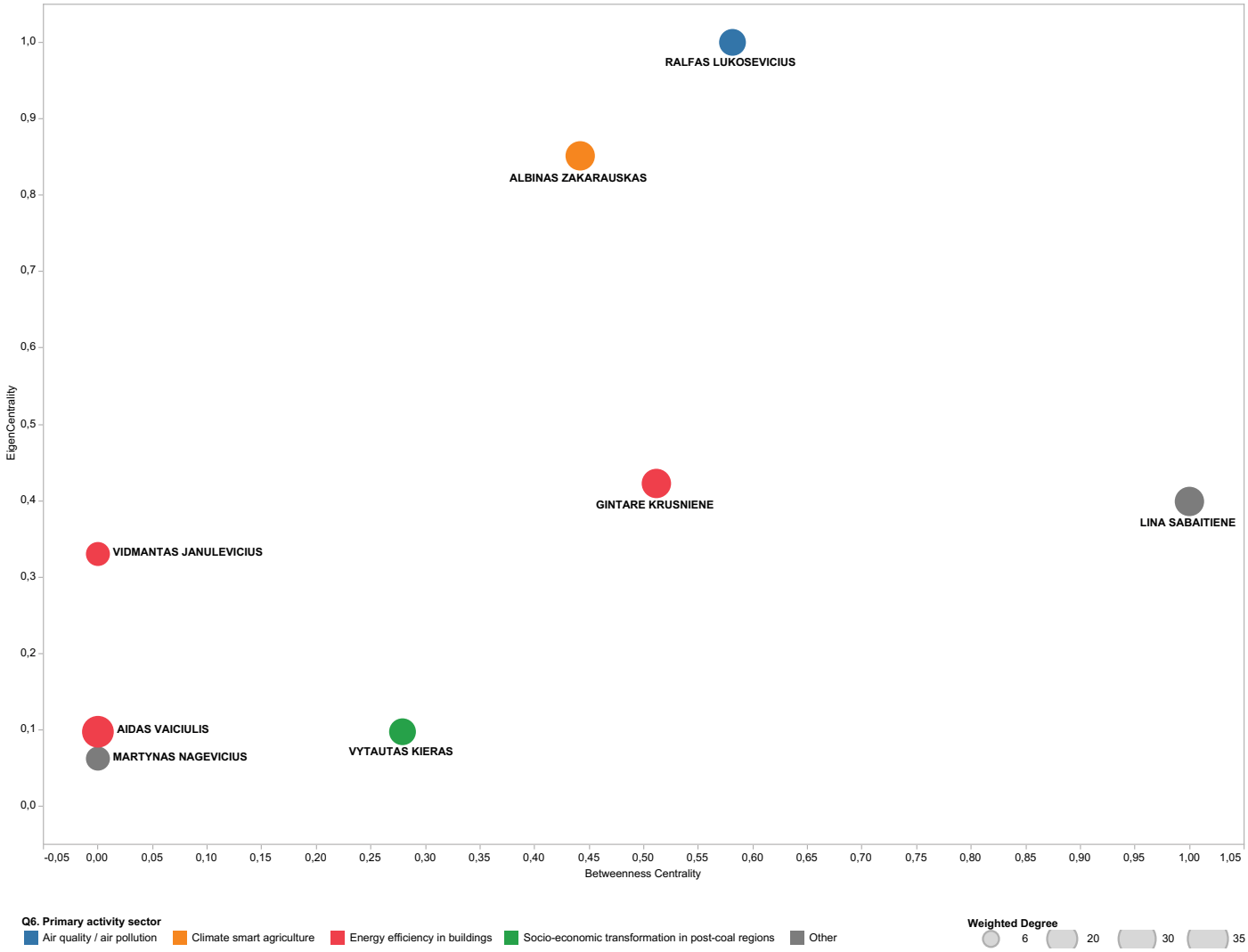
Top organisations by the overall degree (in-degree and out-degree)
(* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector
(* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with 2 or more nominations)



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 8: Qualitative and Network Analysis Latvia

Prepared by **Jana Simanovska, Ilona Platonova**

Latvia is one of the frontrunners in the use of renewable sources (water, biomass) and CO2 absorbers due to high forest coverage. While such factors have naturally given Latvia natural lead, more active climate policy is still lacking. The OECD Environmental Performance review (2019) urges Latvia to do more in order to "maintain efforts to meet long-term climate goals" indicating that agricultural emissions are growing and forest ability to absorb CO2 is decreasing due to forest aging and intensive lodging[1].

Latvia is a moderate overall innovator according to EU's 2019 innovation scoreboard. At the same time, Latvia is ranked as one of the countries where innovation performance has increased the most since 2011. However, R&D spending of private sector is still extremely low. There are many businesses which operate in low value segments of the market and therefore cannot afford to innovate, as well as some businesses which do not report their R&D spending as there is no sufficient motivation to account innovation separately from operational costs. In a few analyzed business cases, the difference between reported and estimated R&D spending was about 10 times. Many reports about innovation in Latvia (Eco-innovation Scoreboard as well) also stress over the reliance on foreign funds for innovation, such as EU funding sources. The private sector plays an important role in adopting especially those innovations which are demanded by the market, such as more efficient heating equipment, smart housing, smart metering.

According to Green barometer elaborated by NGO "Green liberty and Bankwatch," political parties insufficiently address climate policy, since climate policy is not strongly pushed by public opinion, but mostly by Latvia's international responsibilities. However, the youth and NGOs are raising their activity on climate issues.

Energy Efficiency

General context

There are more than 1.36 million energy consuming buildings in Latvia: 0.36 million residential buildings with 90.10 mio m2, and 1.01 million other buildings with 114.64 mio m2. 85% of the residential buildings are single-flat houses, and 14.7% of all residential buildings are houses with 3 or more flats which provide 59.3% of total housing space in Latvia.

Buildings consume up to 40% of the total energy consumption in Latvia, and most of them have significantly lower energy efficiency standards compared to what can be achieved via modern technologies. In 2015, residential buildings consumed 28.3% of the total energy consumption and 66.8% of the total heating consumption. Between 2001 and 2010, the average heating consumption in residential buildings has decreased by almost 20% as a result of energy efficiency measures and lowering the comfort level in buildings to prevent extra costs (caused by low incomes). Despite this, CO2 emissions have increased in recent years.

Energy efficiency requirements for residential buildings have increased significantly since the 1980s through new energy requirements such as the ones introduced in 2003. However, more than 85% of the residential buildings were constructed before such new energy efficiency regulations. Even in the case of more recent buildings, most of the energy efficiency requirements were not met due to construction deficiencies.

As around 70% of residential inhabitants use district heating, initial investments were made to increase the efficiency of the energy delivery systems since around 2000 many Latvian cities lost 20% or more of the generated heat. This approach was succesful, and today many cities' losses are below 5% from total generated heat.

Innovation

Energy efficiency in has received notable attention in Latvia. New products are being developed in materials, technologies for isolation for existing buildings, as well as materials for new buildings. with the Latvian wood construction cluster playsan important role in the movement for passive housing.

Riga Technical University researchers have patented several innovations in this area with EU funding (both ERDF and Interreg-like local actors). Unfortunately, many of these innovations are not commercially viable as they rather demand the

1 http://www.oecd.org/environment/country-reviews/OECD-EPR-Latvia-2019-Abridged-Version.pdf

development of new industries with biological resources which are hard to obtain in large volumes.

The Building and Energy Conservation Bureau [2]shares knowledge and tools on how to insure energy efficiency, organizes events and participates in policy discussions, and promotes new business models where an intermediary is taking on all the risks for retrofitting the buildings and sharing savings with the owners of the real estate.

The Green Incubator previously funded by the Norwegian Financial Instrument provided significant support to new technologies which could contribute new innovations in the climate area. As this incubator closed, EIT Climate-KIC (RTU Design factory) and Climate Pioneers replaced some of its activities, organizing hackathons, idea generating measures and supporting start-ups.

Public opinion

Energy efficiency in public discussion is rarely connected with the climate, but rather advanced by economic benefits. Rather low participation in publicly supported retrofitting programs is explained by the lack of agreement and trust in builders and quality of their reconstruction. For example, only 882 buildings were finished as of November 2019 from a retrofitting program co-funded by the EU, while 70 others are under construction[3]. In the case of house insulation, the public is afraid of personal raising expenses from related loans.

The Latvian public is more skeptical of climate issues compared to other European countries[4], lacking understanding on the issue and the main action needs, including skepticism in regards to alternative electricity production such as wind farms[5]. A potential explanation for such reluctance could be the questionable policy interventions such as the mandatory electricity procurement measure which forced private entities and the public to buy electricity from renewable sources at a higher price. It was revealed that part of this electricity came from fossil sources (eg cogeneration[6]: gas with biomass, or also blatantly fraudulent schemes which resold the same grid electricity at higher price[7]).

Public policies

As heating accounts for relatively high proportion of housing costs[8] and only 6% of the total buildings in corresponded with up-to-date requirements, the Ministry of Economy elaborated the Dedicated Building renovation strategy in 2017[9] influenced by EU directive 2012/27/EU on energy efficiency. As higher standards have been imposed for new buildings, they increase the costs of new constructions, which might diminish the construction of new buildings.

Significant funds are allocated from the EU national envelope for this priority. Altum, a state financial institution managed the EU funding to issue grants, long term loans for reconstructions or guarantees in case of bank loans for reconstructions.

The Ministry of Economics and Altum also provided funding for residential and public building renovation, as well as energy efficiency increases for industry.

In order to raise public awareness on the importance of energy efficiency various actors organized competitions ("Most efficient buildings"[10]) and educational events (seminars for residential buildings and entrepreneurs).

Public procurement, despite being considered a significant driving force for innovation, has not been used efficiently in Latvia yet. Changes in the legislation from 2017 onwards and the projects on sharing best practices should facilitate public procurement and drive innovations. While green procurements have been implemented in Latvia, the major contributor to the GHG emissions, the construction sector, was seldomly addressed.

2 http://ekubirojs.lv/en/home-eseb/
3 https://www.em.gov.lv/lv/es_fondi/dzivo_siltak/renove-to_eku_statistika/
4 Special Eurobarometer 490, Climate Change, April 2019
5 https://eng.lsm.lv/article/economy/economy/local-busi-nesses-object-to-proposed-wind-farm.a292814/
6 https://www.lsm.lv/raksts/zinas/ekonomika/prem-jers-oik-sistema-kritiskak-jaskatas-uz-gazes-kogeneraciju.a288647/
7 https://bnn-news.com/latvia-charges-energy-company-ex-ecutives-for-attempted-fraud-204401
8 https://www.csb.gov.lv/en/statistics/statistics-by-theme/social-conditions/household-budget/key-indicator/house-hold-consumption-expenditure
9 https://ec.europa.eu/energy/sites/ener/files/documents/lv_building_renov_2017_lv.pdf
10 http://www.energoefektivakaeka.lv/

Climate-smart agriculture

General context

The general public considers that the agricultural sector is negatively impacted by the new restrictions pushed by climate change issues. For example, the public considers that measures undertaken to reduce GHG emissions in agriculture are contradictory to growth, development and rural interests. Moreover, more environmentally friendly practices in agriculture are also viewed with skepticism as they do not necessarily facilitate higher yields or more competitive advantage, while they might actually have the opposite effect. While major farmers and their interest organizations (such as Zemnieku Saeima /Farmers Parliament, Latvijas Lauksaimnieku sadarbības organizāciju padome / Latvian Agricultural Organization Cooperation Council) support current farming practices, a number of organizations and individuals promote biological farming and the ecosystem approach. Meanwhile, the forest industry has great lobby power in advocating for more intensive forest cuts.

Public policy

Since half of Latvia's territory is covered by forests, many politicians stress that country has done its part on absorbing GHG emission, so to the farming industry should be allowed to increase their land productivity.

The latest version of the National Energy and Climate Plan of Latvia's draft[11] observes that "a large share of GHG emissions in agriculture come from activities where GHG emissions reduction is very difficult to implement". The draft acknowledges that new innovations are necessary developing methods that reduce emissions from agriculture.

The bioeconomy strategy stresses the promotion of wider use of biomass with lower contributions to climate policy, stating that "Climate policy should not become a limiting factor for the development of the bioeconomy in Latvia"[12].

Innovation

The Ministry of Agriculture supports innovation in the field through CAP sources and the LIFE program. Agricloud is a Latvian SME precision farming project which received support from the European Innovation Council[13]. Rather then developing most innovations locally, Latvia transfers best practices from other countries[14]. Support to R&D is provided via organizations such as "Pārtikas uzņēmumu federācija" /"Latvian Federation of Food Companies", which holds both clustering support and innovation for businesses. The ecent centralization of research institutions in Latvia has reduced the number of institutions working in the innovation field, and research activity is still slow due to low investment in R&D. Smart Agriculture is researched at private institutions such as the Institute of Environment Solutions.

Socio-economic transformation in post-coal regions

Latvia does not have any coal mines, so the role of the coal is reducing organically. Coal plays a rather limited role in heating and it has reduced 4 times since 1996, and its consumption in 2015 was 20.900 tons[15]. Nowadays, when financial support is provided, the reconstruction of older heating systems switch from coal to renewables.Coal still plays a significant role in transit and port activities in Latvia. There were 11-12 million tons of coal transit in recent years, and it made up to 35% of all transit goods in ports in 1st half of 2019.Port authorities have some interest in maintaining the status quo, even though coal transit has an impact on air quality in Latvia, especially in Riga and Liepāja, where the terminals are located.

Even though coal was approved as an energy diversification strategy in 2007, it is not being used for electricity generation. Right now Latvia has sufficient balancing sources for renewable energy, so no opportunities for new stations are defined in the Energy Strategy for 2030. Considering the limited use of coal in Latvia, there are no significant innovation in this domain.

11 https://em.gov.lv/lv/nozares_politika/nacionalais_energetikas_un_klimata_plans/
12 Informatīvais ziņojums, Latvijas Bioekonomikas stratēģija 2030

13 https://www.agricon.de/lv/
14 http://www.oecd.org/publications/innovation-agricultural-productivity-and-sustainability-in-latvia-9789264312524-en.htm
15 https://data1.csb.gov.lv/pxweb/lv/vide/vide__energetika__energ_pat/EPM330.px/table/tableViewLayout1/

Air pollution

General context

Most of Latvia has good air quality, except Riga, which frequently is breaking EC air quality standards due to dust pollution. The current air pollution prevention strategies are insufficiently address the main pollutants, like transportation, the port (currently in the process of relocation) and areas of de-centralized heating[16]. The European Commission requested increased control of PM10 in Riga. The monitoring air station from the main transport artery of Riga was broken in an accident a couple of years ago, and hasn't been replaced ever since.

Other air quality issues have been noted in the two industrialized cities of Liepaja and Rezekne, where metalworking industry and lots of logistics activities are carried out.

Public Policy

The policies drafted in the "Air pollution reduction action plan 2019-2030"[17] were publicly discussed and then ammended in the summer of 2019, but it has not moved forward yet. The issues that received most attention from mass media were controversial measures such as forcing households to change the heating equipment, which could the less financially stable citizens under further economic stress. The draft plan also has assessed forbidding the use of coal, but found this measure unnecessary.

Public opinion

While the public generally agrees on the importance of air quality, it is not always very supportive of those solutions which require personal changes of habbit. For example, those issues that create instant dissatisfaction and don't require any change from private citizens, like the smell from a port activity, are getting sufficient attentio. Meanwhile, the Ministry's of Transport promotion of public transport usage was not as successful, as people were not ready to give up on their personal cars. Several non-governmental organizations (such as "City for people"[18], Sarkandaugavas attīstības biedrība/Development Society for Sarkandaugava[19] , and "Apkaimju alianse /Neighborhood alliance") play an important role in influencing Riga's city plans on issues of air quality. However, Riga's planned priorities for increasing walking and the use of bicycling and public transport is not fully carried out...

Innovations

The annual forum "Mad city"[20] provides the space for NGOs, active individuals and the public sector to elaborate innovative solutions for Riga's territorial development.

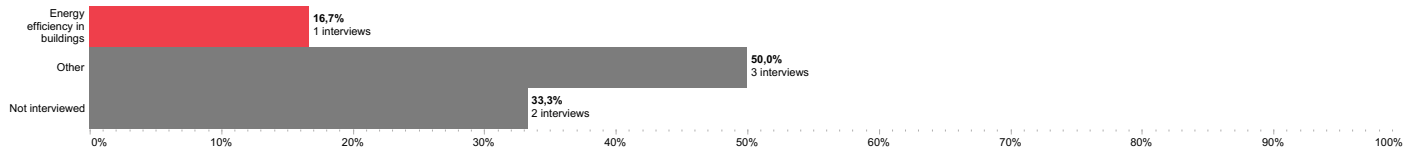
Poor air quality in public non-residential buildings has been addressed by at least three independent businesses in Latvia which developed several CO2 monitoring devices.

