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Public Perception of Geothermal Energy in Selected European Countries

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ABSTRACT

Public awareness and acceptance are among the indispensable factors that facilitate geothermal energy use development. These become clearer also in many European countries possessing prospective resources. Therefore, it is important to know the state of acceptance among key social groups in order to understand current circumstances and constraints that affect geothermal development and to undertake relevant education and promotion activities in order to build positive attitudes among the public. The results of socio-economic research aimed at cross-national, comparative analysis of public understanding and attitudes towards geothermal energy done for seven European countries (Hungary, Italy, Macedonia, Poland, Romania, Serbia, and Slovakia) as well as proposed education activities are presented in the paper.

1. INTRODUCTION

The paper presents selected results of socio-economic research on public perception and attitudes towards geothermal energy and its uses in seven European countries (Hungary, Italy, Macedonia (FYROM), Poland, Romania, Serbia, and Slovakia). The consortium of partners from those countries has been implementing the Project "Geothermal communities – demonstrating the cascaded use of geothermal energy for district heating with small scale RES integration and retrofitting measures" (hereinafter referred to as GEOCOM) co-funded by the European Commission within the 7th Framework Programme since January 2010 (www.geothermalcommunities.eu). The results shall help to increase innovation as well as economic and technological efficiency of geothermal projects.

The socio-economic research were among the main tasks of the Project since the proper level of public understanding and perception create a prerequisite for wider development both of RES and geothermal energy uses, also in the GEOCOM countries. Therefore an insight into the current state of public perception was necessary to define the current social circumstances accompanying the efforts to introduce more geothermal into the energy markets and to suggest some educational and promotional measures to build further public acceptance and awareness for geothermal uses in Project partners' countries as well as in Europe. The research included cross-national, comparative analysis of public understanding and attitudes towards geothermal energy. It embraced the assessment and evaluation of the society's understanding of the function and role of geothermal in energy systems and everyday use.

2. GEOTHERMAL ENERGY IN THE GEOCOM COUNTRIES

2.1 Geothermal Energy Potential

As a whole, Europe possesses mostly low-temperature geothermal resources thus reservoir and exploitation parameters imply their exploitation for direct uses. This is also the case of the above listed countries embraced by the GEOCOM Project. Moreover – one shall point out that some of them: Hungary, parts of Slovakia, Serbia, and Romania are located in the Pannonian basin which belongs to the best and most prospective area in Europe thanks to very good reservoir parameters, large extent of geothermal aquifers as well as current and future potential interest and demand for their practical uses. Also other Partner countries: Italy, Poland, and Slovakia have prospective resource bases for harnessing geothermal energy in a much wider scope than it has been so far. In case of Italy (Tuscany region) high-temperature resources are also found and successfully implemented for power generation and for direct uses.

Depending on the exploitation parameters (temperatures, water flow rates), in the GEOCOM countries (similar like in other states) the use of geothermal energy can be realized in the systems based only on this energy source but also in integration with other energy carriers, both fossils and other renewables (so-called hybrid systems). These options offer many opportunities for wide and efficient geothermal uses.

2.2 State of Geothermal Energy Uses

Direct geothermal use takes place in 37 European countries (for a world total of over 70 countries reporting this type of use) (Lund et al. 2010). The total installed thermal capacity of geothermal uses was 23,469.308 MW_t, while heat production amounted to 233,736.7 TJ (61,839.9 GWh/yr), i.e. about 47% and 51% respectively of the world total. The GEOCOM partner countries contribute significantly to these uses: all total they presented about 1,582 MW_t of installed thermal capacity while heat production of ca. 27,553 TJ in 2009, i.e. about 7% and 12% respectively of the European total (Table 1). It is worth noting that Italy and Hungary are among the top ten states in Europe in geothermal direct uses – each of them produced over 9,700 TJ in 2009. Climate, market demand, reservoir conditions, economic, social and ecological reasons favor applications of geothermal energy mainly for space heating (centralized and individual), heating greenhouses and tunnels, bathing and balneotherapy. Other uses comprise aquacultures, industrial uses and some others. In many cases the utilities operate as integrated (hybrid) systems.

Power generation using high-temperature (H-T) resources takes place in a few states in Europe, i.e. Iceland, Italy, Turkey, and Portugal (Azores). In 2010, total installed capacity was 1,553 MW_e, and power generation 12,371.8 GWh (Bertani, 2010), i.e. 14.5 % and 18.4% respectively of world generation, respectively. Italy (GEOCOM partner) is the leader in Europe (before Iceland) with significant contribution of 843 MW_e and 5,520 GWh (2010) and also one of the world top countries (Bertani, 2010). Geothermal power plants operate in the Larderello – Monte Amiata area meeting about 40% of the energy needs of the Tuscany region. In this area, a variety of direct uses have also been developed (space heating, agriculture, bathing) based both on H-T and L-T (low-temperature) resources. It is also an area where Montieri a GEOCOM pilot-site is located. For several years in Austria and Germany some binary installations (0.2-6 MWe) for power generation, based on low-temperature water, have been on-line. In 2012 a 0.05 MWe installation was launched in Romania (GEOCOM country). Interest in the development of these technologies has been observed, also in the GEOCOM states (eg. Hungary, Slovakia).