16 https://content.sciendo.com/downloadpdf/journals/cons/15/1/article-p29.xml
17 http://www.varam.gov.lv/lat/likumdosana/normativo_aktu_projekti/normativo_aktu_projekti_vides_aizsardzibas_joma/?doc=27258
18 https://www.pilsetacilvekiem.lv/
19 http://www.sarkandaugavai.lv/
20 https://straume.lmt.lv/lv/video-saraksts/madcity-2019

Facts and figures regarding the data collection process

Data collection period: 5/11/2019 - 2/12/2019
Number of initial contacts: 6
Initial distribution of contacts by gender:

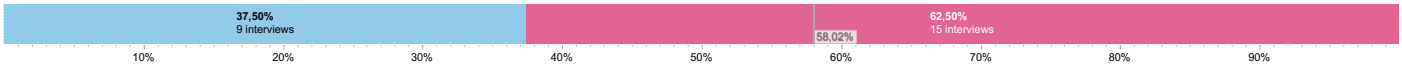
Initial distribution of contacts by thematic sector:



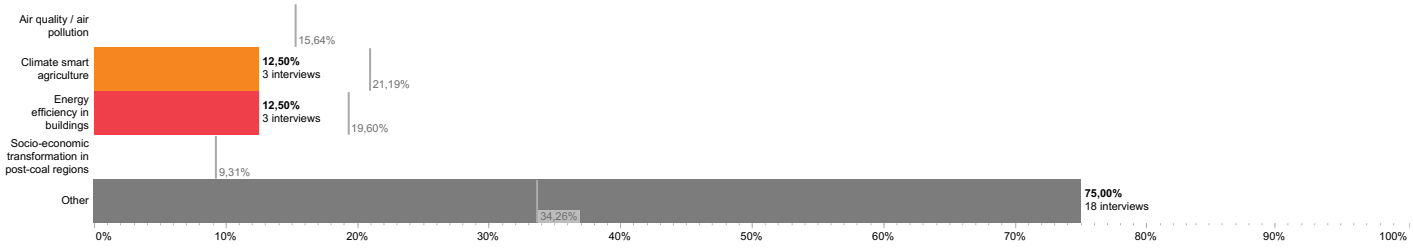
Number of contacted persons: 29
Finalised interviews: 24
Number of people not interested in participating in the study: 5
Response rate: 82.75%
Total number of nominations: 30
Total number of unique nominations: 29
Average amount of nominations by interview: 1.25

Interviewee profiles

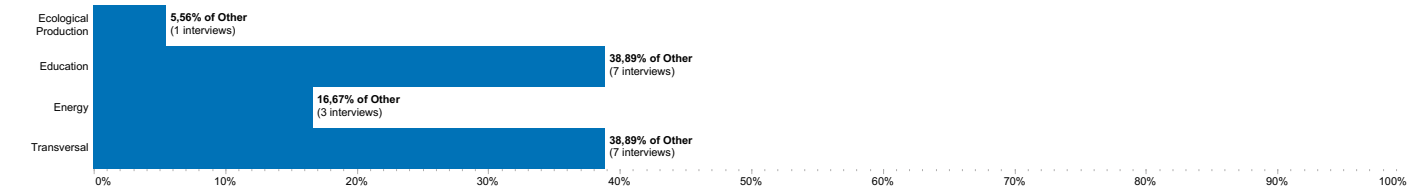
Distribution of interviewees by gender
(* data based on 24 conducted interviews)



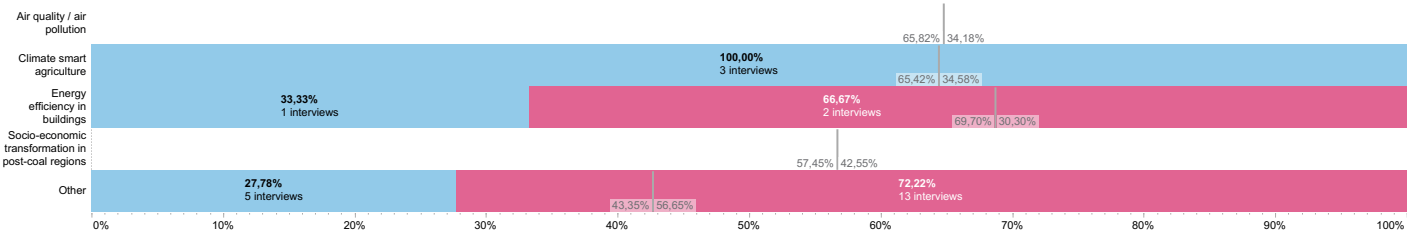
Distribution of interviewees by primary activity sector
(* data based on 24 conducted interviews)



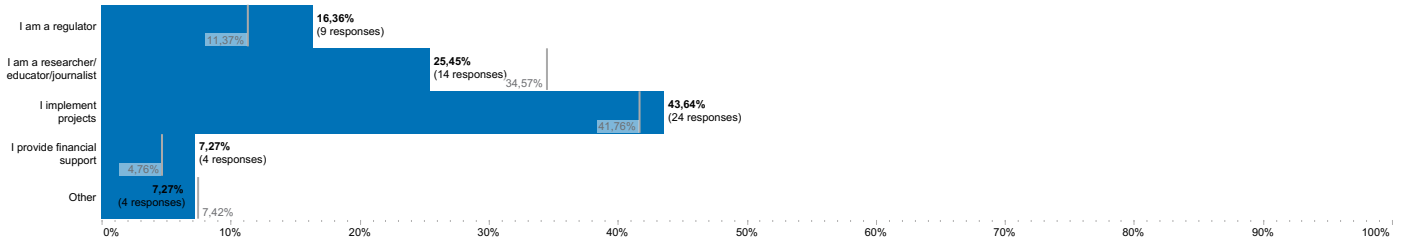
Breakdown of Other primary activity sectors
(* data based on 24 conducted interviews)



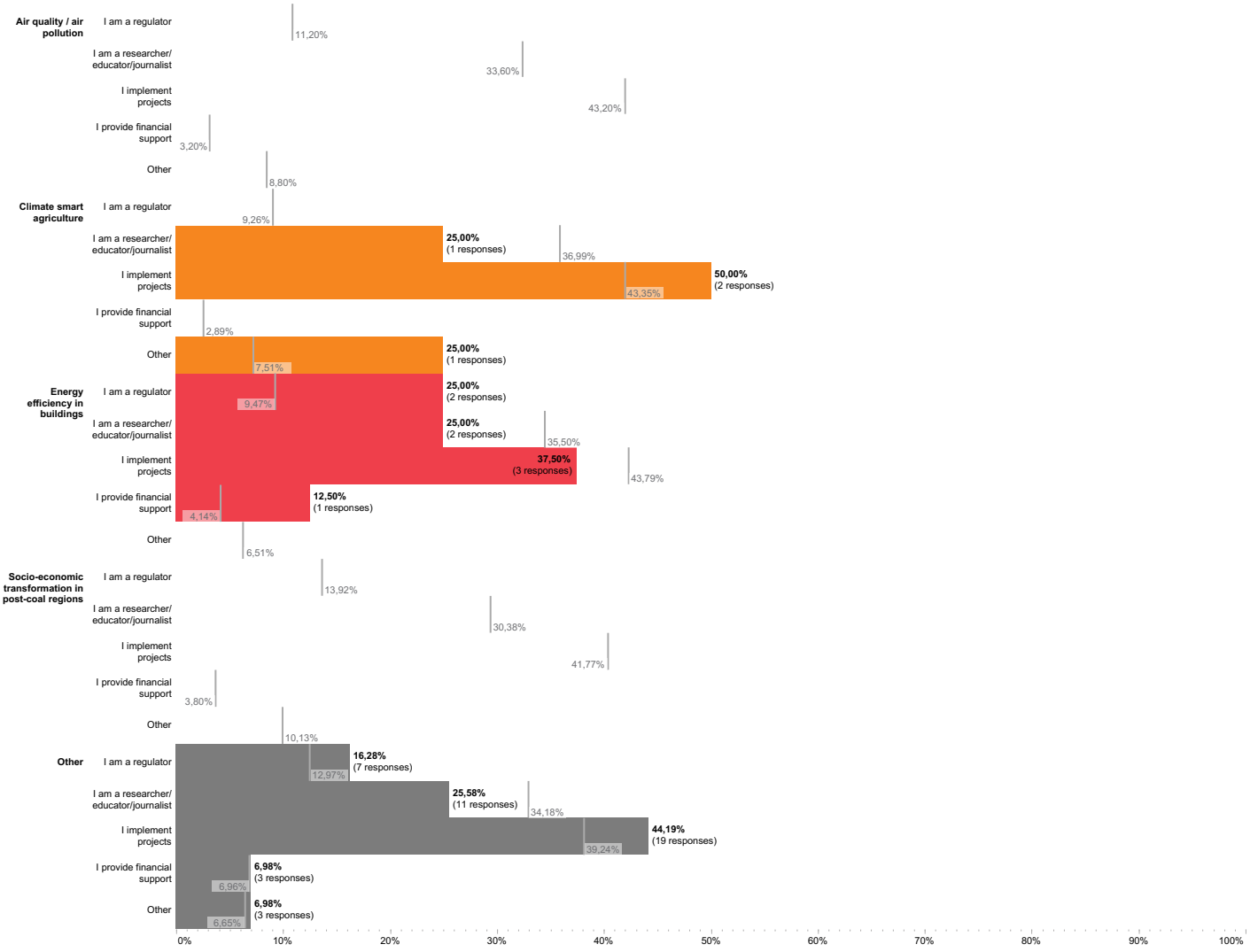
Gender distribution by primary activity sector
(* data based on 24 conducted interviews)



Distribution of interviewees by the type of role
(* data based on 24 conducted interviews)

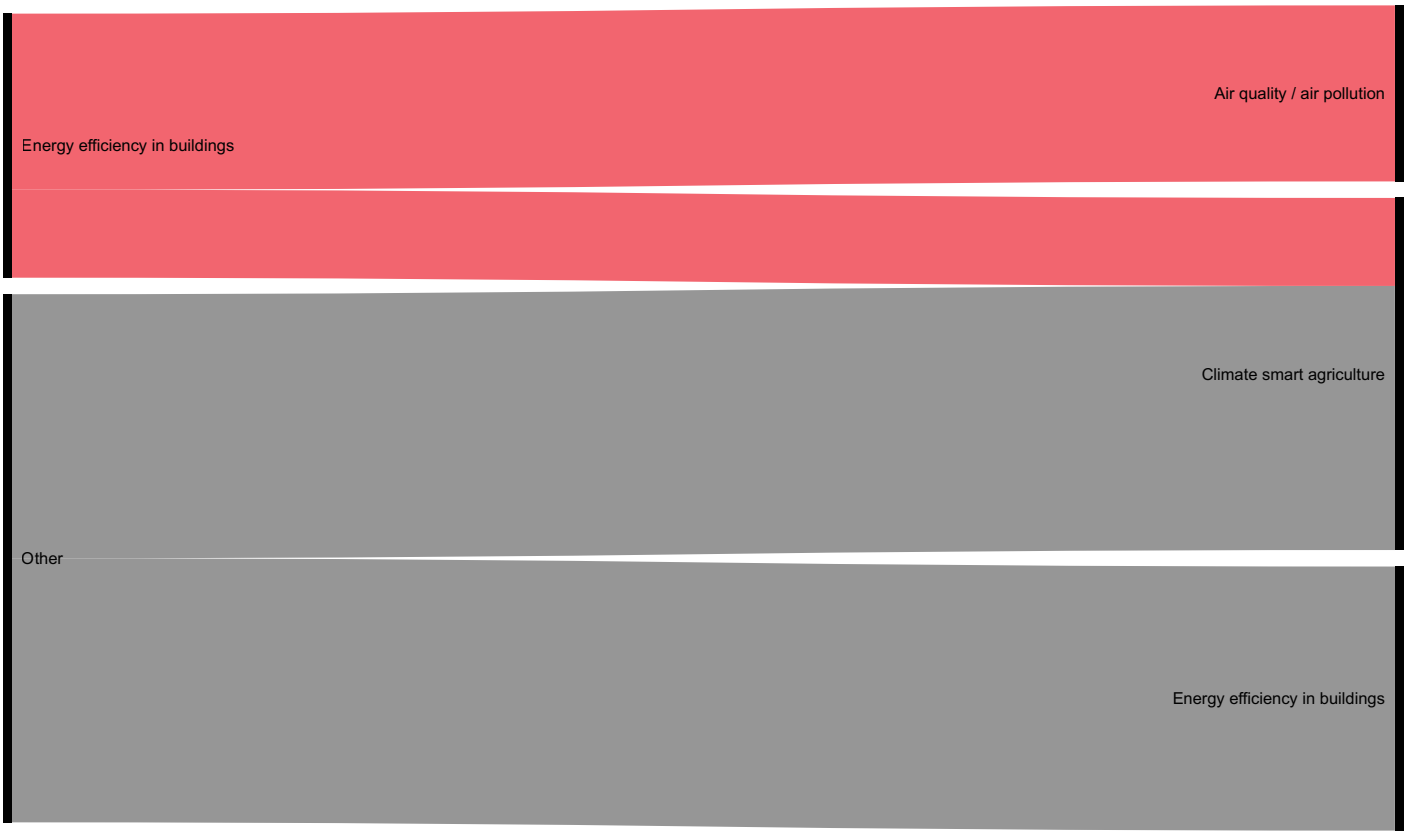


Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 24 conducted interviews)

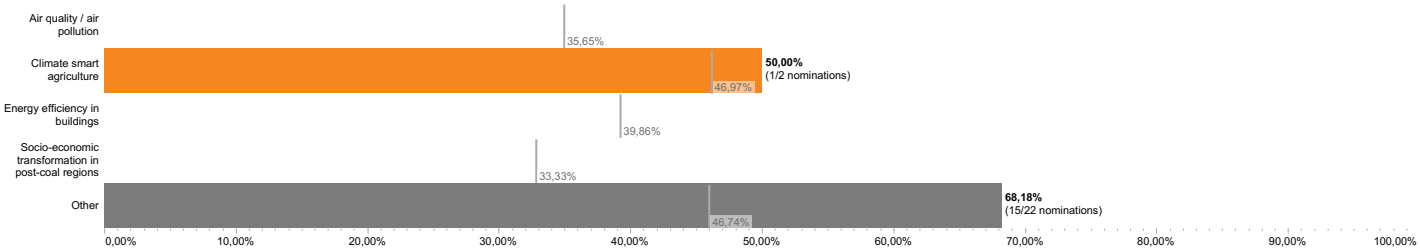


Distribution of interviews by region
(* data based on 24 conducted interviews / more then 2 interviewees)

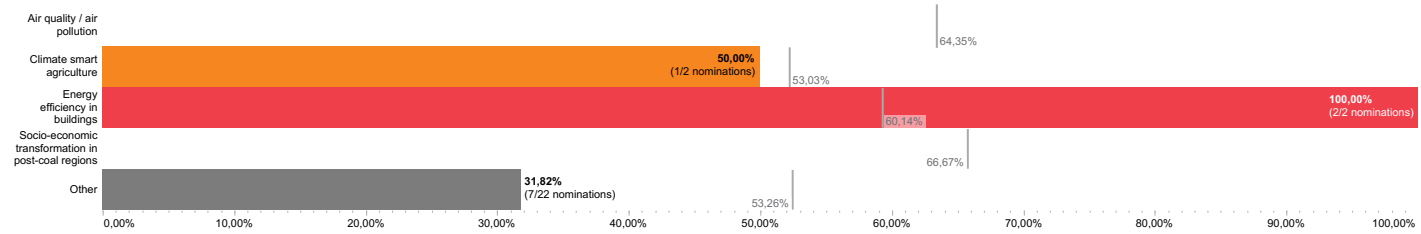
Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 24 conducted interviews)



Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 24 conducted interviews)

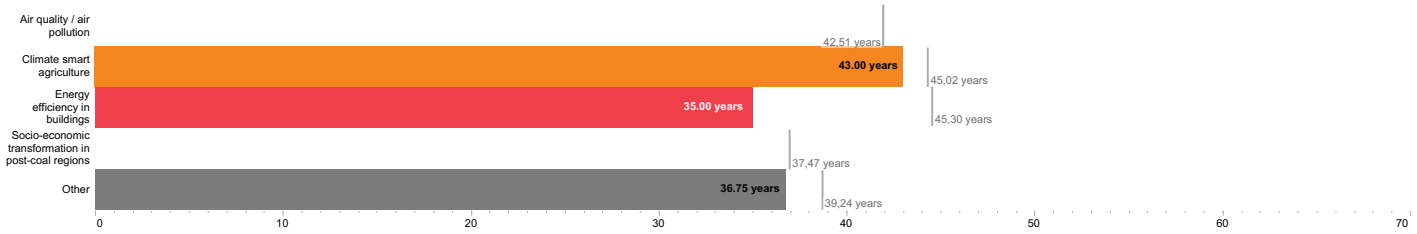


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 24 conducted interviews)

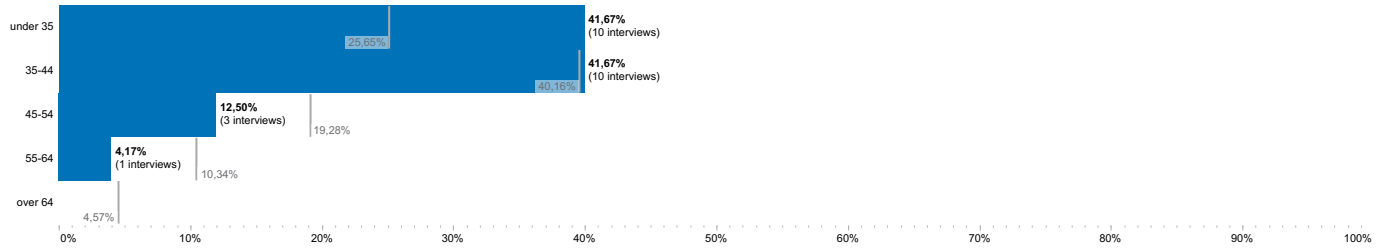


Average age of interviewees: 37.46 years (Regional average: 41.62 years)
(* data based on 24 conducted interviews)

Average age by primary activity sector
(* data based on 24 conducted interviews)



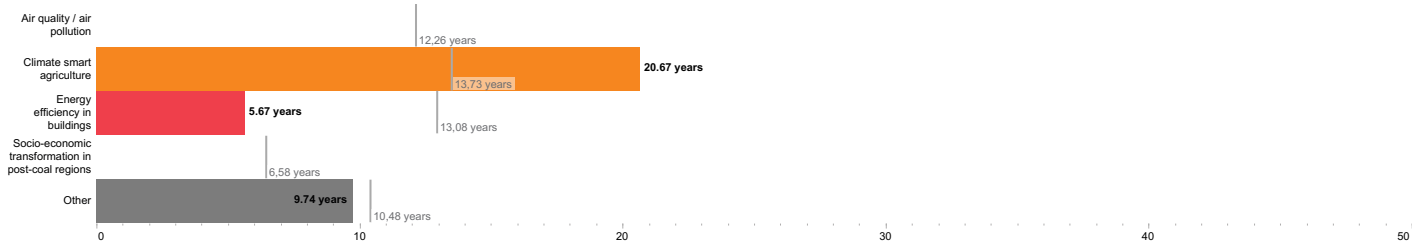
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 24 conducted interviews)



Average number of years of experience: 10.50 years (Reginal average: 11.58 years)
(* data based on 24 conducted interviews)

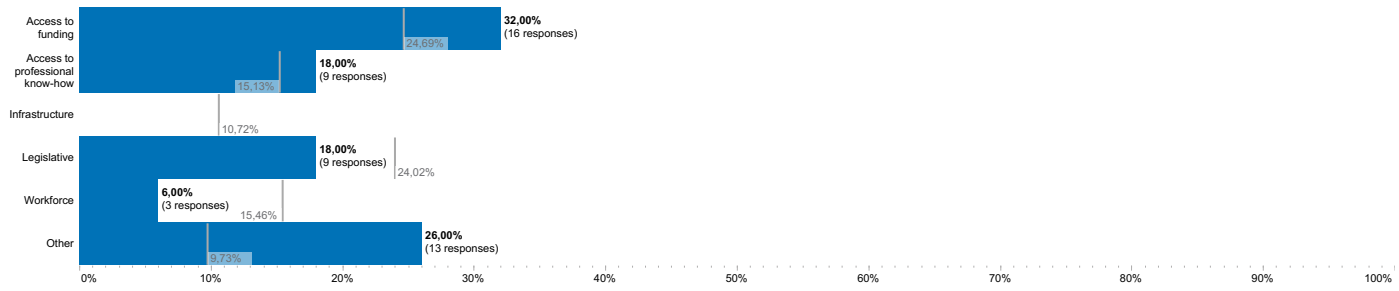
Average number of years of experience by gender
(* data based on 24 conducted interviews)

Average number of years of experience by primary activity sector
(* data based on 24 conducted interviews)