Table 1: Geothermal uses in the GEOCOM countries, 2009 (based on Lund at al. 2010; Bertani 2010)

Country	Direct uses		Power generation	
	Installed capacity [MW_{th}]	Heat production [TJ/a]	Installed capacity [MWe]	Production [GWh/a]
FYROM (Macedonia)	46.18	586.11	-	-
Poland	281.05	1501.1	-	-
Romania	153.24	1,265.43	-	-
Serbia	100.8	1,410.0	-	-
Slovakia	132.2	3,067.2	-	-
Hungary	654.6	9,767.0	-	-
Italy	867	9,941.0	843	5,520
Total 7 GEOCOM countries (% of total Europe)	1,581.47 (6.7%)	27,553.14 (11.79%)	8-43 (54.28%)	5,520 (44.62%)
Europe total	23,603.708	233,736.7	1,553	12,371.8

2.3 Geothermal Energy Share in Country Renewable Energy Mix Structures

In 2010, the share of all RES in gross final energy consumption in 27 EU-countries amounted to 12.5% on average. The contribution of geothermal to this share was only 1%. The RES sector is dominated by hydropower (60%), wind (21%) and biomass (17%), while solar (thermal, PV) as well as geothermal around 1% (www.eurostat.ec.europa.eu).

In 2010, in the GEOCOM countries the RES share in gross final energy consumption amounted to 14.3% on average. In individual cases it ranged from 5.19% (Hungary) to 23.4% (Romania) (Table 2). In that year, geothermal energy contributed to the total RES mix in the percentage share of 0.02–0.6% for FYROM (Macedonia), Poland, Romania, and Slovakia, but more significant figures were reached in Italy: 5.6% and Hungary: 8.1% and on average, it was only 2.56%. Results from presented statistics show that exceptional geothermal resources in the GEOCOM countries have been exploited so far at the scale far below real possibilities. Among the reasons one may indicate the lack of knowledge about the resources available in particular regions and localities, lack of technological know-how, and – last but not least – lack of or low public acceptance.

Table 2: Renewable and geothermal energy shares in gross final energy consumption in the GEOCOM countries in 2010 and planned for 2020 (based on www.eurostat.ec.europa.eu, EU-Directive 2009/28/EC, National Renewable Energy Action Plans, Italian Management Energy, Italian Oil Union, and other sources)

Country	2010			2020	
	Gross final energy consumption [1000 toe]	RES share in gross final energy consumption [%]	Geothermal share in RES gross final energy consumption [% of total RES]	RES share in gross final energy consumption [%]	Geothermal share in RES gross final energy consumption [% of total RES]
FYROM (Macedonia)	1782	20.84	0.02	21.0	0.04
Hungary	18255	5.19	8.1	14.65	19.16
Italy	124769	10.1	5.6	17.0	6.9
Poland	66319	9.4	0.2	15.0	0.5
Romania	22475	23.4	0.4	24.0*	?**
Serbia	9792	21.2	3.0	27.0	5.0
Slovakia	11593	9.8	0.6	14.0	1.7

* electricity only; **NREAP for Romania gives no detailed projections as to RES/geothermal share in heating& cooling sector in 2020 (despite that this sector is prospective for geothermal development) (source: www.repap2020.eu/fileadmin/user_upload/Roadmaps/EREC-roadmap-V4_final.pdf)

3. RESEARCH ON PUBLIC PERCEPTION OF GEOTHERMAL ENERGY IN THE GEOCOM COUNTRIES

3.1 Basic Diagnosed Elements of Public Perception of Geothermal Energy

Considering public perception and acceptance of renewables and geothermal energy one shall consider several decisive factors of various nature including social, economic, environmental, technological, and scientific ones. Following the work of Czaplicka-Kolarz and Pyka ([eds], 2010), they can be included into several groups: position of energy in the hierarchy of social values; priorities in the implementation of energy policy; the level of knowledge on energy sources; the level of support for the use of various sources of energy; priority areas of research related to energy; adopted the RES share in energy mix and energy costs and energy savings.

The research presented in this paper embraced an insight into basic socio-economic components in the GEOCOM countries, i.e.: state of knowledge on RES/geothermal energy; orientation on basic national and EU-documents, strategies and obligations related to RES (geothermal energy); level of knowledge of RES/geothermal potential in a particular country and main domains of their uses taking into account economic and social aspects; acceptance for RES/geothermal energy uses; opinion on costs of RES/geothermal energy; opinion on the needs and measures to be introduced to support RES/geothermal energy development in particular countries; the state of education and promotion addressing various groups of society; proposals of concrete methods and tools of education on RES/geothermal energy dedicated to various groups of society and other issues. These factors were covered in details by the questionnaire survey recognized on the background of national, regional and local circumstances regarding geothermal, other RES and fossil energy resources' base, its availability, energy policies, costs, prices, regulations, and other conditions.

3.2 Research Methods

The work to diagnose the level of public perception of geothermal energy employed a comparative research design investigating differences between respondents residing in seven GEOCOM countries. The research included two main research methods to obtain the necessary source data and information: (1) quantitative (questionnaire surveys), (2) qualitative (open opinions, comments) and screening of the basic information on RES and geothermal development, prospects, and place in energy mix of particular countries.

Quantitative methods enabled the gain of required information from a large number of appointed experts from seven GEOCOM states. The items included in the Questionnaires were formulated as questions which required that the respondents (experts) had to quantitatively assess the level of given items in the proposed numerical scale (ranking) or by selecting one or more options from the proposed answers. Furthermore, the respondents were asked to supplement their answers by some open opinions and feedbacks related to the issues and aim of the Questionnaire.

Qualitative methods were used to emphasize the experts' personal experiences and interpretation over quantification in an efforts to understand the meaning of the quantified social responses; to place and interpret the investigations and understand their results. The experts' role was to objectively assess the state of geothermal energy perception by the public in their country. The experts represented both scientific and practical sectors of activities related to research, R&D, investments, operation of traditional energy sources as well as RES and geothermal utilities, energy planning, and management.

These methods also included open opinions of experts related to public perception of RES and geothermal with the references to various country-specific circumstances affecting this perception. In addition, the results of the survey on public perception of geothermal energy in the GEOCOM countries were put on a wider background of geothermal resources base, main prospective areas, and the current state of development prospects.

4. PUBLIC PERCEPTION OF GEOTHERMAL ENERGY IN THE GEOCOM COUNTRIES – RESEARCH RESULTS

4.1 Energy in Hierarchy of Issues Important to Europeans

The place of energy matters (such as prices, energy supply) in the hierarchy of issues important to the public of European countries were given according to results of separate comprehensive research covering 25 European states (*Attitudes on issues related to EU Energy Policy*..., 2007). They showed that the energy matters occupied 12th place in such a ranking (for 17 issues of ranking (Figure 1); in the countries covered by quoted research, the percentage was different, which certainly also applies to GEOCOM countries).

4.2 State of Knowledge on Renewable and Geothermal Energy

According to experts, the level of public knowledge on RES and their uses is generally poor (in a 4-rank scale), with a more optimistic picture for FYROM (Macedonia) and Slovakia (55-60% of "sufficient" ranks) and Hungary – respective knowledge was evaluated as sufficient by 85% of the experts (Figure 2). In no case did the experts evaluate public knowledge on RES as good (highest rank 4). Regarding the situation in all seven GEOCOM states, 40% of the ranks indicated this knowledge as sufficient (while 60% as poor).

On such a background, the public knowledge on geothermal energy as one of the RES mix component, is even worse: the ranks "poor" dominate (for Italy the "lack of" knowledge is counted as 80%). The two only states with the significant share of higher evaluations defined as "sufficient" level of knowledge are Hungary (50%) and Slovakia (75%) (Figure 3). This more positive image is made up of several factors (e.g. access to information, relatively frequent uses, opportunities to see the installations, positive experience of using geothermal water (numerous geothermal bathing and spa centers, etc.). Taking into account the responses from all countries, the level of public knowledge on geothermal was evaluated as sufficient by ca. 18% of the experts only, prevailing is the rank "poor" (70%) or even lack of knowledge (12%).

In the context of the received image of the level of public knowledge on RES and geothermal energy, which is generally low, the experts point to the need for education and promotion addressing a very important group – decision makers and administration of various levels – as an indispensable element of building public acceptance for these energy sources. Observations and experience of

the experts show that the relevant knowledge is sometimes weak or superficial, which results, among others, in unsatisfactory level of some documents and regulations, quality of social dialogue, efficiency of cooperation with professionals and NGOs. Such entities are sometimes neglected by the governmental agencies in the process of preparing legal and regulatory documents, and their expertise and knowledge are not used sufficiently. Fortunately, there are also positive examples of such cooperation – as in Hungary, where a national geothermal non-governmental organization (NGO) was appointed to elaborate a part of the National Renewable Energy Action Plan (NREAP) related to geothermal energy uses' development by 2020 – this path should be followed by the others.

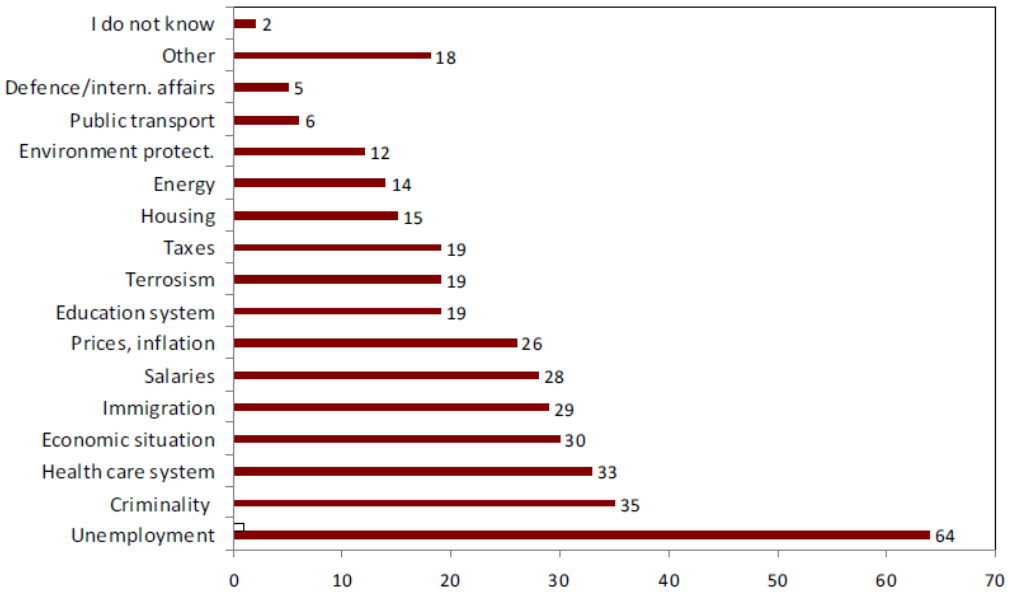

Figure 2: Energy in hierarchy of priorities important to Europeans (%) ([in:] Czaplicka-Kolarz, Pyka [eds], 2011)

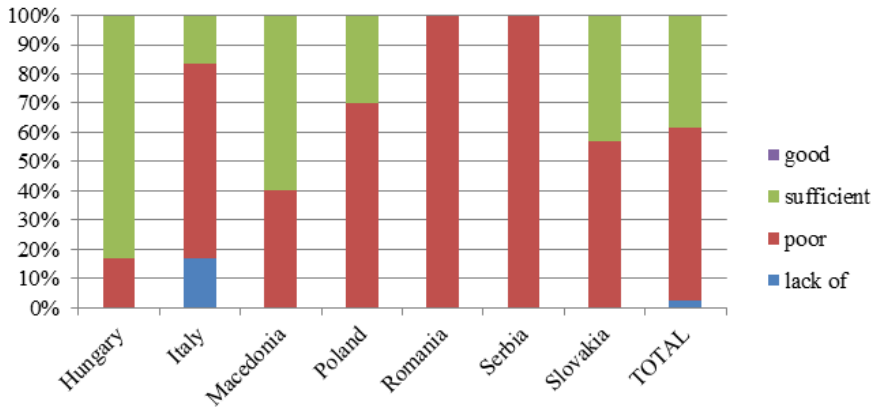

Figure 2: Level of public knowledge on RES and possibilities of their uses, the GEOCOM countries