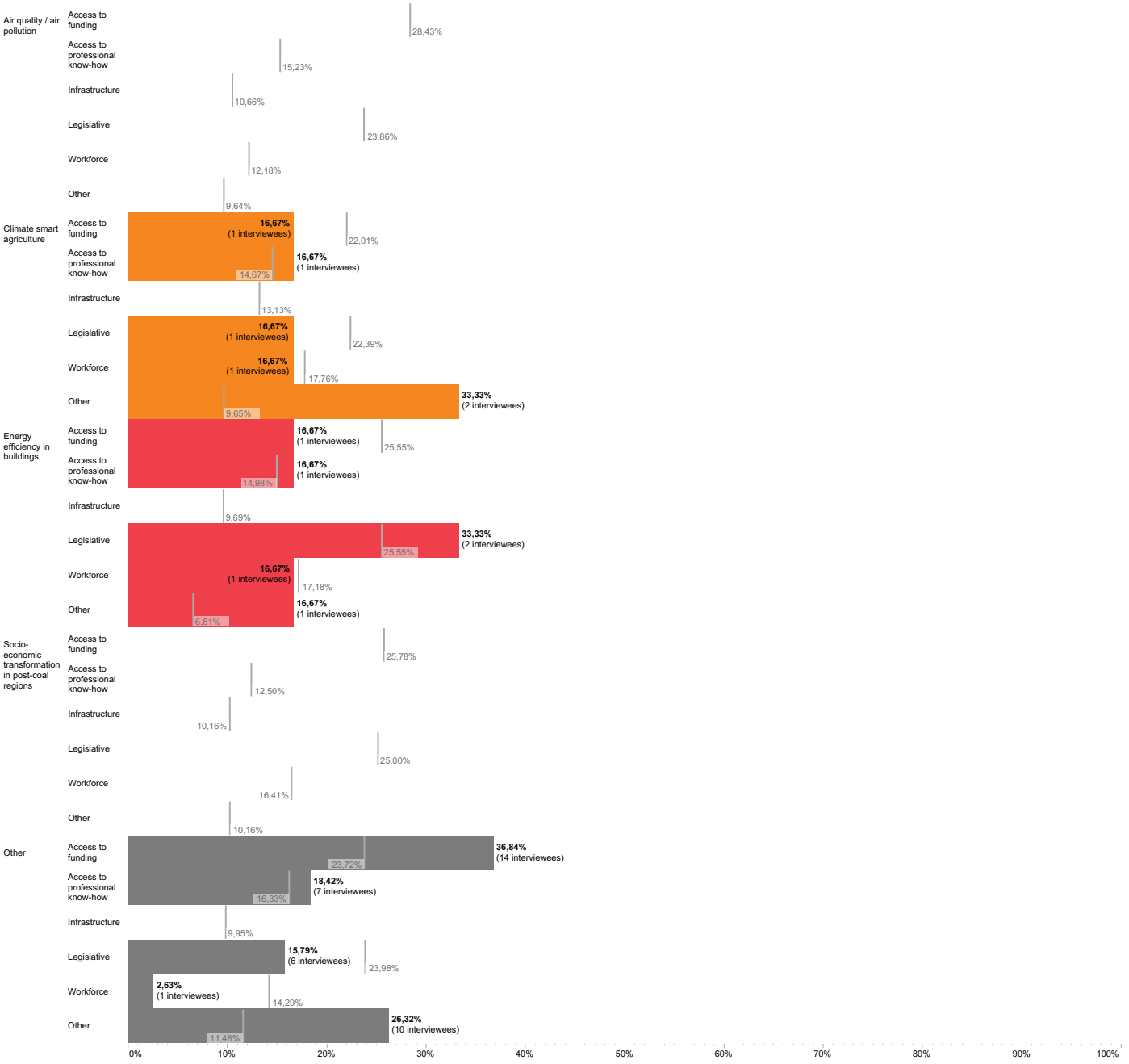


Average number of years of experience by the legal status of their member association
(* data based on 24 conducted interviews)

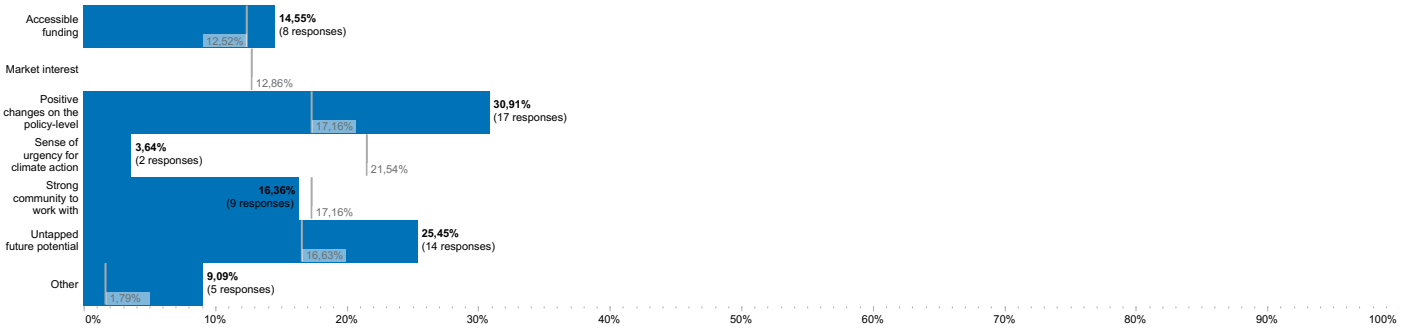
Distribution of interviewees by Barriers/Challenges category
(* data based on 24 conducted interviews)



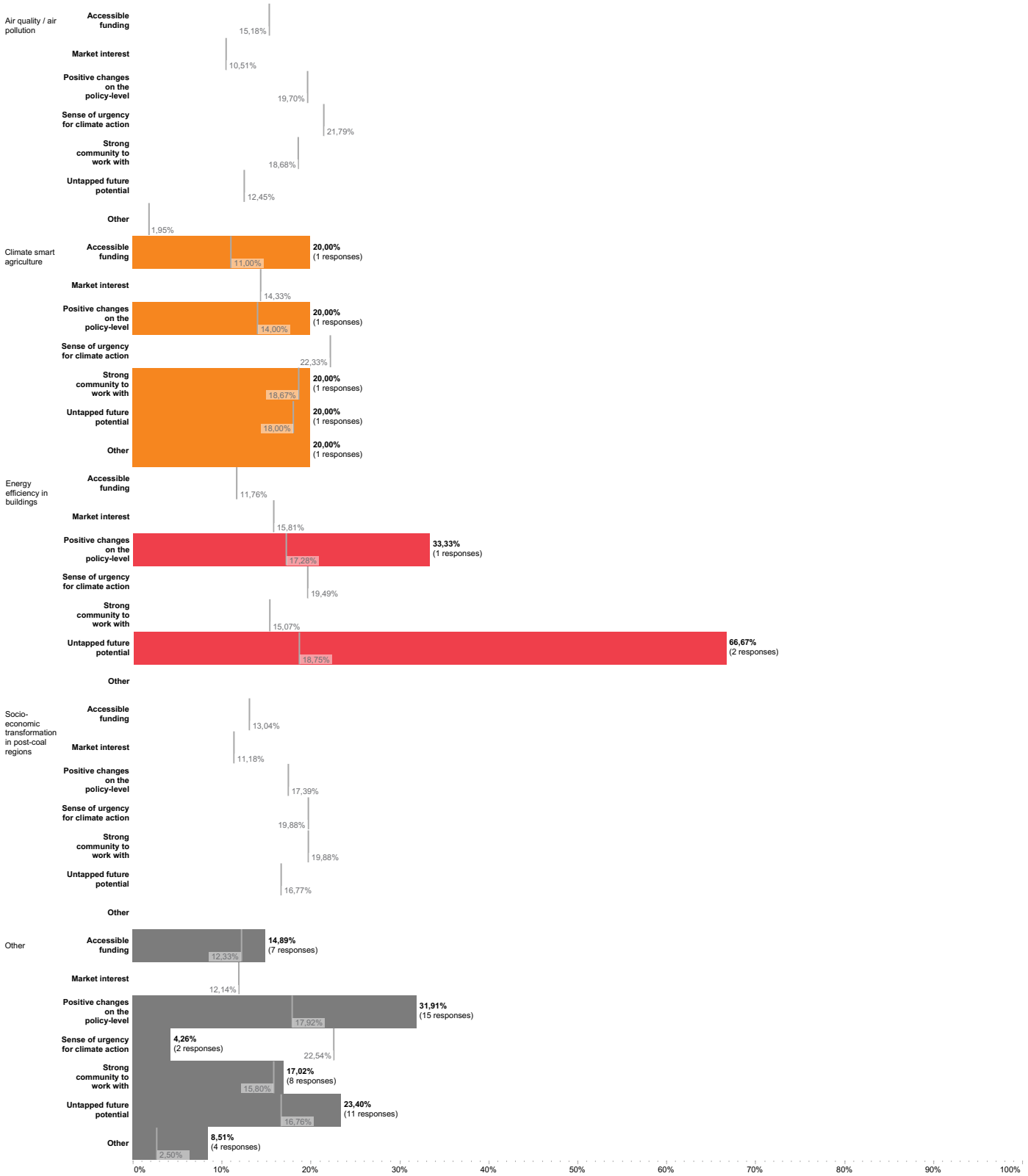
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 24 conducted interviews)



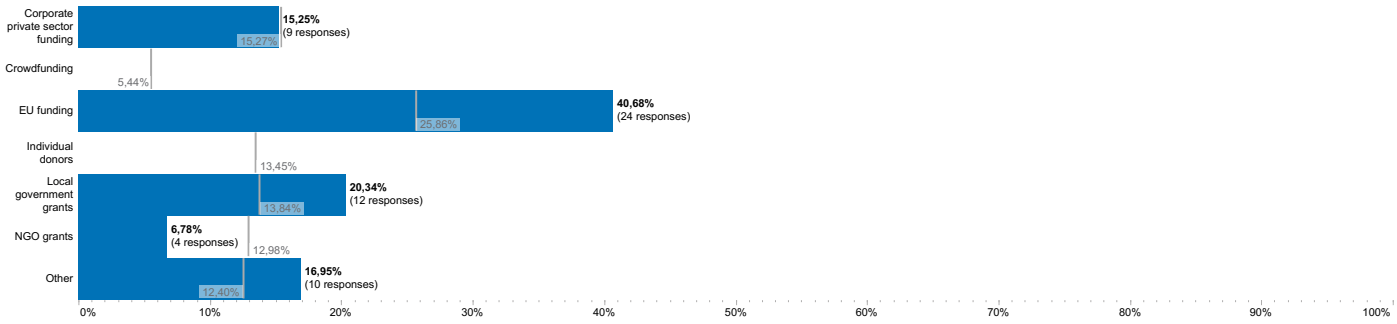
Distribution of interviewees by Opportunities category
(* data based on 24 conducted interviews)



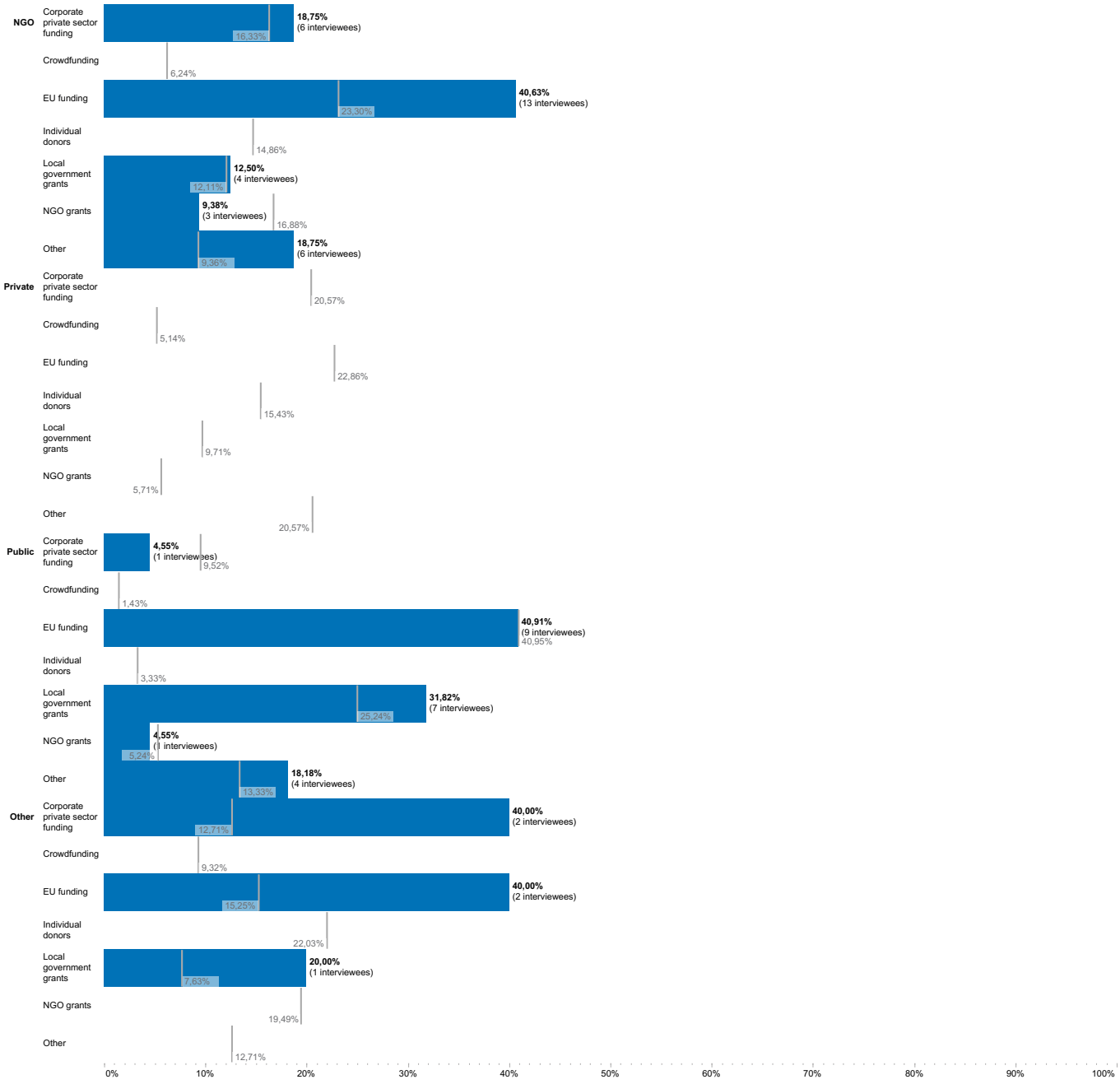
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 24 conducted interviews)



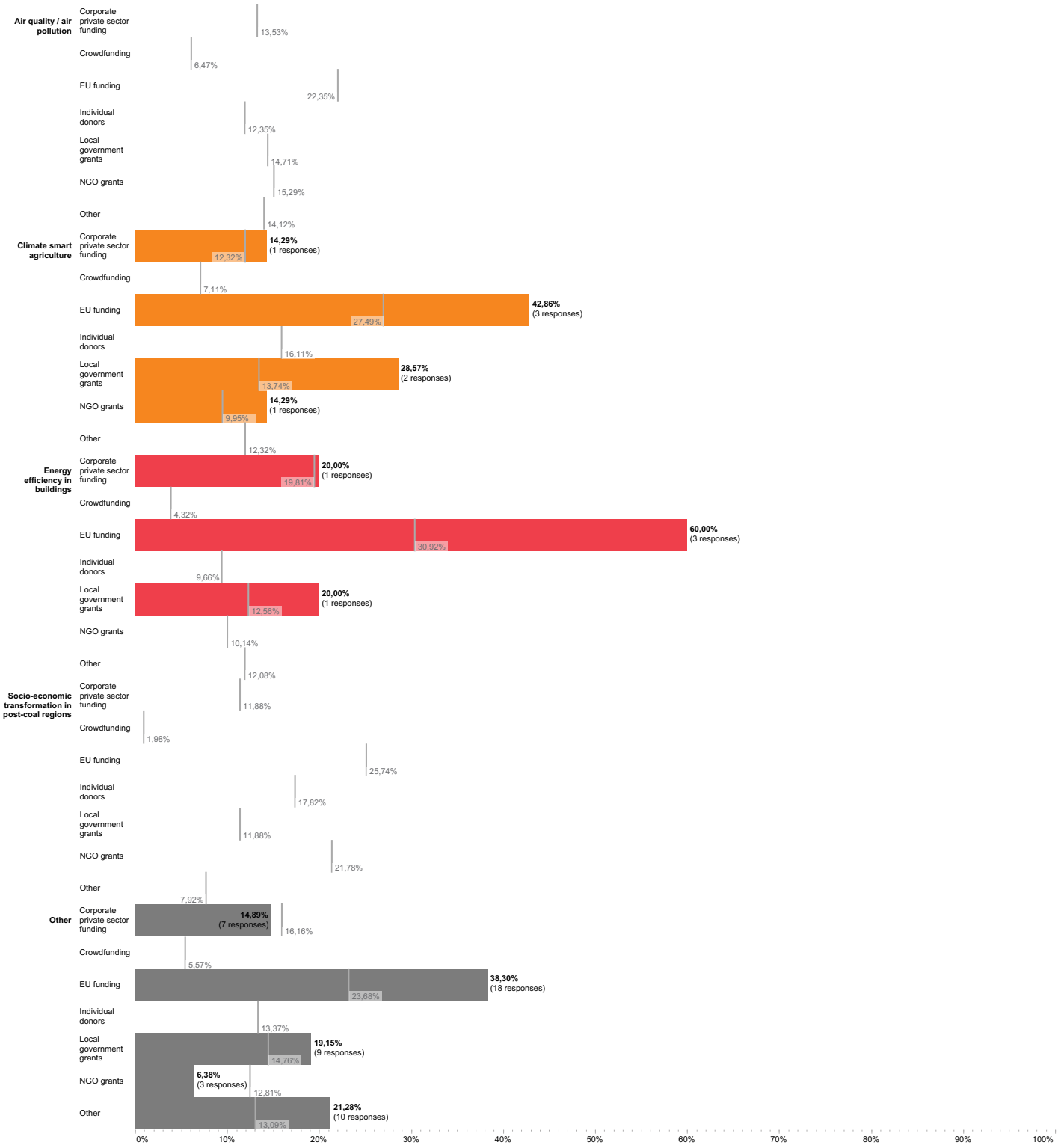
Distribution of interviewees by Funding opportunities category
(* data based on 24 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 24 conducted interviews)

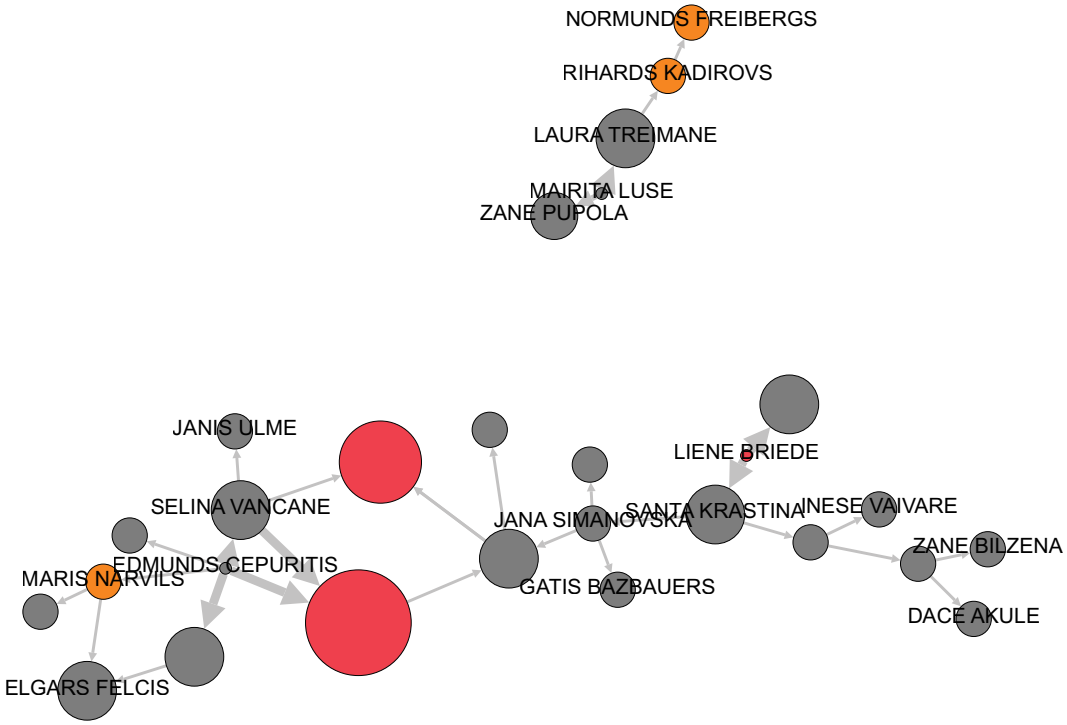


Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 24 conducted interviews)