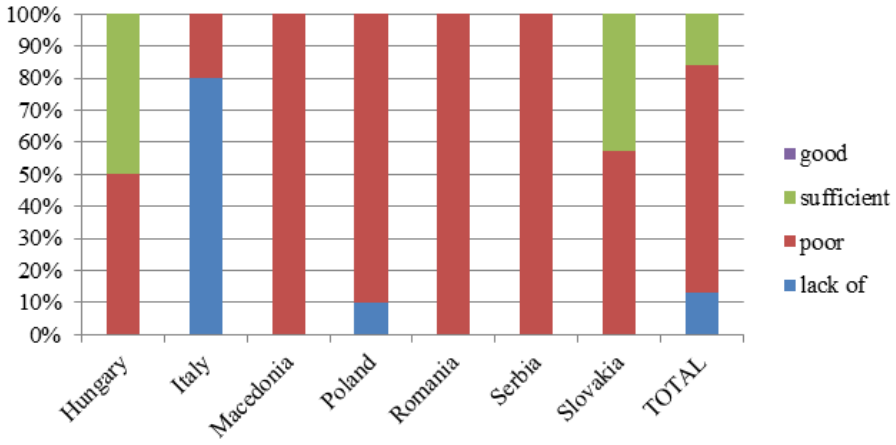

Figure 3: Level of public knowledge on geothermal energy and possibilities of its uses, the GEOCOM countries

In all cases, conspicuous is the lack of or poor knowledge of national and EU documents related to RES and geothermal (partly sufficient level of this knowledge is supposed in Hungary and Macedonia only) (Figure 4). On the other hand, as indicated by experts from Slovakia, where public awareness on renewables is generally at a sufficient (or even good) level, such documents and strategies are generally poorly or not at all known to the public, as they are not sufficiently disseminated. This is important information, the diagnosis of situation which must be consistently changed by appropriate actions, as it is an essential factor – "a reference point" for national activities at various levels in the RES and geothermal energy sectors, as well as part of building public perception of these energy carriers. Better knowledge of national strategies and commitments could stimulate the activity of citizens as well as increase knowledge and acceptance of RES/geothermal. Referring all the GEOCOM states, the experts evaluated that public knowledge is missing (35%) or its level is poor (ca. 45%); the percentage of "sufficient" ranks was low (10% of responses)

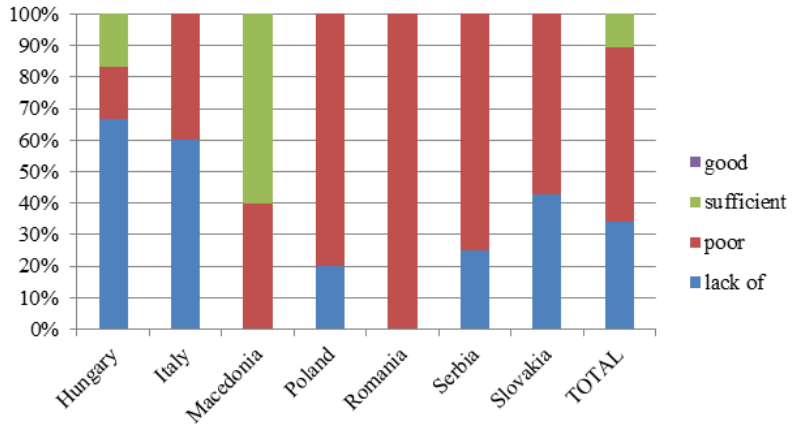

Figure 4: Level of public knowledge on national and EU-strategies and documents related to RES and geothermal energy, the GEOCOM countries

4.3 State of Knowledge on Possibilities of Geothermal Energy Uses

Referring to the orientation as to the main types of geothermal energy uses (taking into account economic and social aspects) which shall be developed in particular countries, the public in all seven states is generally aware that from the economic point of view the best uses are (Figure 5): space heating (centralized and individual systems); agriculture, and balneotherapy and recreation. In all seven states not only is space heating but also agricultural sector strongly indicated among the best uses from an economic point of view. This is supported by the fact that the potential for this kind of development exists in all states therefore more attention shall be paid on this matter.

In case of Italy, the public indicates power generation also since Italy has a high-temperature resources (steam) harnessed by large power plants in an economic profitable way in Larderello area, Tuscany. It is worth mentioning that in Hungary and Slovakia the co-generation is also indicated. These states have the proper conditions for such systems with low-temperature binary power installations. This is a hot topic among the professionals now therefore also in other GEOCOM countries, e.g. in Poland some interest is growing. Along with the above types of uses, the public in all surveyed states indicated also balneotherapy and recreation as one of the main sectors for the use of geothermal water and energy. They are attractive from the economic, social points of view, relatively better known and experienced by the general public that the uses in heating or power generation industries. The listed types of uses enhance local or regional business, market development of various specialized services (e.g. in bathing and spa & wellness centers), which in turn translates into increased revenues involved in the activities of entrepreneurs.

In respect to the types of geothermal uses from a social point of view (Figure 6) the public, in all countries, prefers the three main types of uses (similar as in the case of economic aspects) (acc. to the percentage share of answers) are the same, i.e.: space heating, agriculture, balneotherapy and recreation. Relatively high is also the percentage of indications at power generation and co-generation (Italy), and co-generation (Slovakia).

For the public it is important that these options, in some cases, create and maintain new places of employment, as has been observed in several countries where new installations of various uses were launched or some old ones were retrofitted and put into operations. This factor is important both from economic and social point of view. Geothermal spas and recreation utilities contribute to maintain and upgrade quality of life and leisure, positively influence the curing and prevention of many diseases. Both cases form important added values for the society as well as for economics on local, regional scales. Some geothermal uses like heating increase the comfort of life and result in energy saving and increase energy efficiency and some like horticulture bring not only economic income but high quality and ecologically-grown local food products as well. These benefits will be even more evident if more intense geothermal energy use development takes place the conditions for which exists in each of the Partner countries. It is noted a regularity that the same options of geothermal applications are shown by the public (country by country and as total) in both cases - economic and social ones, which indicates that their development on a larger scale can produce both economic profits as well as social benefits – this coincidence confirms with similar situation for geothermal energy development in GEOCOM countries. With regard to the picture of all the countries it is noted that a relatively large consensus indicated the main types of direct uses, both from economic and social points of view, are space heating, agriculture, balneotherapy and recreation (ca. 25% of each use) with some higher percentage for space heating (30%) where social criterion is concerned.

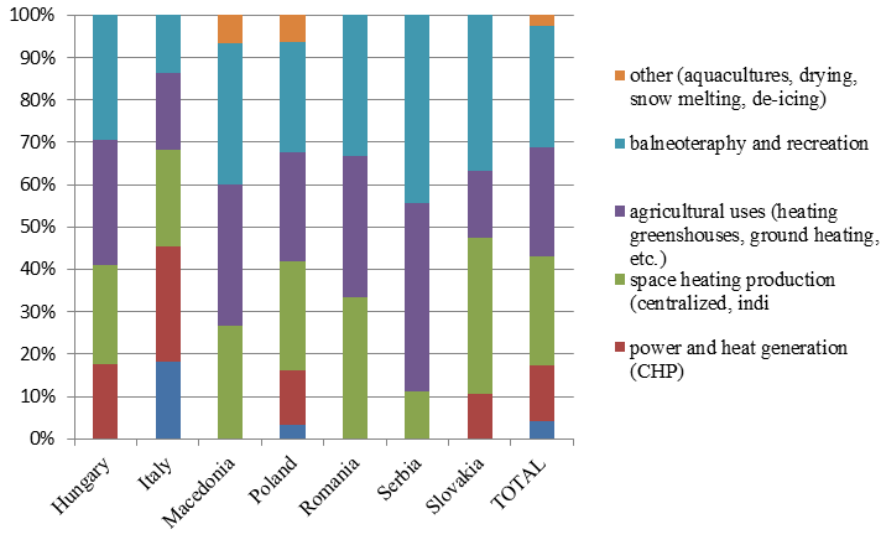

Figure 5: The best types of geothermal energy uses from economic point of view, the GEOCOM countries

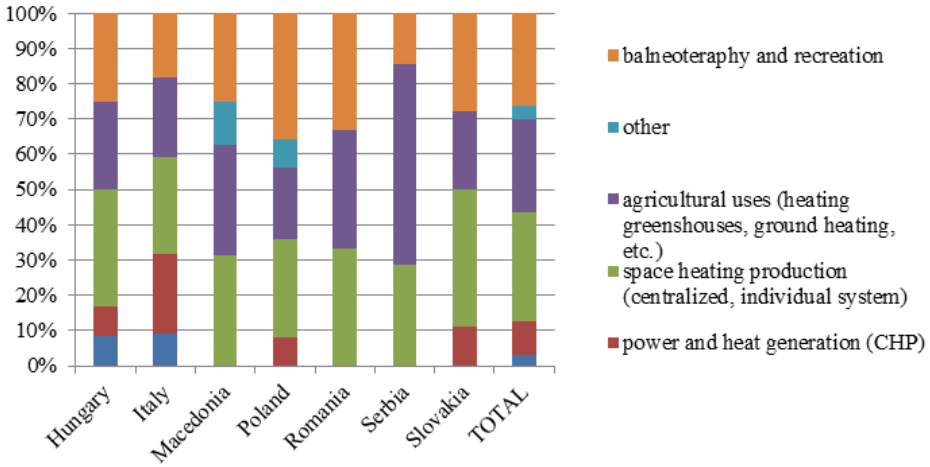

Figure 6: The best types of geothermal energy uses from social point of view, the GEOCOM countries

4.4 Public Opinion on Costs of Renewable and Geothermal Energy

Opinion on the costs of RES and geothermal energy, and their acceptability to a large extent affect the public perception of these types of energy. In a survey the evaluation of the level of costs (low, acceptable, high) was relative; the experts were asked for

information about their social assessment in relation to the level of incomes and expenditures in particular GEOCOM countries (which are different). Against the background of the costs and prices of traditional energy, in case of RES, these parameters are rated as acceptable and even low (Hungary, Italy, Serbia). The percentage rating of "high" is low in five countries, only in two as high (80% of responses – FYROM (Macedonia), Poland; Figure 7), which is primarily affected by high investments in the RES sector especially if sufficient support is not available. For all countries, the percentage of particular costs evaluations was as follows: low – 15%, acceptable – 45%, high – 40% (this rank affected to FYROM (Macedonia) and Poland). This means that some 60% of the evaluations indicate that the positive attitude as to these costs prevails (ca. 60% of "low" and "acceptable" ranks).