Social network analysis

Overall social network map diagram (30 nodes / 29 edges)



Primary activity sector:

- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

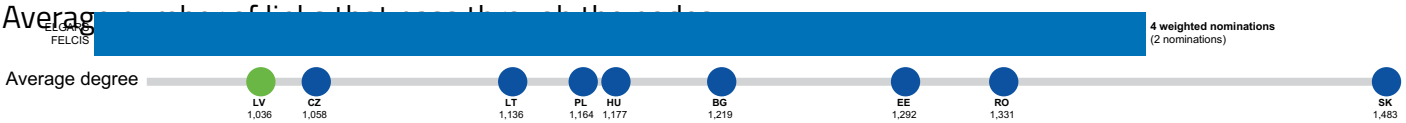
Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)

Social network statistics

Top interviewees by the number of nominations (weighted in-degree)
(* 2 or more nominations)

Average degree

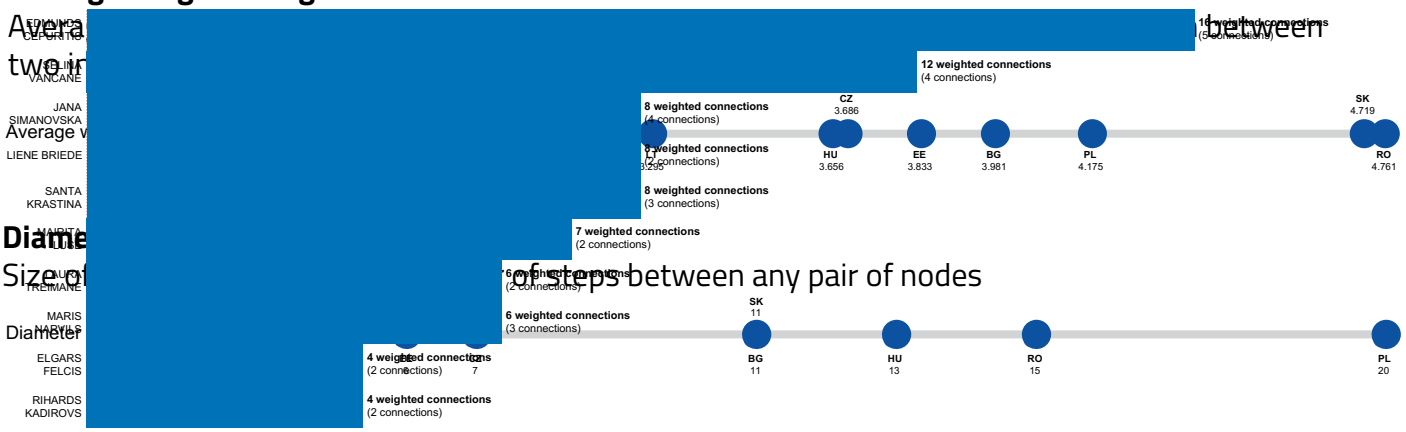
Average number of links that pass through the nodes



Top interviewees by the overall degree (in-degree and out-degree)
(* 2 or more connections)

Average weighted degree

Average number of links between two individuals



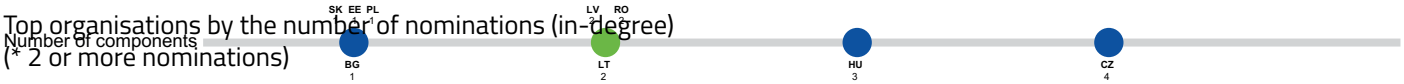
Diameter

Size of steps between any pair of nodes

Number of components

Number of discrete groups in the network

Top organisations by the number of nominations (in-degree)
(* 2 or more nominations)

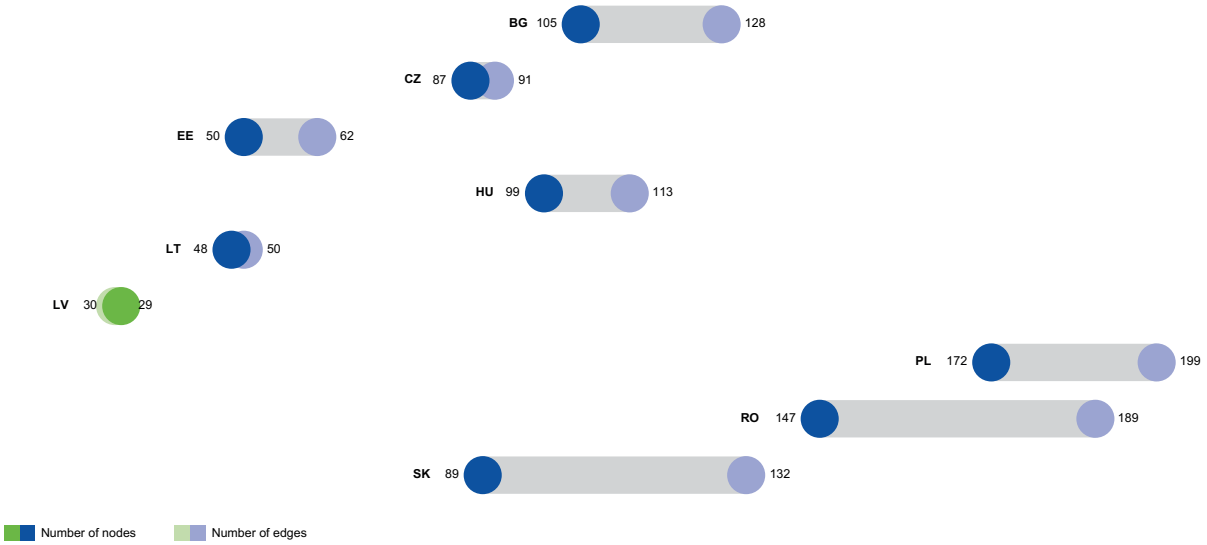


Number of r

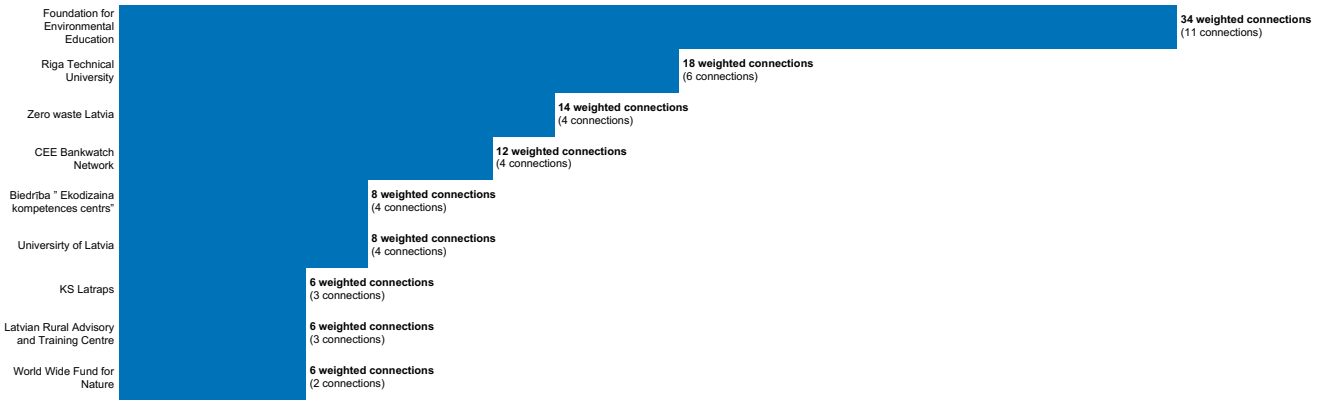
Number of i

Number of edges (links)

Number of relationships between individual in the network (in total)

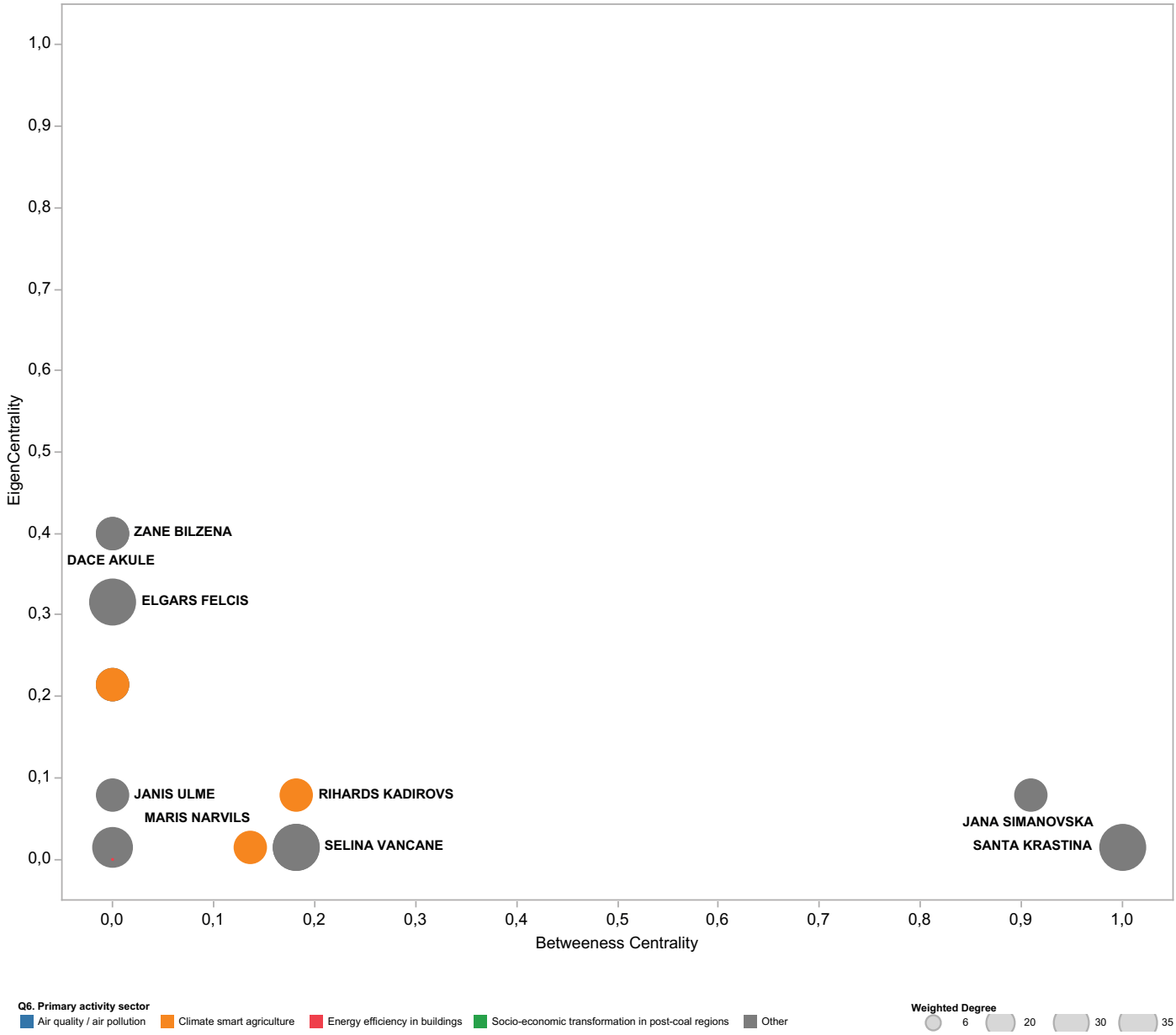


Top organisations by the overall degree (in-degree and out-degree)
(* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector
(* 2 or more nominations)

Distribution of interviewees by the type of role they play in the network



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 9: Qualitative and Network Analysis Estonia

Author: **Ragmar Saksing**

Reaching climate neutrality in Estonia

Many Estonian support organizations in the climate movement align behind the SEI report[1], which concludes that reaching climate neutrality in Estonia by 2050 is technically possible if all the sectors (private, public and non-profit) contribute towards this goal. Climate neutrality can also be potentially profitable on the long term provided that strategically wise investments are carried out to reach the goal[2].

Energy efficiency in buildings

Construction and housing sector

The construction sector is one of the biggest employers in Estonia, providing jobs for almost 10% of the employed population. Combined with the production of building materials, the construction sector contributes to approximately 7% of Estonia's GDP[3].

Energy performance of buildings

Approximately 33% of the energy utilised in Estonia is used for houses. Therefore, increasing the energy performance of residential buildings is highly important for Estonia. The Ministry of Economic Affairs and Communications has developed support and loan programmes for the renovation of apartment houses for the purposes of reducing the energy consumption of such buildings. In 2009–2013, the state supported the renovation of more than 600 housing units.

In 2014–2020, the state will invest more than 100 million euros from Structural Funds Financing to improve the energy performance of buildings; according to the estimates, this amount will be sufficient to renovate approximately 1,000 housing units. Apart from improving the energy performance of buildings, complex renovation will improve the internal climate of buildings, help to maintain and protect the existing structures and will improve the general appearance of the facades[4].

1 Stockholm Environmental Institute https://www.sei.org/
2 https://www.sei.org/publications/reaching-climate-neutrality-in-estonia/
3 https://www.mkm.ee/en/objectives-activities/construction-and-housing-sector)
4 https://www.mkm.ee/en/objectives-activities/construction-and-housing-sector/energy-performance-buildings

Nearly zero-energy buildings

Starting the construction of technically and economically viable nearly zero-energy buildings will be the biggest challenge of the construction sector over the years to come. The construction of nearly zero-energy buildings requires improved awareness and the development of skills of both customers, project designers, consultants and everyone else participating in the construction process.

Experts consider that the move to Class A or near zero-energy buildings will put a strain on the construction of new homes for a while. In addition to the higher construction costs, there is a shortage of specialists who can design and construct buildings to such standards.

The Ministry of Economic Affairs and Communications (MEAC) announced in January 2019 that from 2020 only buildings with energy class A will receive a construction permit in Estonia. Construction professionals are critical of the plan, which is why MEAC has since slightly softened its rhetoric.

The requirement for near-zero energy buildings applies to building permits issued from 2020 onwards, regarding buildings whose construction begins after 2020. The aim is to reduce the heating costs of buildings by a fifth over a 30-year period so that new buildings can handle 100 kWh of energy per square meter (for comparison, buildings with a power consumption of 160-200 kWh / m2 are currently under construction). The requirement stems from a European Union directive that requires Member States to set minimum energy efficiency requirements that are technically sound and provide the best amount of initial investment and fixed costs of energy use. According to a study carried out at Tallinn University of Technology (TalTech), the cost-optimal level for the construction of new buildings has already risen to the energy class A level[5].

Innovation

There are several energy efficiency awareness initiatives at present. One program is Interreg Project EFFECT4buildings. Estonia's team is formed by Tallinn Science Park Tehnopol and State Real Estate Ltd. EFFECT4buildings develops

5 https://www.err.ee/687567/liginullenergia-noue-pidurd-ab-uute-elamute-ehitamist

in collaboration with public building managers a comprehensive decision-making support toolbox with a set of financial instruments to unlock investments and lower the risks of implementing energy efficiency measures (retrofitting, upgrading and deep renovation) in buildings owned by public stakeholders.

Public opinion

Public opinion is positive, with the City of Tallinn and Tallinn Technical University (TalTech) having achieved considerable progress. Several illustrative buildings (Teacher's Home, Seaplane Harbour and more) have been built. The topic is of great interest to entrepreneurs through conferences and information days. Jarek Kurnitski from Tal Tech is a leading personality in the domain[6]. His studies and main research area include:

- Energy performance and indoor climate analysis of buildings and systems;
- Low energy and nearly zero energy buildings.

The concern is that companies are currently calculating acquisition cost, not maintenance cost. If this aspect changes then the buyers' position also changes.

Climate-smart agriculture

The topic of climate-smart agriculture is dealt in Estonia by the Estonian University of Life Sciences[7], mainly at the scientific level.Other key players include the Ministry of Rural Affairs[8], Tallinn University[9] and the NGO Field Crops Cluster[10]. In the business line, E-Agronom is a rising star. E-Agronom[11] is an IT company that helps grain farmers focus on farming. In general, every Estonian sector is IT driven. Information technology has been widely used in the Estonian agricultural sector as well. However, there are no major breakthroughs, because the volume of agriculture is not that big.

Public and public sector opinion

The public sector generally believes that the agriculture sector must move towards sustainable environmental management. The conference "Agriculture, Fisheries and Rural Life: Yesterday, Today and Tomorrow" held in Tallinn, Estonia on the 13th of November stressed on the importance of agriculture and fisheries development plan in establishing a common goal.

Socio-economic transformation in post-coal regions

General context

Over 90% of Estonia's CO2 emissions come from burning oil shale for electricity, and oil shale contributes significantly to other pollution and waste levels in the country. Praxis, a Tallinn-based consultancy firm, has analysed the socio-economic costs of using oil shale, but, in doing so, has failed to interpret the cost of PM2.5 air pollution and water usage. When factored in, the total socio-economic cost of producing electricity from oil shale far exceeds the benefits.

The Estonian electricity grid is well connected with the country's neighbours, and large amounts of oil shale energy are for export. The costs of wasted resources, damage to health and environmental destruction, however, stay in Estonia. The oil shale industry seems to provide very little economic benefit compared to the massive pollution toll. The positive aspect of the oil shale industry is that it provides with numerous jobs (about six thousand people work in mining and energy production). This industry offers relatively high-paying jobs in a region with already high unemployment rates. Associated social problems should be a national priority, and new investments in the region are required to implement a just economic transition.

With the rising CO2 prices, electricity production is getting very expensive and new renewable energy sources are taking over the market. Solar energy is booming in Estonia and is expected to intensify after 2020 due to the requirements for near-zero energy buildings, but large-scale energy production is hampered by the market situation. The oil shale industry is heavily subsidised: the industry enjoys exceptional marginal resource and water costs, which allow electricity to be sold below its actual cost[12].

6 https://www.etis.ee/CV/Jarek_Kurnitski/est
7 https://www.emu.ee/en/
8 https://www.agri.ee/en
9 https://www.tlu.ee/en
10 http://www.mullakaitse.ee
11 https://eagronom.com/en/

12 https://estonianworld.com/opinion/teet-randma-estonias-dirty-secret/

The development of wind farms was hindered by the restriction of the Ministry of Defence. On November 7, 2019, the wind energy sector achieved a breakthrough when the government decided to make the necessary investments to improve air monitoring capabilities in north-eastern Estonia so that wind farms could be built in Virumaa without height restrictions[13].