In the case of geothermal energy, one observes a slightly larger share of the opinion that its costs are low or acceptable (Figure 8). This refers especially to Hungary and Slovakia, where several larger geothermally-heated utilities are operating, further investments are underway or planned, accompanied by relevant information. Convincing are also the low or acceptable bills paid by real customers for geothermal heat. All these factors give a true picture of the situation and tends to take an interest and provide arguments for development. For all countries, the share of the geothermal uses' costs evaluations were similar, as in case of RES in general, but with higher evaluations for them as low (25%), acceptable (45%) and high (40%), in total ca. 60% are "low" and "acceptable" ranks. In the Polish case, however, costs and prices are still seen as "high". Such an assessment may be affected e.g. by high investment costs of geothermal installations, especially drilling, the low cost of coal (which is still commonly used in many heating systems) and the lack of awareness of the real costs and current energy prices. As an example one may indicate the heat tariffs approved by the Energy Regulatory Office – the prices of heat from geothermal plants are in the middle ranges for heat from various sources. It should be noted that in the CEE countries economic aspects are still the leading public perception and acceptance criteria for considered sources of energy – because they are a lower-income population than the so-called Western European countries. In the latter case economic factors do not determine so clearly these ratings, due to the generally higher standard of living, higher places taken by environmental aspects, the use of local sources, comfort, etc. in the public hierarchy of needs and values. Therefore the more visible is the dominance of positive opinions as to the costs of RES and geothermal in the GEOCOM countries (60% of responses evaluating the level of costs as "low" and "acceptable).

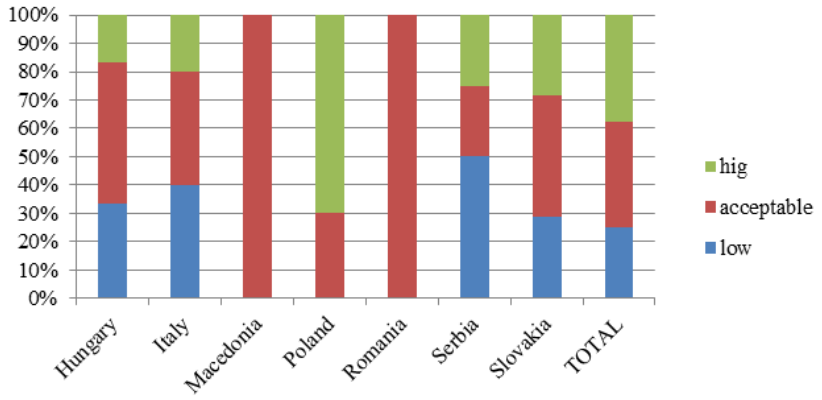

Figure 8: Public opinion on costs of geothermal energy, the GEOCOM countries

4.5 Suggested Tools to Support Renewable and Geothermal Energy Uses Development

It seems from the evaluation of public opinion on costs of renewable and geothermal energy that the level of their acceptance could increase (especially in the countries where the opinion prevails that they are high) if the costs and prices could be lowered thanks to more support dedicated to the development of these energies. However, according to information given by the experts, in some GEOCOM countries there are no governmental financial support tools for heat produced from RES, including geothermal energy. They are aimed primarily at supporting the RES electricity, sometimes the-so-called "micro-installations" (less than ca. 50 kWe or 100 kWt) or a high-efficiency cogeneration (not applicable especially in case of low-temperature geothermal resources prevailing in GEOCOM states). What's more, national documents do not envisage to introduce them. Such an unfavorable situation has been pointed out by the experts from FYROM (Macedonia), Poland, Serbia, Slovakia. As a necessary support for RES in all GEOCOM countries the main three measures were indicated (Figure 9): (1) grants, subsidies, low-rate loans/credits (40% of responses from all states), (2) feed-in-tariffs (35%), (3) green certificates (and other types of certificates) (20%).

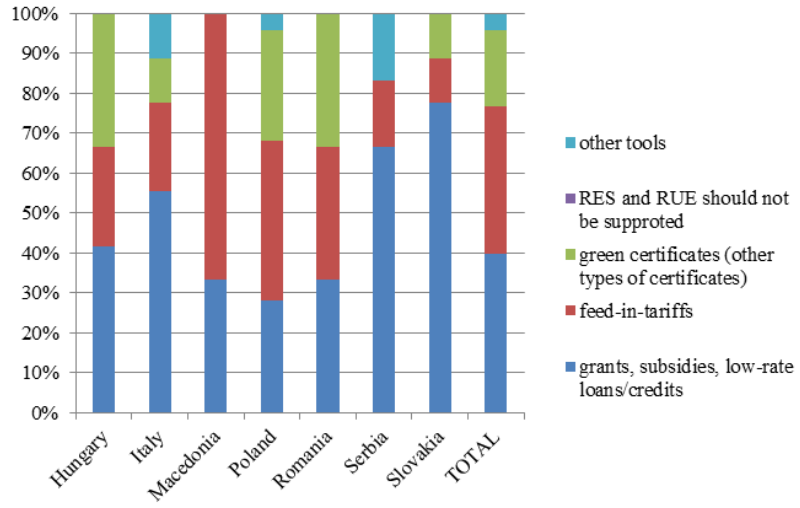

Figure 9: Suggested tools to support RES uses, the GEOCOM countries

In case of geothermal energy the attention is drawn to the fact that in addition to the conformity of the type of indicated tools of financial support for RES, an identical support tool was indicated for geothermal development in four countries (Hungary, Italy, Poland, Slovakia), i.e. Geological Risk Insurance Fund (Figure 10), a specific measure tailored for this type of energy. It has been successfully working in other countries (e.g. France, Germany; see the Intelligent Energy Europe (IEE) Project "Geothermal Regulations – Heat, GRT-H"; 2006-2010 reports; www.gtr-h.eu), and it would encourage more entrepreneurs to invest in geothermal, reduce financial risk and ultimately affect the positive perception of geothermal energy and increasing acceptance of its use. The need to introduce this tool was indicate by the experts from countries where they are carrying out more actively drillings of geothermal wells or the investors' interest exists (Poland) and where it would be very clearly recommended (Hungary, Italy, Slovakia). The GEOCOM public and experts pointed out that current legal rules do not favor the RES, especially geothermal.

No adequate governmental support now and in the documents covering the 2020 horizon makes geothermal energy *a priori*, a disadvantage compared to other renewable energy sources (particularly prospective in terms of electricity generation), and as a consequence, geothermal may be attracted to the inferior level of perception and social acceptance. Negative signals are sent to the public by government and decision-makers, both of economic importance (e.g. discouraging investors) and social one (e.g. social acceptance). The above considerations are clearly confirmed in the case of Slovakia with a lack of sufficient state support of RES (including geothermal) and rational uses of energy results in the fact that despite the country has a potential for development, it is not exploited as the public needs and accepts due to lack of funds or legislation constrains. Similar opinions are shared by the Serbian experts who pay attention to the fact that a modest approach to the investigation and preparatory work for the use of geothermal resources and the lack of incentives for organized use of renewables are the main reasons for minor RES' share in country energy mix and low uses of energy extracted from geothermal water.

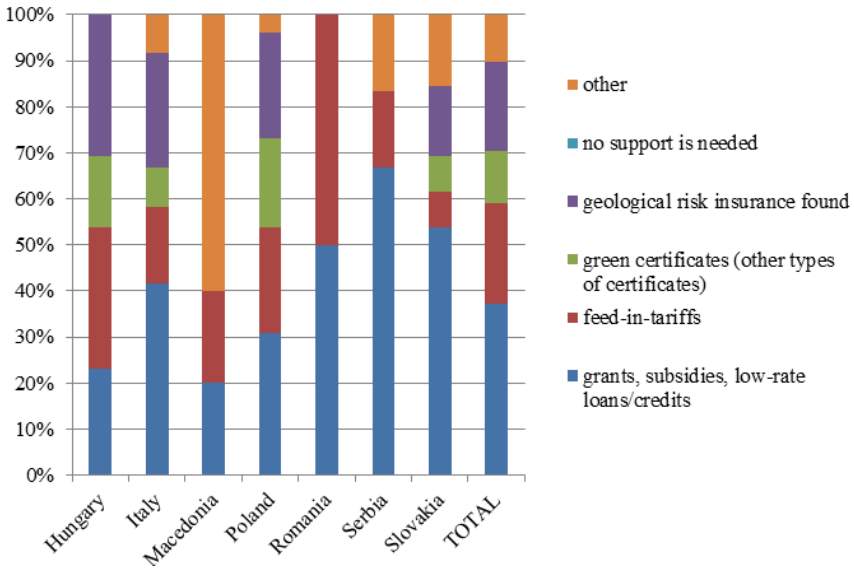

Figure 10: Suggested tools to support geothermal energy uses, the GEOCOM countries

4.6 Level of Public Acceptance of Renewable Energy Sources

In general, with the exception of Serbia, the acceptance of RES at sufficient levels (50–100%) prevails in the GEOCOM states. In the case of Hungary, Slovakia and Poland the experts evaluated its level partly even as "good" (Figure 11). There are also countries where the poor level of RES acceptance dominates like Serbia as well as in Italy (which may be surprising) where it is even a significant share (40%) of opinions indicating the lack of acceptance. Such a low assessment might be influenced by recently observed in some countries and regions of the lack of acceptance for the development of wind mills, which are largely regarded as a synonym of RES. A tendency is also observed that a higher level of knowledge about RES and geothermal energy results in a higher level of acceptance of their application as one can see it on the example of Hungary and Slovakia.

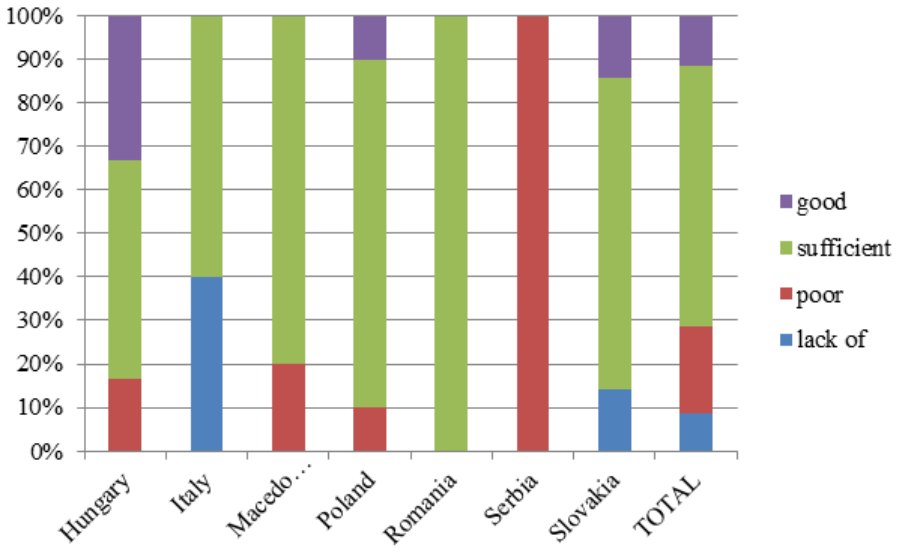

Figure 11. Level of public acceptance of RES uses, the GEOCOM countries

4.7 Level of Public Acceptance of Geothermal Energy Uses

On the above general background for RES, the percentage rated as "sufficient" level for the acceptance of geothermal energy is similar to RES in general, with the exception of FYROM (Macedonia) and Serbia where it is poor, or even defined as a lack of acceptance (FYROM (Macedonia), and Italy). As to the RES, in the case of Hungary and Slovakia, 50% of evaluations indicate good level of acceptance. Such evaluation appeared to be even in Poland (10%) (Figure 12). Generally the public acceptance for geothermal energy is slightly lower than for the RES, which may be due to, among others, lower knowledge, less working installations accessible to the public and specifics of geothermal energy not so "visible" at the surface like other types of RES. Comparing with the level of acceptance for RES uses in GEOCOM states as a whole, the acceptance for geothermal uses is slightly lower, around 50% for “sufficient” responses but around 20% for “good” ranks and around 30% for poor or lack of acceptance).