Air pollution

General context

Estonians are more positive in assessing air quality than EU citizens on average and are not as keen on tightening air purity standards, according to a Eurobarometer survey[14].

The European Environment Agency (EEA) and the European Commission recently launched a new service, the European Air Quality Index, which allows users to monitor air quality in European cities and regions. Compared to other European countries, Estonia's air quality is good.

Based on the results of the air quality monitoring, the quality of the air outside Estonia is still good for the above-mentioned pollutants. Fine particles, whose negative impact on human health worldwide has been receiving increasing attention in recent years, can be considered as a major urban air problem. The sources of fine particulates are heating, including furnace heating and central heating boilers, road transport and various industrial plants. According to the Estonian National Environmental Surveys 2016, the average concentration of fine particles in most Estonian urban air monitoring stations has decreased compared to the previous year, as have the daily average maxima and the number of exceedances[15].

Outdoor air quality monitoring is part of the national environmental monitoring commissioned by the Environmental Agency and conducted by the Estonian Environmental Research Centre. Estonia has a total of nine national outdoor monitoring stations (six urban and three background monitoring stations). In addition to national monitoring, outdoor air quality monitoring is also carried out by several companies whose data is easily accessible[16].

According to the data from the World Health Organization, Estonia is among the countries with the cleanest air[17]. That's why these topics aren't on the agenda. Yes, we can talk about air quality in industrial areas and in the oil shale industry. More thoroughly than mentioned above, there is no data to comment on.

Innovation

The main environmental and green technology support organizations in Estonia:

- Tehnopol is a science and business campus for innovative tech companies www.tehnopol.ee
- Stockholm Environment Institute: bridging science and policy www.sei.org
- Ministry of the Environment www.envir.ee
- PAKRI Science and Industrial Park www.pakri.ee
- Nordic Council of Ministers´ Office in Estonia www.norden.ee
- Tallinn University of Technology www.taltech.ee
- Estonian non-profit that supports and funds early stage green technology startups www.cleantechforest.ee
- The Estonian Renewable Energy Association www.taastuvenergeetika.ee
- Renewable energy company that is active in the
- Baltics and surrounding markets. www.sunly.ee
- Environnemental Investment Centre www.kik.ee
- The Estonian Wind Power Association www.tuuleenergia.ee
- World Energy Council Estonia www.wec-estonia.ee
- Estonian Association for Environmental Management www.ekja.ee
- Estonian startup ecosystem www.startupestonia.ee
- Estonian Association for the Club of Rome: www.roomaklubi.com

Estonia has a busy, supportive and open startup ecosystem eager to support ambitious individuals and startups. In total Estonia has 110 organisations which provide a wide range of services for startups. These new entrepreneurs create innovation, including in the areas of environment and climate.

13 https://majandus24.postimees.ee/6820649/tuuleparkidele-tehakse-tee-vabaks-riik-ostab-uue-radari
14 https://www.err.ee/1007874/eestlased-tahtsustavad-ohu-puhtust-vahem-kui-eurooplased-keskmiselt
15 https://www.keskkonnaagentuur.ee/et/eesmargid-tegevused/valisohk/kui-puhas-ohk-mida-hingad
16 http://airviro.klab.ee
17 https://estonianworld.com/life/estonia-has-one-of-the-cleanest-airs-in-the-world-who

Cleantech start-ups

48 start-ups, total turnover 14,8 million € and 212 employees[18]. Clean technology is an umbrella term which is used to define technologies which optimize the use of natural resources, produce energy from renewable sources, increase efficiency and productivity, generate less waste and cause less environmental pollution.

Cleantech is comprised of sustainable solutions in the fields of energy, water, transportation, agriculture and manufacturing, including green technologies, smart city solutions, advanced material, smart grids, water treatment, efficient energy storage and distributed energy systems. Innovation in the energy performance of buildings is high. There are many companies in Estonia that deal with the energy efficiency of buildings[19].

Agrytech & Foodtech

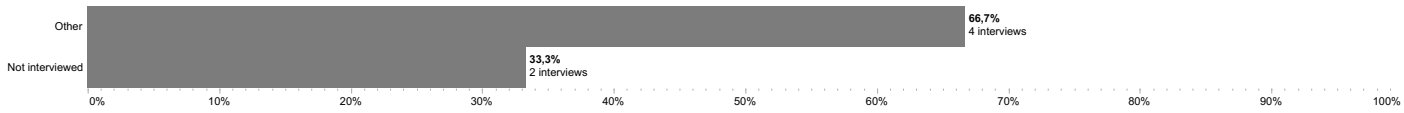
15 start-ups, total turnover 2,6 million € and 92 employees[20]. The sector covers technologies used in agriculture, forestry, fishing, hunting, animal husbandry, food and beverage fields, horticulture, and aquaculture with the aim of improving yield, efficiency, and profitability through information monitoring and analysis of relevant indicators such as weather, pests, and soil and air temperature. Also, scientifically driven farm practices, equipment or processing including bio-engineered, transgenic crops, proprietary breeding, GPS, water management and improved equipment, conservation-based best management practices, food manufacturing and related advancements. Food technologies consists any technology applied to the production, selling (including supply chain and distribution), or serving food and beverage.

18 https://startupestonia.ee/startups
19 http://www.effect4buildings.se/en/Pages/Technological-solutions.aspx
20 https://startupestonia.ee/startups

Facts and figures regarding the data collection process

Data collection period: 25/11/2019 - 29/11/2019
Number of initial contacts: 6
Initial distribution of contacts by gender:

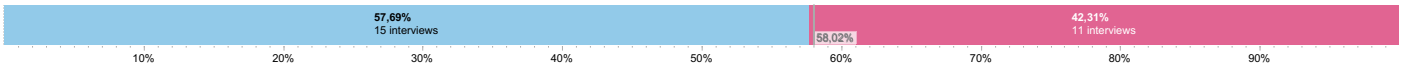
Initial distribution of contacts by thematic sector:



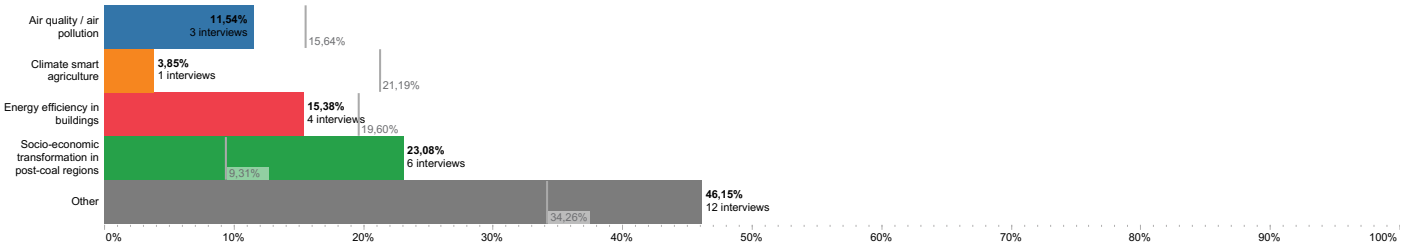
Number of contacted persons: 26
Finalised interviews: 26
Number of people not interested in participating in the study: 0
Response rate: 100%
Total number of nominations: 62
Total number of unique nominations: 50
Average amount of nominations by interview: 2.38

Interviewee profiles

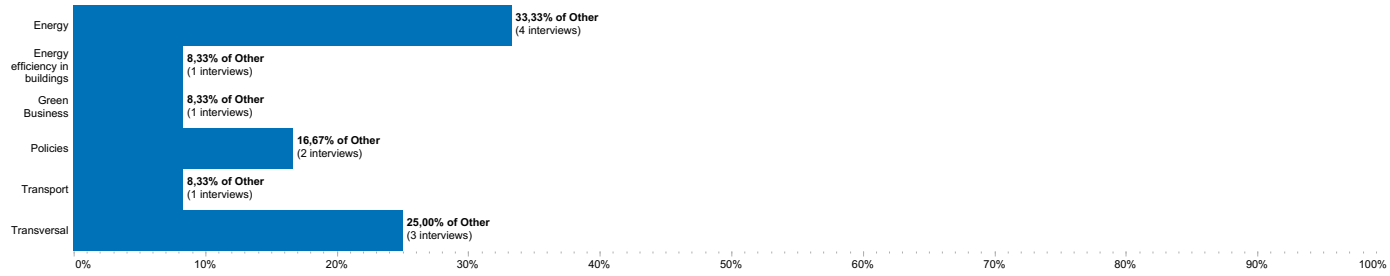
Distribution of interviewees by gender
(* data based on 26 conducted interviews)



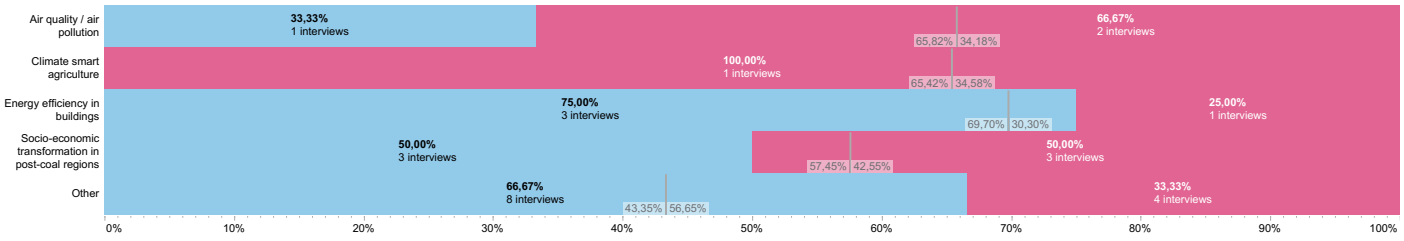
Distribution of interviewees by primary activity sector
(* data based on 26 conducted interviews)



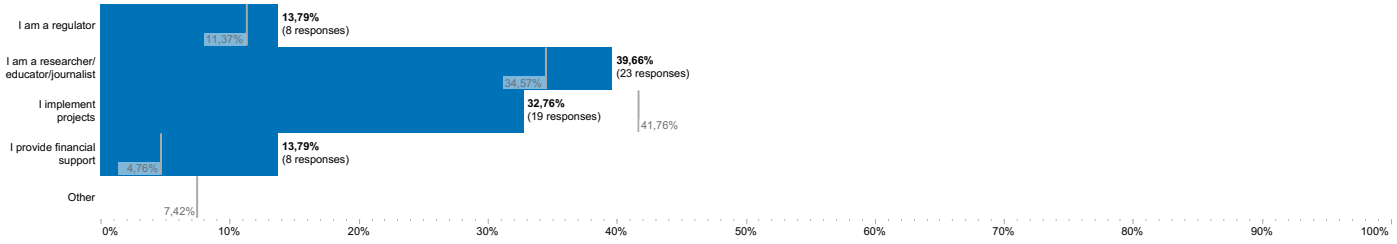
Breakdown of Other primary activity sectors
(* data based on 26 conducted interviews)



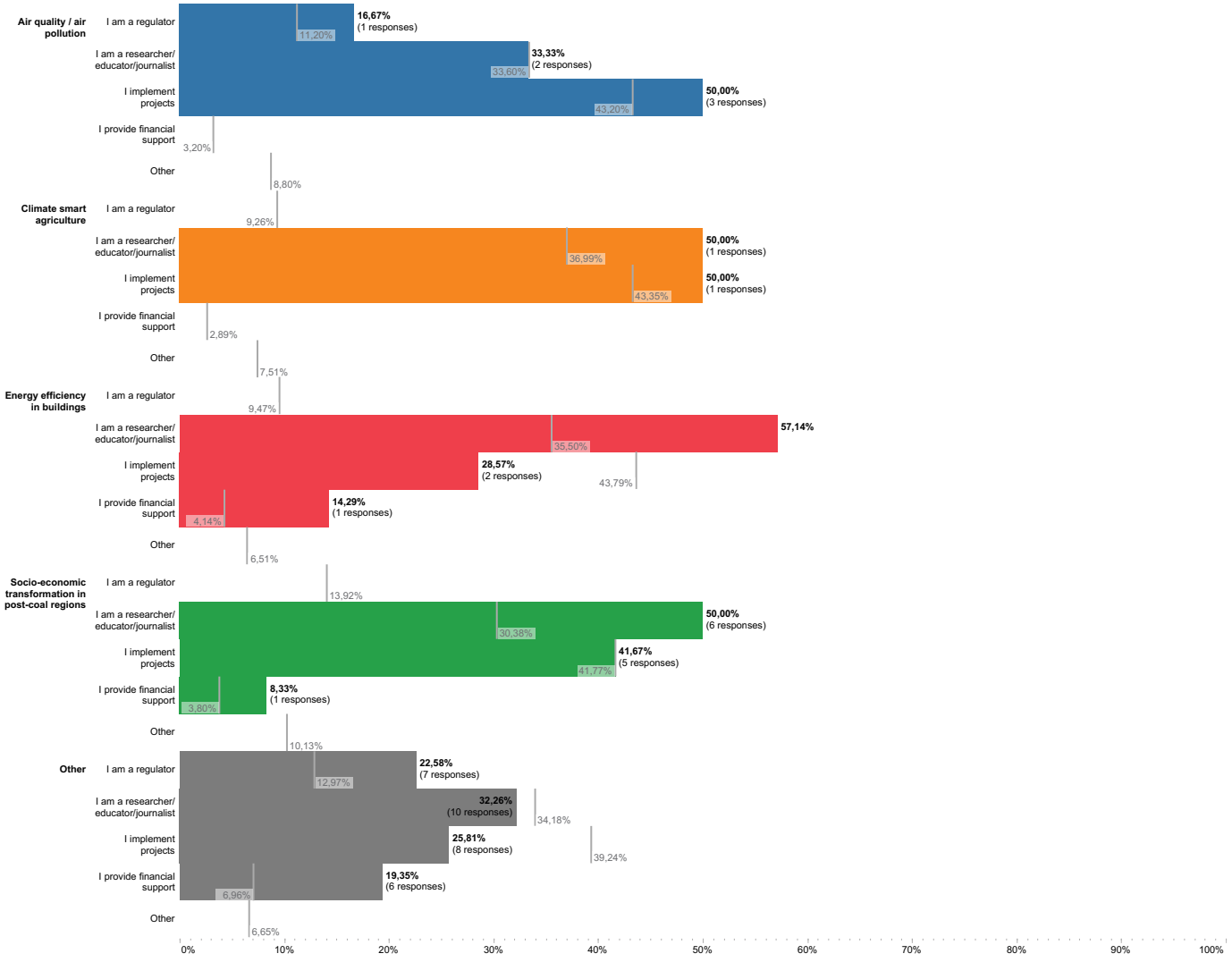
Gender distribution by primary activity sector
(* data based on 26 conducted interviews)



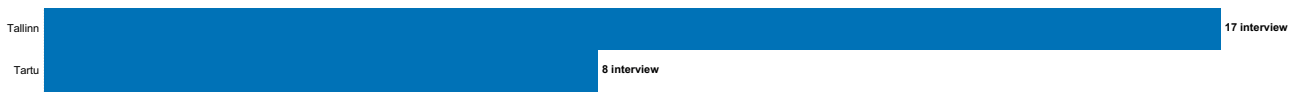
Distribution of interviewees by the type of role
(* data based on 26 conducted interviews)



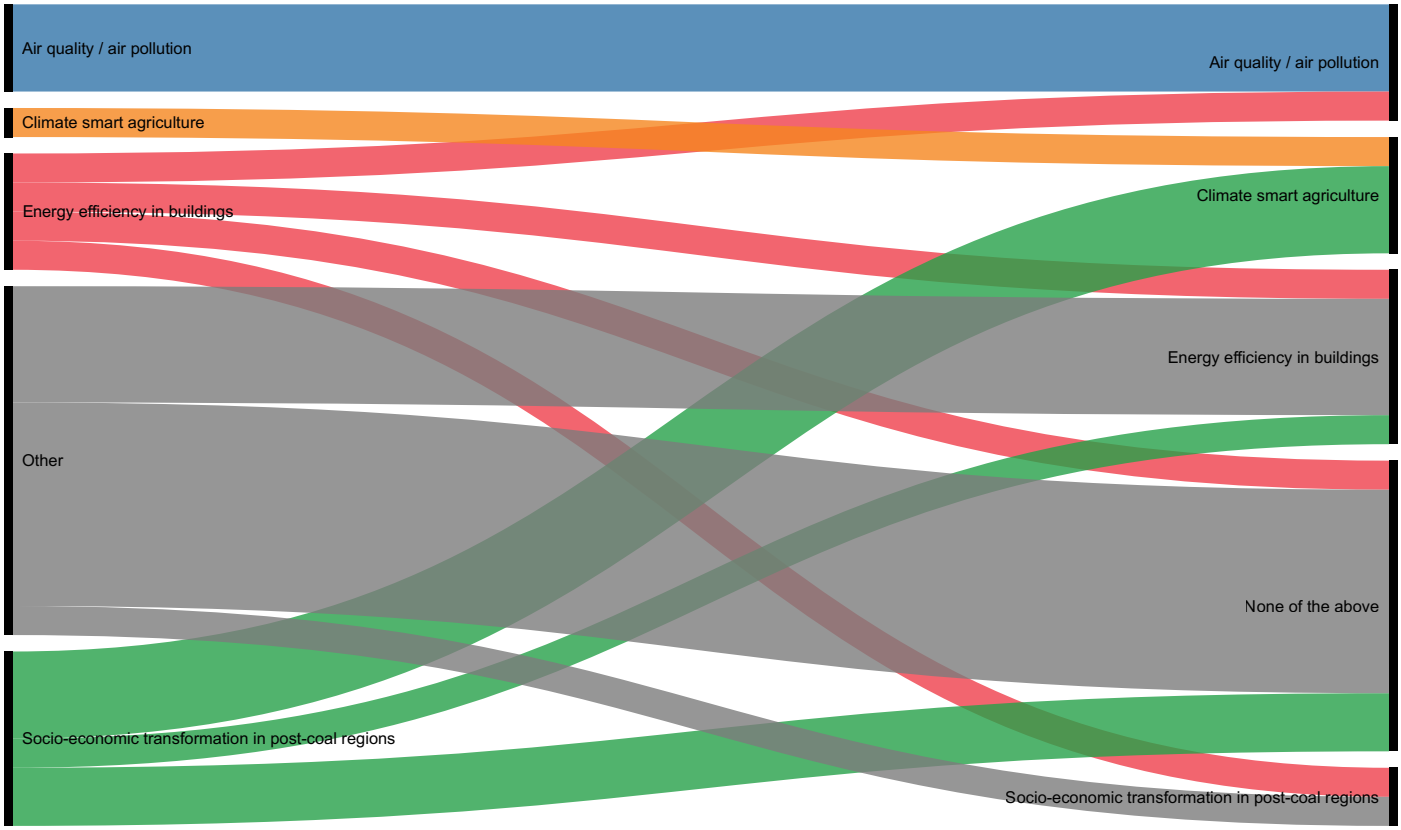
Distribution of interviewees by the type of role they play within each primary activity sector
(* data based on 26 conducted interviews)



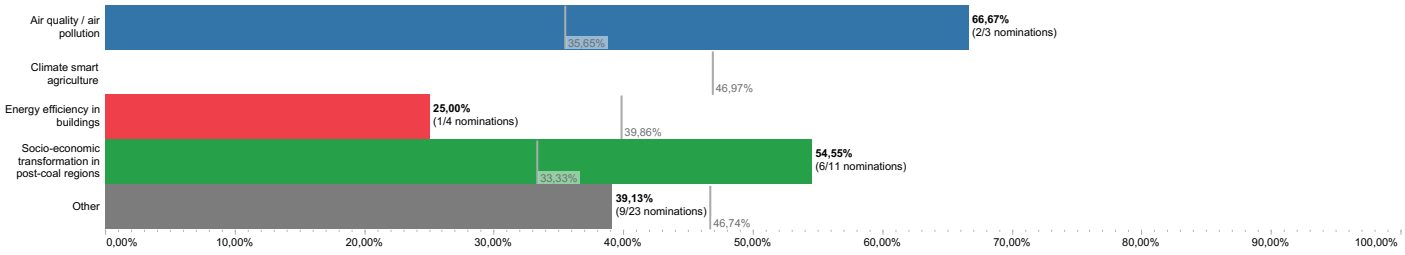
Distribution of interviews by region
(* more then 2 interviewees)



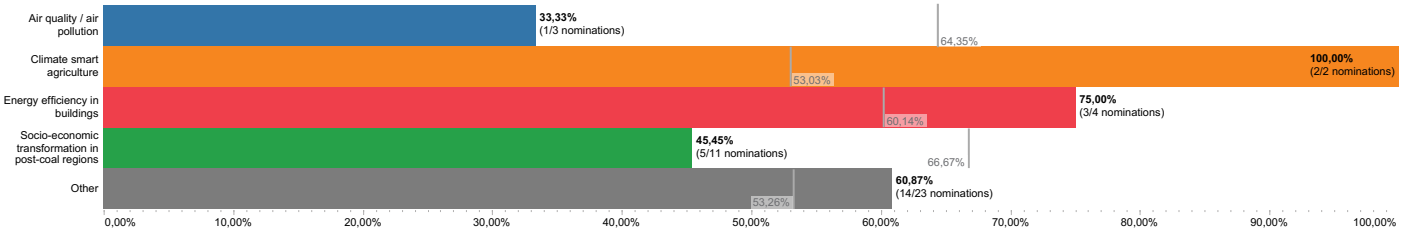
Distribution of interviewees by the correlation between primary activity sector and secondary activity sector
(* data based on 26 conducted interviews)



Endogamy
Measures the percentage of nominations to the same activity sector
(* data based on 26 conducted interviews)

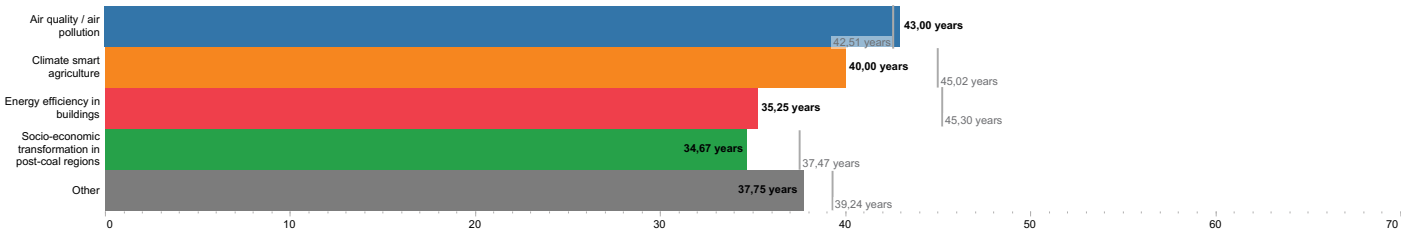


Exogamy
Measures the percentage of nominations to other primary activity sectors
(* data based on 26 conducted interviews)

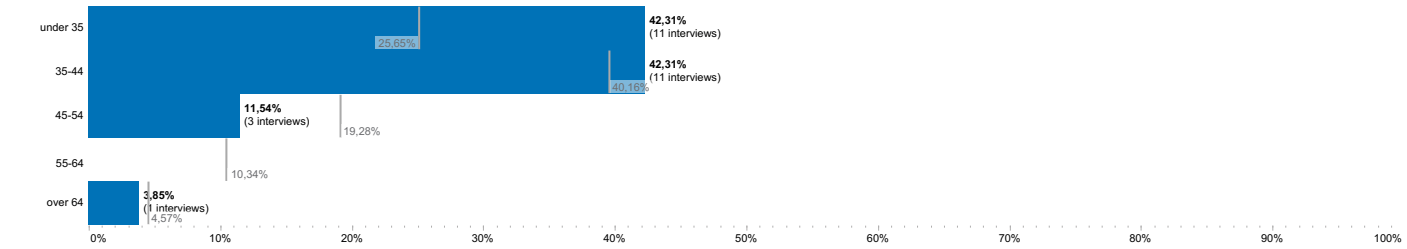


Average age of interviewees: 37.35 years (Regional average: 41.62 years)
(* data based on 26 conducted interviews)

Average age by primary activity sector
(* data based on 26 conducted interviews)



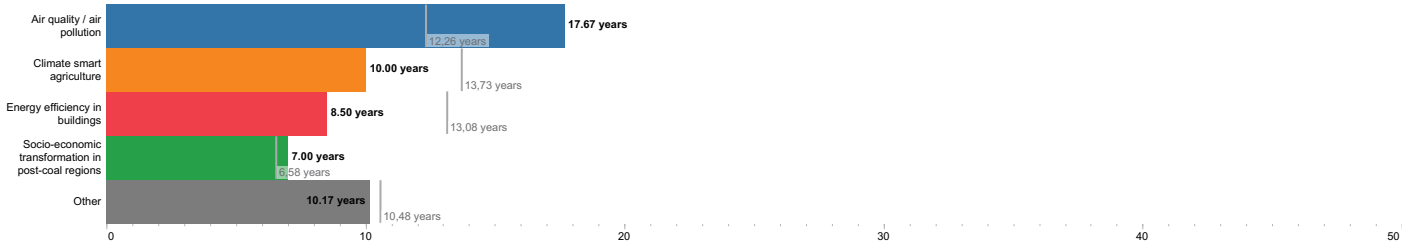
Distribution of interviewees by age group (under 34, 35-44, 45-54, 55-64, over 64 years)
(* data based on 26 conducted interviews)



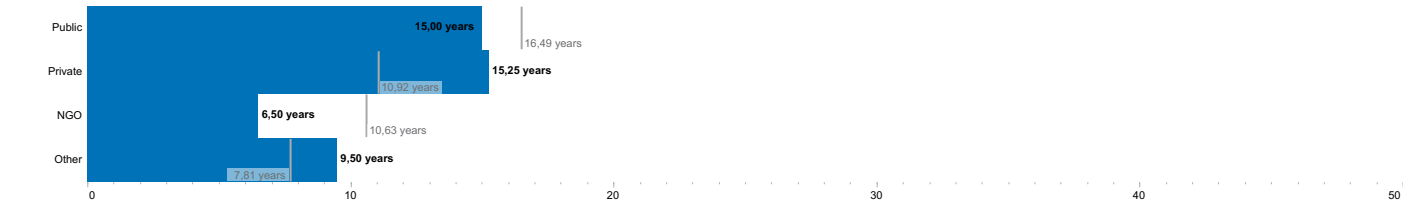
Average number of years of experience: 10.40 years (Reginal average: 11.58 years)
(* data based on 26 conducted interviews)

Average number of years of experience by gender
(* data based on 26 conducted interviews)

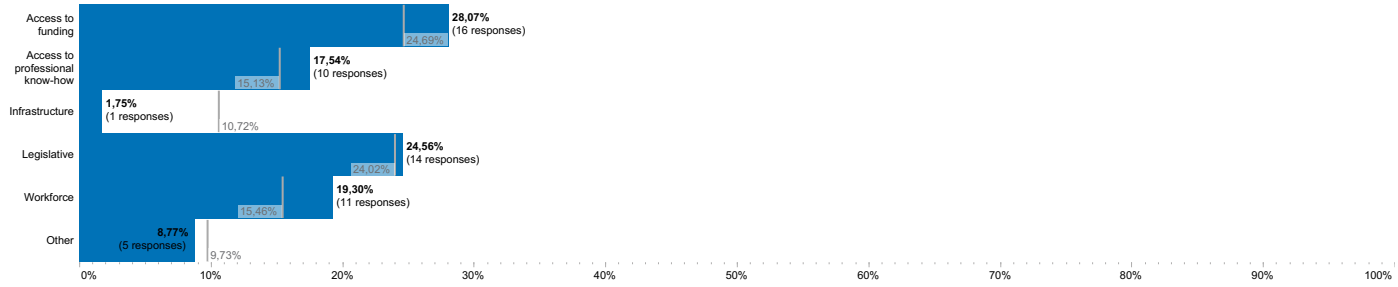
Average number of years of experience by primary activity sector
(* data based on 26 conducted interviews)



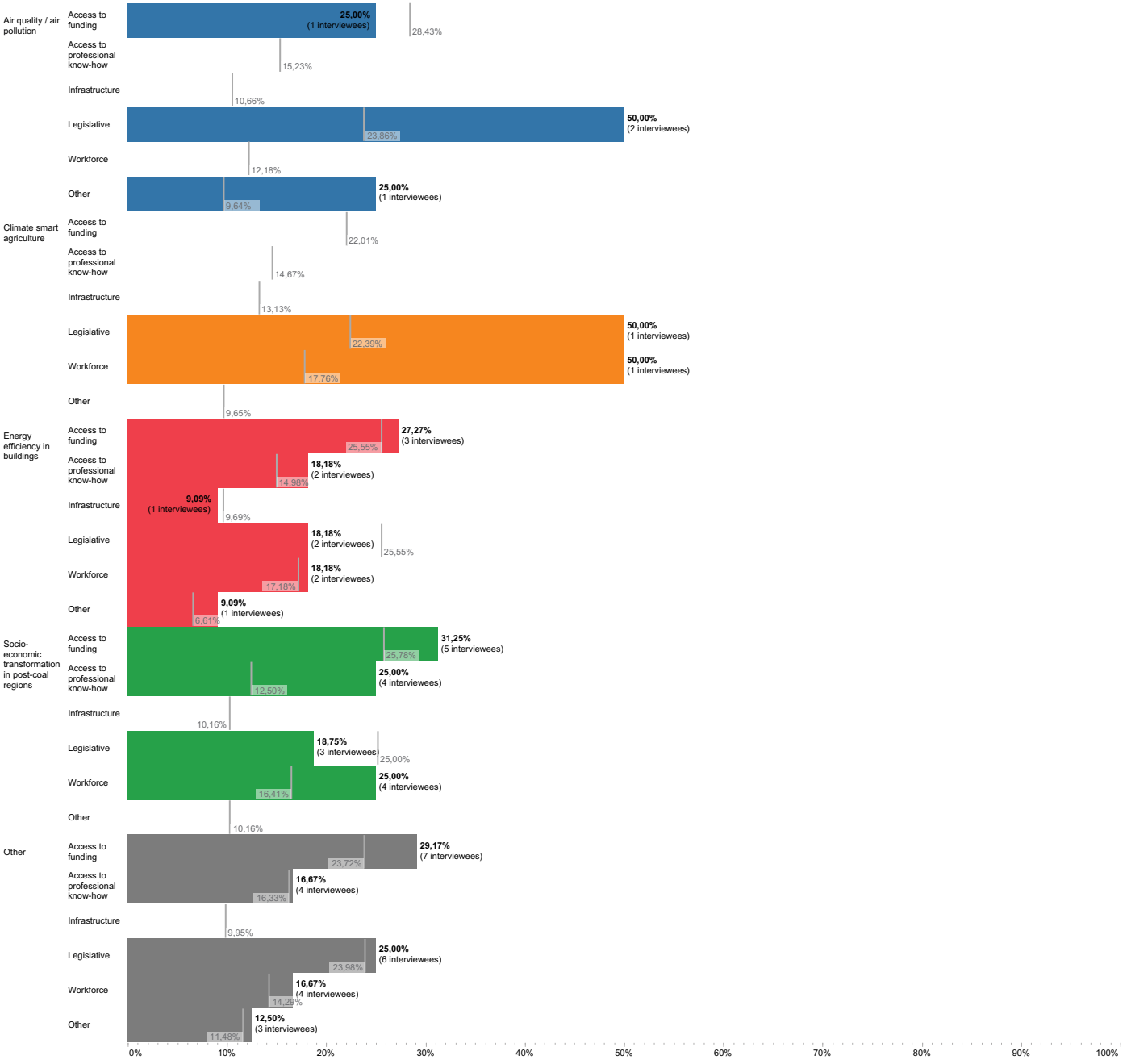
Average number of years of experience by the legal status of their member association
(* data based on 26 conducted interviews)



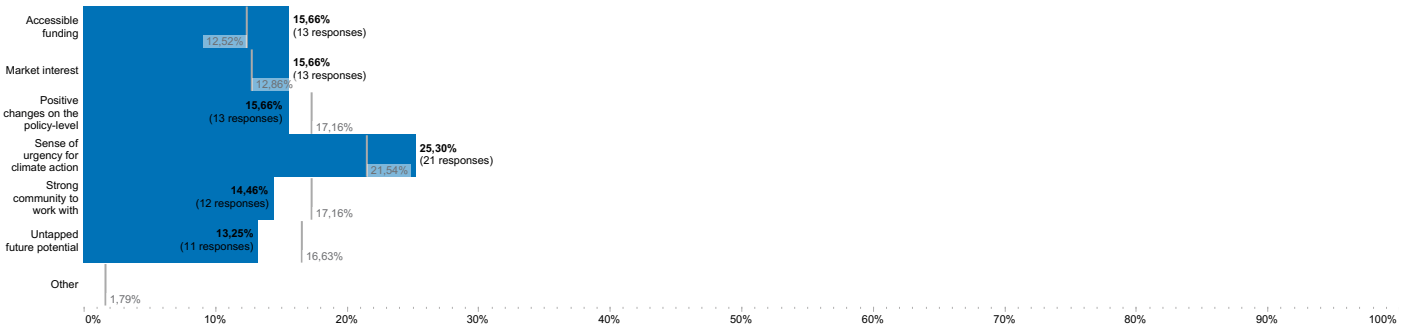
Distribution of interviewees by Barriers/Challenges category
(* data based on 26 conducted interviews)



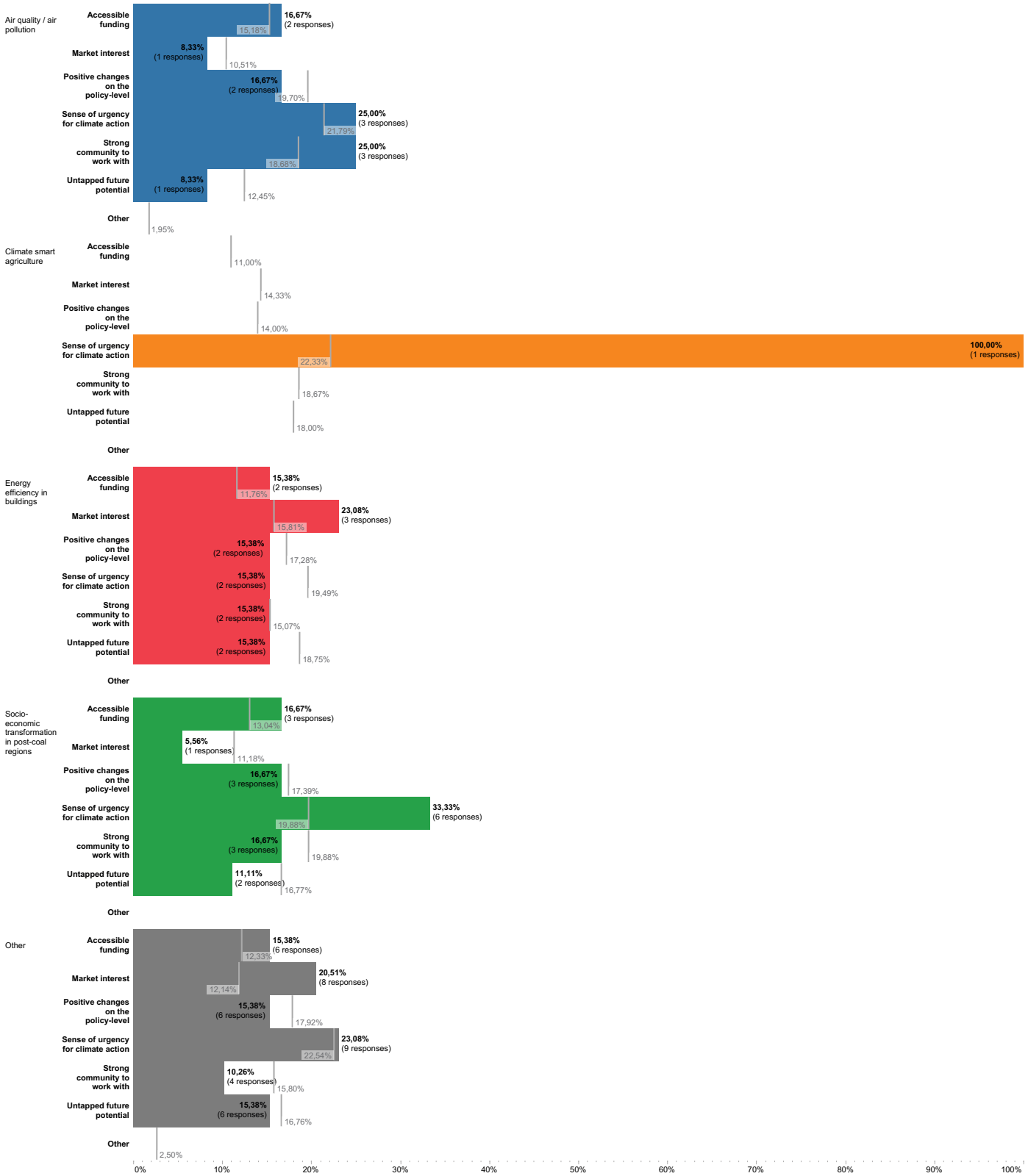
Distribution of interviewees by Barriers/Challenges category and primary activity sector
(* data based on 26 conducted interviews)



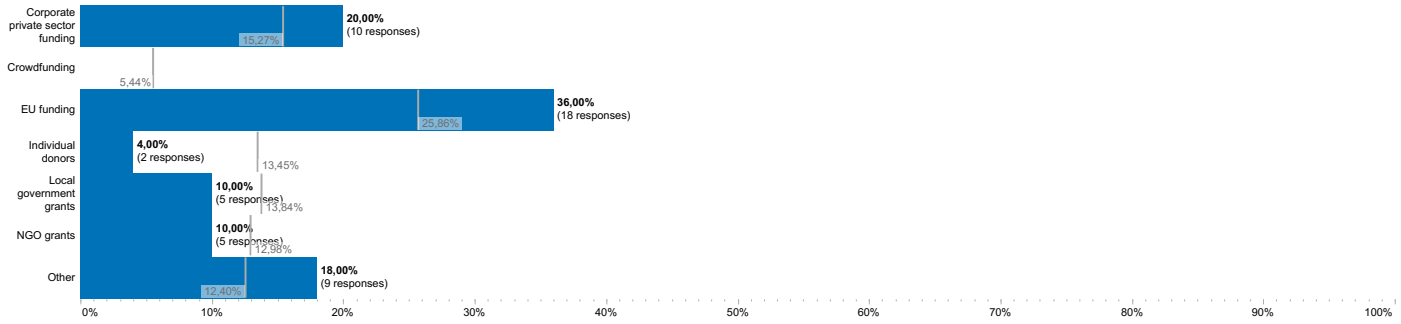
Distribution of interviewees by Opportunities category
(* data based on 26 conducted interviews)



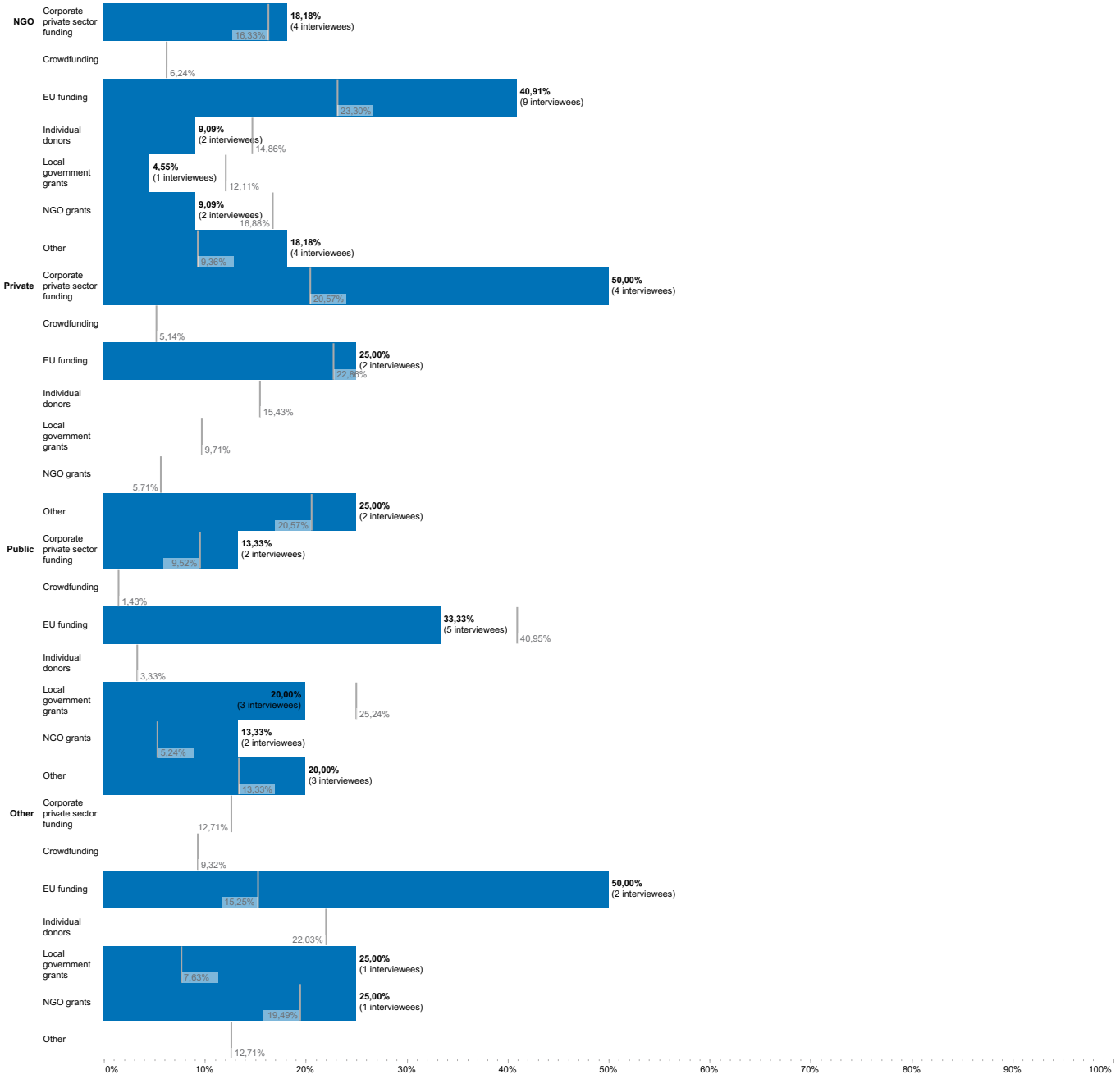
Distribution of interviewees by Opportunities category and primary activity sector
(* data based on 26 conducted interviews)



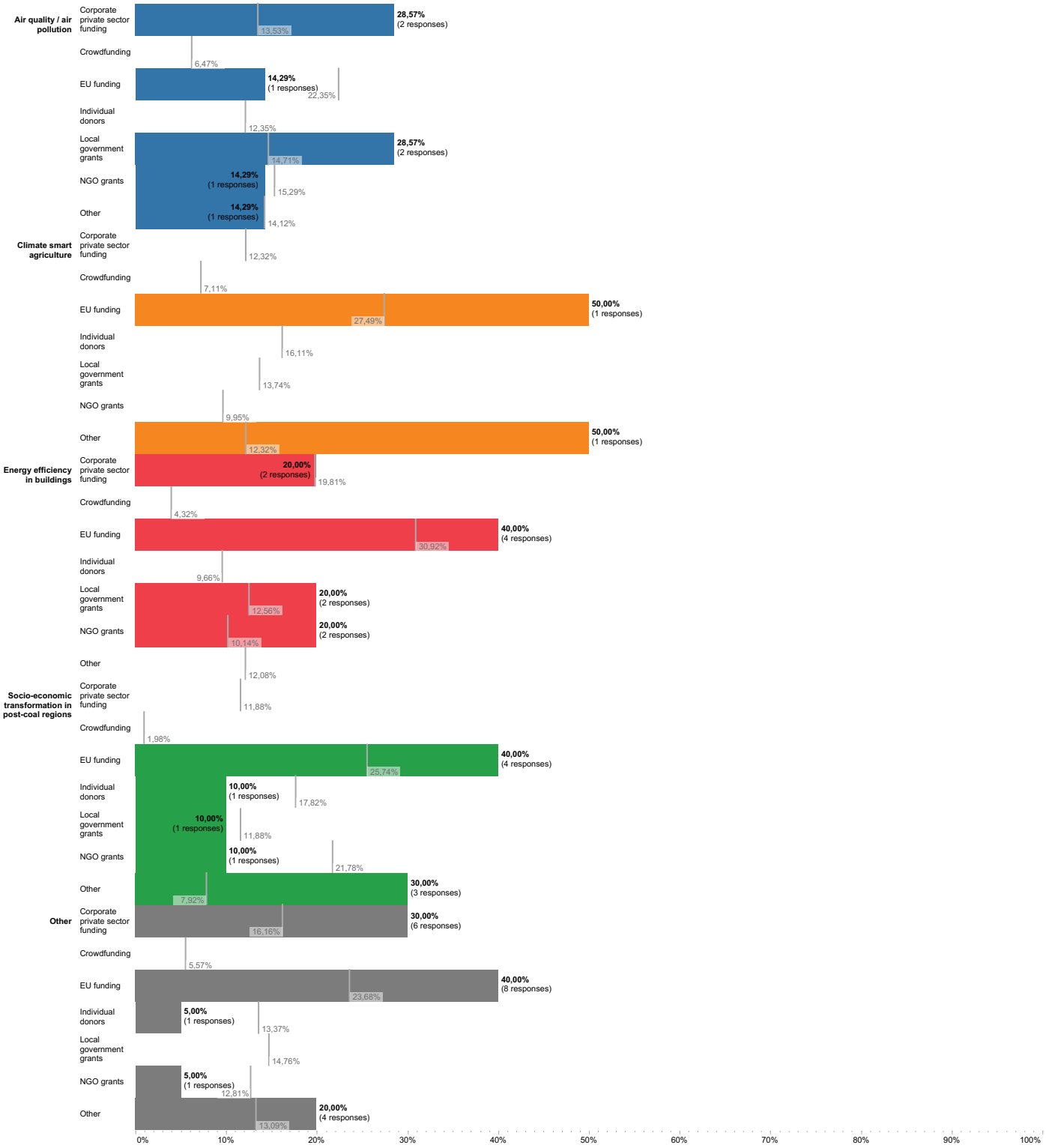
Distribution of interviewees by Funding opportunities category
(* data based on 26 conducted interviews)



Distribution of interviewees by Funding opportunities category and legal status of member association
(* data based on 26 conducted interviews)

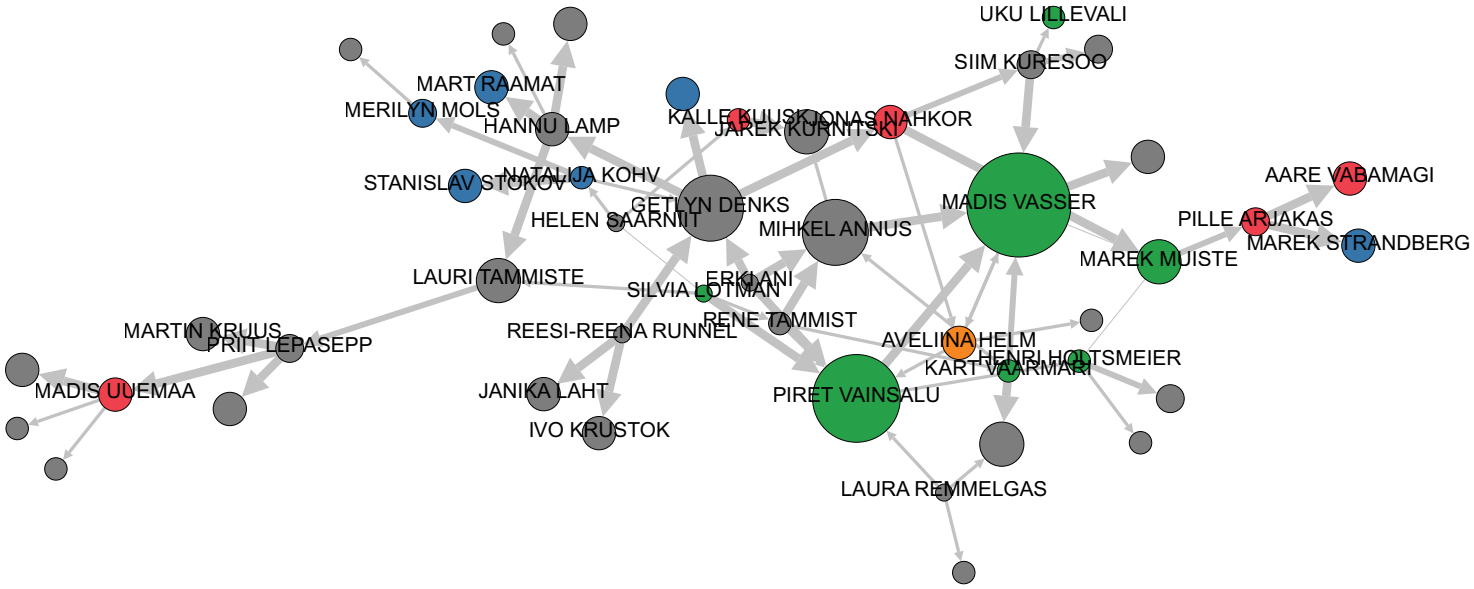


Distribution of interviewees by Funding opportunities category and primary activity sector
(* data based on 26 conducted interviews)



Social network analysis

Overall social network map diagram (50 nodes / 62 edges)



Primary activity sector:

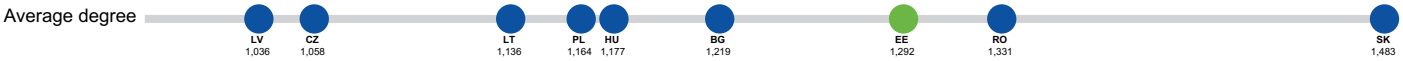
- Air quality / air pollution
- Climate-smart agriculture
- Energy efficiency in buildings
- Socio-economic transformation in post-coal regions
- Other

Size based on weighted in-degree of each node (i.e. number of nominations weighted by the relationship type)

Social network statistics

Average degree

Average number of links that pass through the nodes



Average weighted degree

Average number of links that pass through the nodes weighted by the type of connection between two individuals

Diameter

Size of the network. Greatest number of steps between any pair of nodes

Number of components

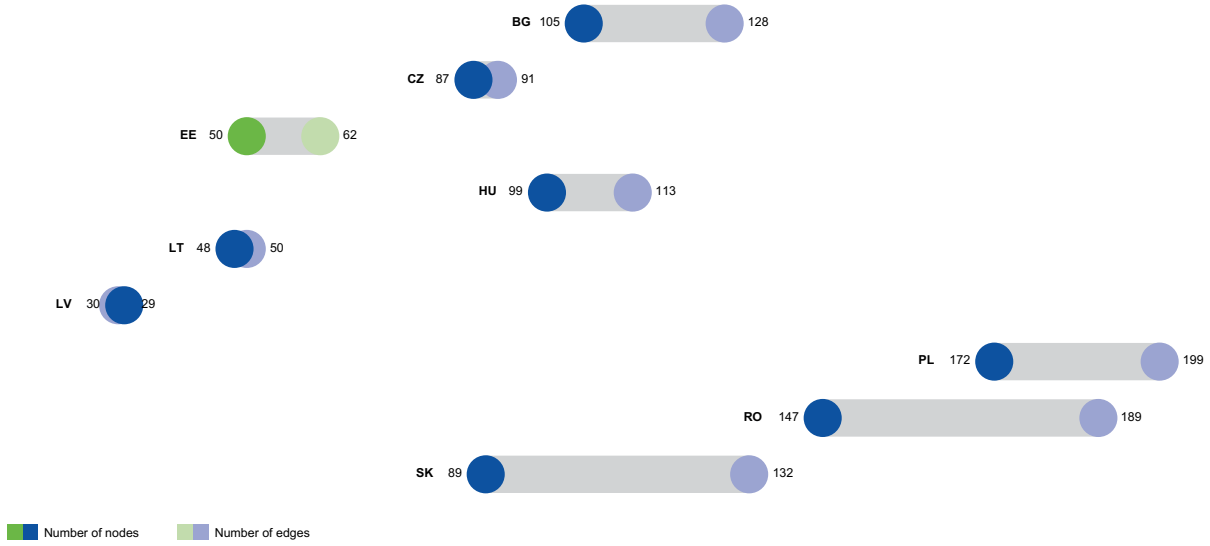
Number of discrete groups in the network

Number of nodes

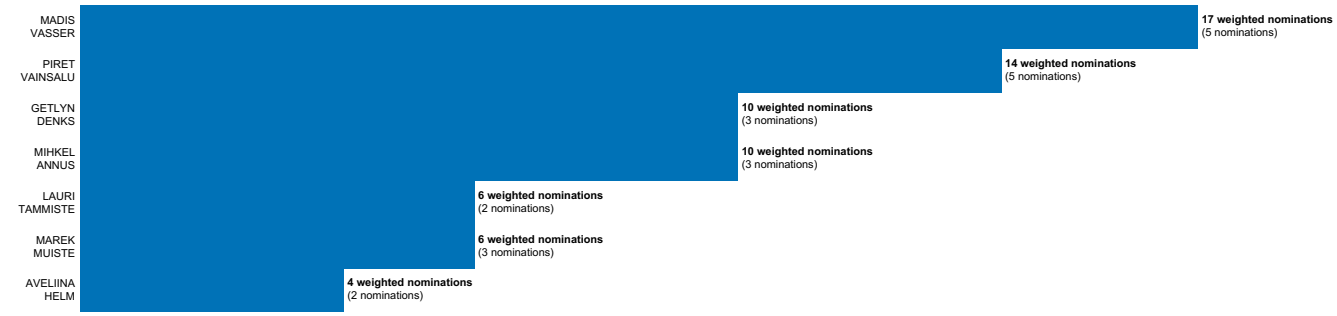
Number of individuals in the network

Number of edges (links)

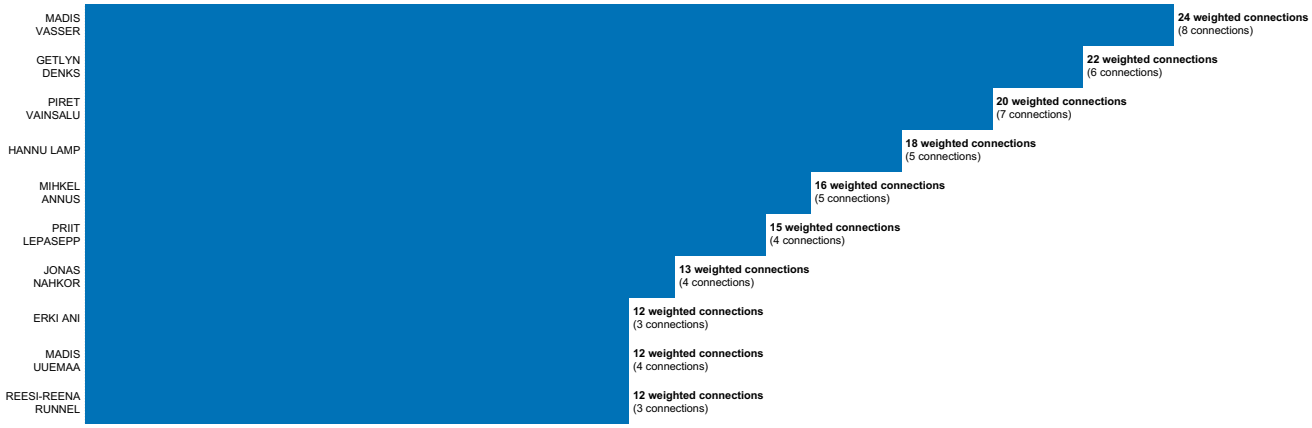
Number of relationships between individual in the network (in total)



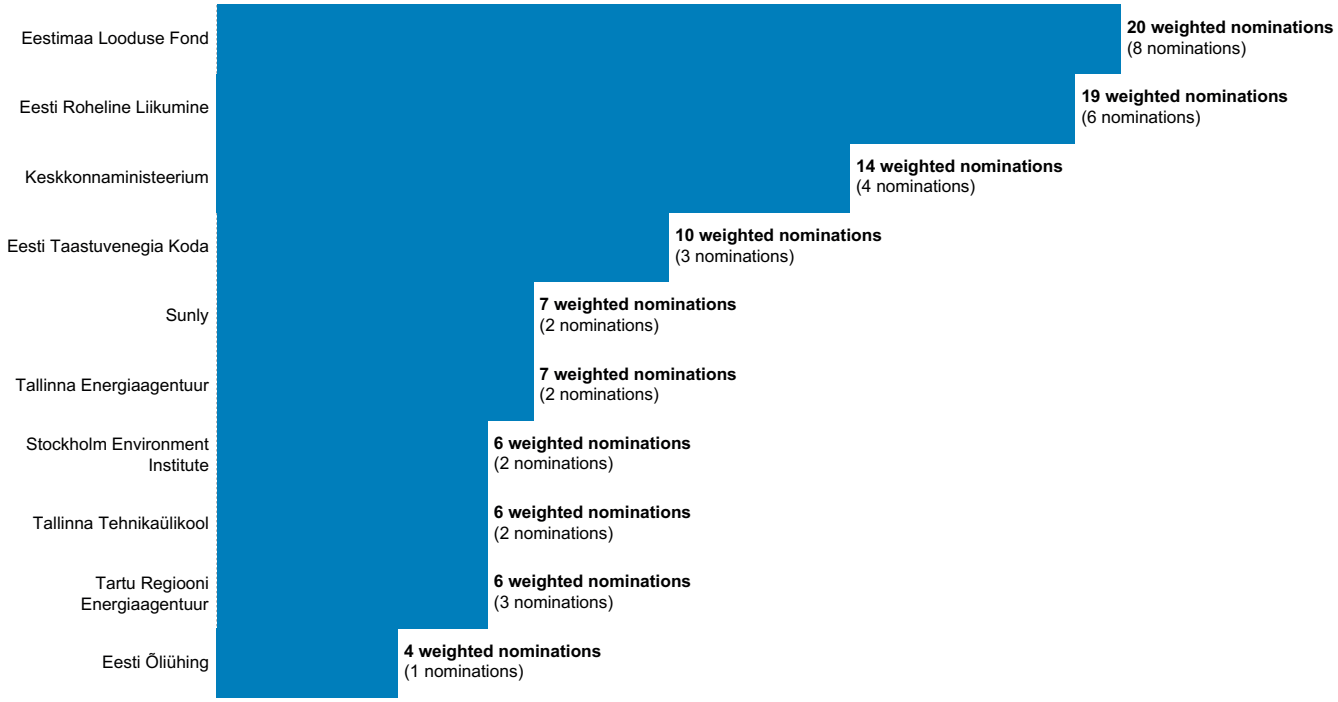
Top interviewees by the number of nominations (weighted in-degree)
(* 2 or more nominations)



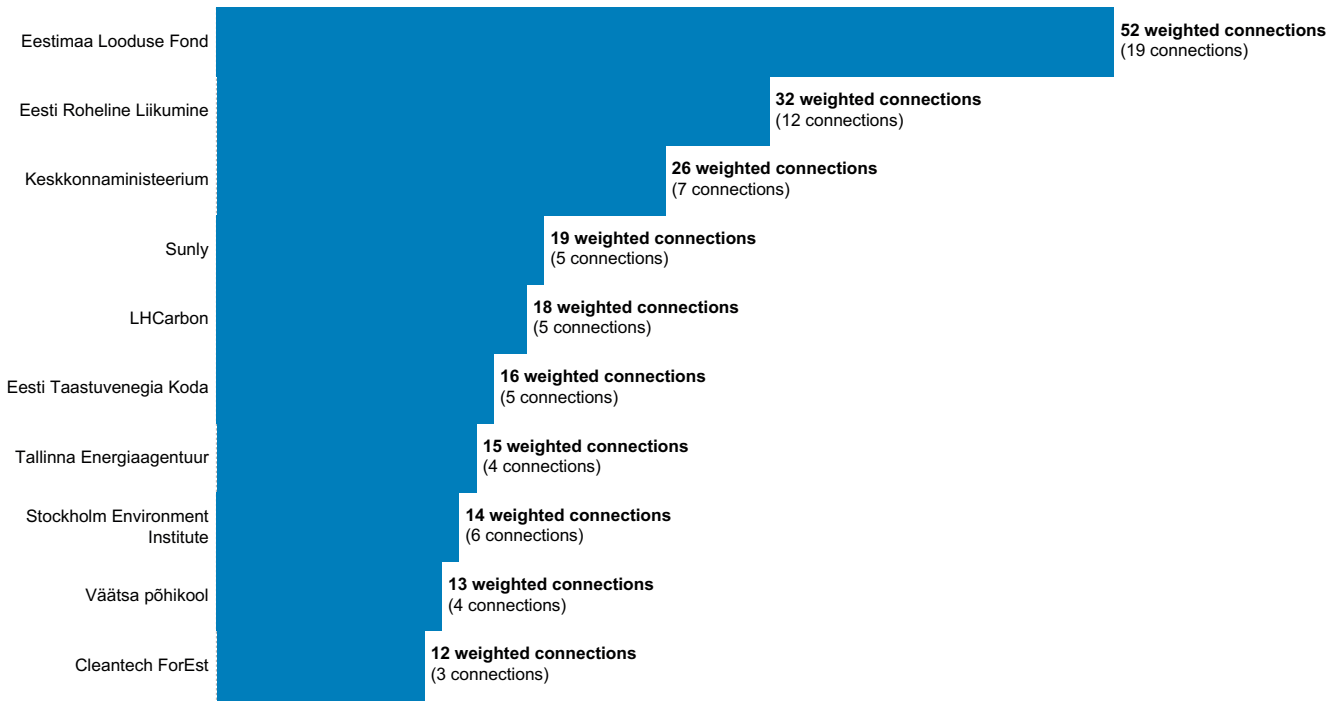
Top interviewees by the overall degree (in-degree and out-degree)
(* 2 or more connections)



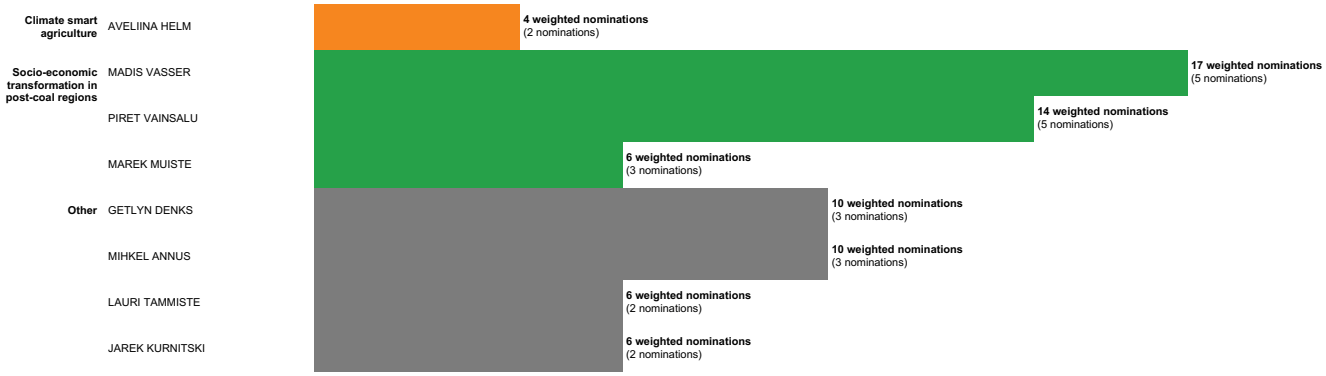
Top organisations by the number of nominations (in-degree)
(* 2 or more nominations)



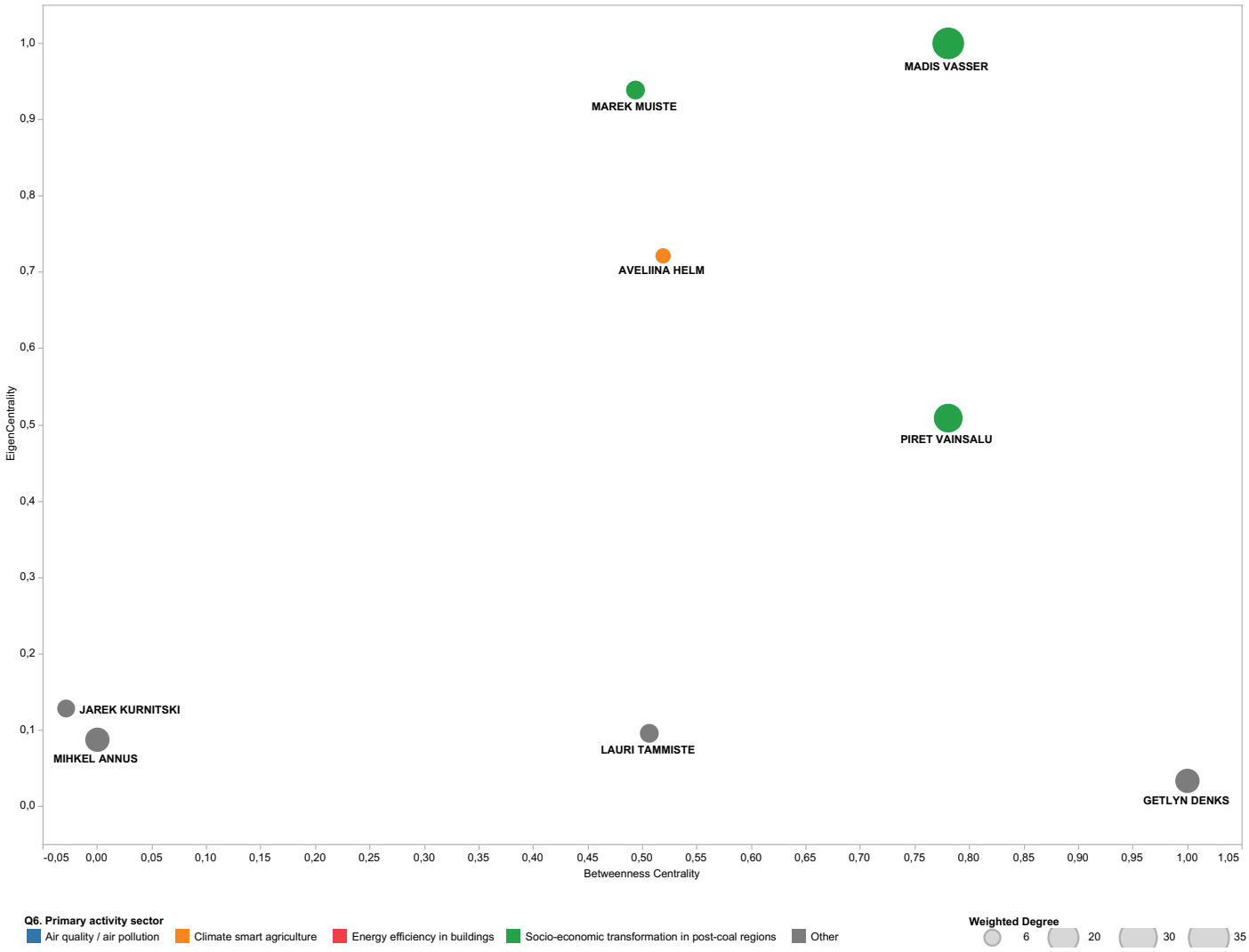
Top organisations by the overall degree (in-degree and out-degree)
(* 2 or more connections)



Top interviewees by the number of nominations (in-degree) and primary activity sector
(* 2 or more nominations)



Distribution of interviewees by the type of role they play in the network
(* interviewees with 2 or more nominations)



Betweenness centrality
Betweenness centrality measures the number of times a node lies on the shortest path between other nodes.
It shows which nodes act as 'bridges' between nodes in a network by identifying all the shortest paths and then counting how many times each node falls on one.
Betweenness centrality is used for finding the individuals who influence the flow around a system.

EigenCentrality
EigenCentrality measures a node's influence based on the number of links it has to other nodes in the network. It also also taking into account how well connected a node is, and how many links their connections have, and so on through the network. By calculating the extended connections of a node, EigenCentrality can identify nodes with influence over the entire network.

Annex 10: Terms of Reference for the Qualitative Briefings

ToR Expert Briefings on Ecosystem on Climate Innovation in CEE

CONTEXT:

Ashoka is [insert boilerplate]

Climate KIC is [insert boilerplate]

In partnership, Ashoka and Climate KIC have set out do map the ecosystem of social innovation/ changemakers in the climate innovation space in nine countries in Central and Eastern Europe: Romania, Poland, Hungary, Czech Republic, Slovakia, Bulgaria, Latvia, Lithuania, Estonia. Based on snowball sampling, a network mapping has been done in each of these countries, surfacing names of changemakers and other ecosystem players that support changemakeers in four areas of priority, directly related to innovation in the climate field.

Climate-smart agriculture
Energy efficiency/ retrofitting in buildings
Post coal transition
Air pollution

Based on these network mappings and on the qualitative insights drawn through individual country reports (i.e.: object of this ToR), Ashoka and Climate KIC plan to draft an external report showcasing the names of changemakers identified and key findings related to the ecosystems for social innovation in the climate area in each of these countries. Furthermore, we are planning to develop a strategy for engaging with the ecosystem in each of the countries under scrutiny, to support systemic changemaking and to make sure changemakers are connected to each other and to the best possible resources to enable them to achieve impact at scale.

PROFILE OF PERSON:

We are looking for a senior expert in field of climate/ innovation policy in each of the aforementioned countries, without deep sectoral expertise in any of the four areas of focus, but instead with a broad perspective over the country's state of development when it comes to climate policy and climate innovation. The person may have had experience with think tanks, with the academic environments, with local civil society, with local social impact ecosystem, with local high quality media. The person must be proficient in English, have complex analysis skills, capacity for meta-reflection, deep embededness in the country's ecosystem for climate innovation/ changemaking.

TASKS OF PERSON:

A 2-4 page high-level qualitative insight/ report/ briefing/ memo on the state of play in the country of choice for the researcher, highlighting issues such as:
How developed is innovation in the four fields under scrutiny?
How is public opinion perceiving each of these four fields?
How are public authorities treating these areas? Are specific policies actively developed and rolled out?
What other ecosystem actors play a significant role in nurturing these areas, supporting developments in these fields, etc.? They may representing the business sector, the financing sector, the social impact sector, civil society or the academic environment.
Is there significant opposition to progressive development in each of these areas? Are there ideological divides in society with respect to these areas?
What are some key initiatives (policies, acceleration programs, incubators, research) that have been developed for each of these areas?

To the greatest extent possible, the report should contain references to data, where data exists (e.g.: Eurostat, local statistics and third party research, other research done by think tanks and academics, etc.). It is not expected of the author to conduct interviews for this specific task, but to already have in his/ her knowledge evidence to reflect on the topics. Of course, he/ she may feel free to call up contact persons that he knows personally/ has worked it, who may have more thematic expertise in one of the areas of focus in which the author doesn't have much knowledge.

DEADLINES:

The author should present a draft 1 of the document no later than … Detailed feedback over the first draft is expected to be sent to the author by … A final, revised draft of the document is supposed to be sent to Ashoka no later than …

The remuneration for each briefing is …

APPLICATION PROCESS:

If interested, competent authors are invited to submit his/ her resume to …, and no more than 2 paragraphs, in English, highlighting their expertise/ interest in the topic.

Annex 11: Interview Guide for the Changemakers Maps

STRUCTURED INTERVIEW
CLIMATE INNOVATORS MAPPING

Intro: "Hello, my name is… I have your contact information from (nominator's name) … because you were nominated as a key player in the climate innovation area.

EIT Climate-KIC and Ashoka are currently conducting a study with the purpose of creating A CLIMATE INNOVATORS MAP, do you know these organizations? (if they say "no", mention: EIT Climate-KIC is an organization that is working to accelerate the transition to a zero-carbon economy while Ashoka is the largest global network that supports social entrepreneurs. You can find more information on www.climate-kic.org and www.ashoka.org)

The reason we are doing the map is because people like you are quite few and even fewer in climate innovation. Thus, we need support in two areas: first - I will ask you some questions about you, and secondly, we will need you to direct us to other important players in climate area. The data collected in this study will only be used by EIT Climate-KIC, Ashoka and their partners, in the purpose of creating the map and possible further engagement with you on this topic.

Do you agree with starting this interview? It will only take 15 minutes of your time.
Yes
No, let's reschedule please

FIRST PART: Interviewee Profile

Q1. First name: Can you please confirm your first name (birth name)? (OPERATOR: please confirm or complete the name from "initial list" or "Nominations list")

Q2. Last name: Can you please confirm your last name (family name)? (OPERATOR: please confirm or complete the name from "initial list" or "Nominations list")

Q3. Date of birth: What is the year you were born in?

Q4. Gender: (OPERATOR: don't ask!)

Male
Female

Q5. Residence city: Currently, in which city do you work? (take into account the main physical location of your activities in the field you were nominated for)

Q6. Primary activity sector: Currently, what is the main activity sector you are professionally involved in?

1. Energy efficiency in buildings,
2. Climate-smart agriculture,
3. Socio-economic transformation in post-coal regions
4. Air quality / air pollution
5. Other: _____

Q7. Type of role (multiple choice) : What is the role you play in your primary activity sector?

1. 1. I provide financial support
2. 2. I am a regulator
3. I am a researcher/educator/journalist
4. I implement projects

5. I don't know
6. Other

Q8. Number of years of experience in the field: Thinking about your primary activity sector, how many years of professional experience do you have?

Q9. Member association - Thinking about your main field of activity, what is the name of the organization you are working for or you represent?

Q10. Legal status of member association: Thinking about the organization you mentioned earlier, how would you frame it from a legal status perspective?

1. Public
2. Private
3. NGO
4. Other

Q11. Barriers/Challenges (multiple choice) - Thinking about your activity in this field, what are the main barriers (operational, financial, legal or other) and challenges to grow YOU and the stakeholders are facing today? You can mention just one, multiple ones or none from the list I'm about to read:

1. Legislative
2. Access to funding
3. Infrastructure
4. Workforce
5. Access to professional know-how
6. I don't know
7. Other

Q12. Opportunities (multiple choice) -Thinking about your activity in this field, what are the main opportunities to engage more resources (human/financial/contextual) YOU see around you today? You can mention just one, multiple ones or none from the list I'm about to read:

1. Sense of urgency for climate action
2. Strong community to work with
3. Accessible funding
4. Market interest
5. Untapped future potential
6. Positive changes on the policy-level
7. I don't know
8. Other

Q13. Funding opportunities (multiple choice) - Thinking about your activity in this field, what are the main funding opportunities YOU benefit from today? You can mention just one, multiple ones or none from the list I'm about to read:

1. Local government grants
2. NGO grants
3. EU funding
4. Corporate private sector funding
5. Individual donors
6. Crowdfunding
7. I don't know
8. Other

Q14. Secondary activity: are you secondarily involved in another field among the following?

1. Energy efficiency in buildings,
2. Climate-smart agriculture,
3. Socio-economic transformation in post-coal regions
4. Air quality / air pollution
5. None of the above

Q15. Contact details: Thank you for your answers. Please leave me the email address and phone number you would like to be contacted on by EIT Climate-KIC or Ashoka

Phone:
E-mail:

You will receive a GDPR consent via email. It is very important that you reply to that email with "OK" in order to validate this interview and to integrate you on the CLIMATE INNOVATORS MAP.
[a standardised message will be sent by email. The email will also contain a link to the full GDPR policy. The respondent will be required to answer with an "OK" to the message in order to validate his/her approval]

SECOND PART: Nominating additional people (3 nominees per interview)

Thinking about your activity in this field, nominate three actors with an important role. Now, we need your help building this MAP and community. Can you please nominate 3 other people with an important role in CLIMATE INNOVATION, to be more specific in any of these four sub-fields: energy efficiency in buildings, climate-smart agriculture, transition in post-coal regions, air pollution/ air quality). **Preferably those that you have been working with/ know, but can also be that you just heard about. Please provide us with the contact details of these persons.**

Q16. Please tell me the name of this person...
Nominee first name:
Nominee last name:

Q17. Type of connection: How well do you know each other?
1. We work(ed) together (professionally)
2. We interact regularly
3. We interact from time to time
4. I have heard of him/her

Q18. What is the name of the organization they are working for?...

Q19. Nominee contact information (if possible): How can we reach them?
Nominee Phone:
Nominee E-mail:

Climate-KIC is supported by the
EIT, a body of the European Union