According to some experts, for many years among some groups of politicians, it was shaped an opinion that investments in the geothermal development were unprofitable. This contributed to the building of a small geothermal acceptance among some social groups and decision-makers. One important task is to change this false approach which in some experts’ opinion is a major obstacle in development of geothermal energy, among others, in Poland. The experts also noted that the determination of strategies and priorities for the development and support of individual RES is based not only on substantive grounds, economic and technological, but also often on political decisions or dependent on the lobbying of different groups (which doesn’t favor geothermal).

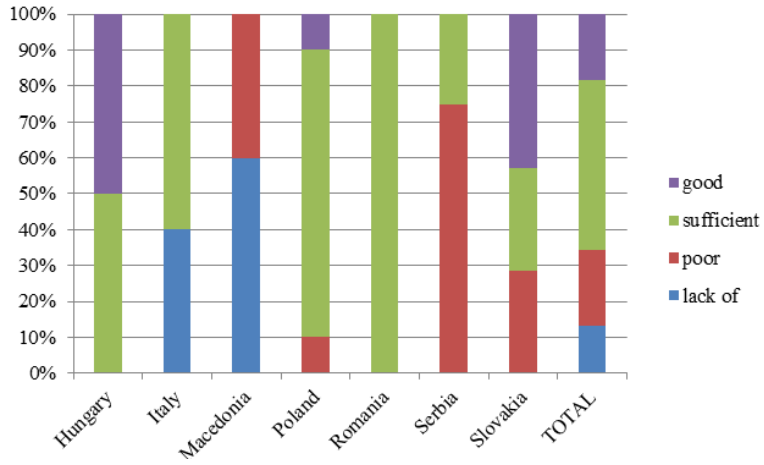

Figure 12. Level of public acceptance of geothermal energy, the GEOCOM countries

4.8 State of Education on Renewable and Geothermal Energy

The reported research gave an orientation on the state of knowledge on RES / geothermal knowledge and acceptance by the public and a number of factors that make up the picture. The question is whether proper education and promotion addressing different public groups is conducted and how it affects and can affect the state of respective knowledge. Part of the research was related to these matters.

In general, various information activities on RES / geothermal / rational energy uses (RUE) addressed to the general public have been conducted in the GEOCOM countries as confirmed by around 75% of all respondents (Figure 13). This is done in frames of many different national and international programs and projects (including EU). This applies above all to the most "popular" and promoted RES in the country, but it is worse in the case of geothermal energy.

In case of geothermal energy, the information is generally less available, carried out occasionally in localities and regions where its uses take place, while it often does not include broader information about resources and opportunities for development in other areas of the respective country. It also depends on the activity and involvement of operators of these systems, regional and local administration and cooperation with experts to provide essential knowledge and not just superficial. Such activities are often carried out in relation to information about other values of a region or a location (e.g. Italy – Tuscany, FYROM (Macedonia) – Kocani area, Poland – the Podhale area, Hungary, Slovakia – several areas where geothermal water and bathing centers are treated as main components of tourist offers). This places geothermal energy in the broader context of local natural resources, tourist attractions and it favors its positive image and thus public acceptance. As in the whole RES sector, also in geothermal energy, no regular education and information has been conducted which would be associated with general strategy of the country or region.

According to the experts, it is especially important that the information on geothermal energy (which is relatively little-known compared to other RES) disseminated among the general public be objective and reliable. It was pointed out in some cases that the conflicting, not objective information about the resources, abilities and range of use, role and share in meeting the countries' energy needs (too optimistic, too negative) given to the public by various influential groups, and even individuals, can create too high expectations of society, undermining the credibility of this energy source, put into question economic and technical credibility discouraging the provision of sufficient public support and deter potential investors. In this light, it is therefore very important ethical responsibility of individuals, communities and the media for the information, the public perception and the multiple consequences not only for individual choices and attitudes, but also for key strategic decisions taken at regional and national level with regard to RES and geothermal sectors.

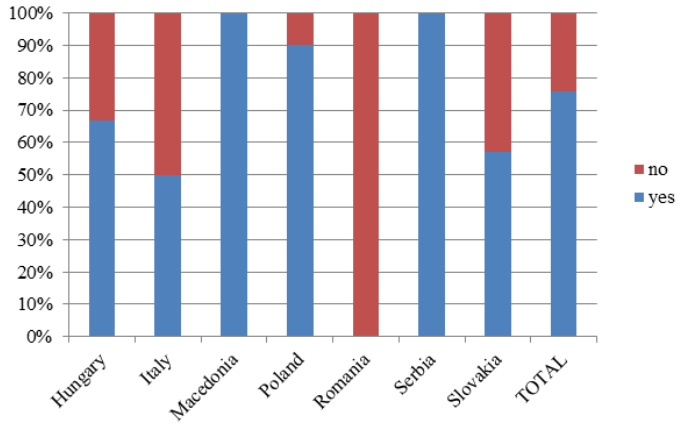

Figure 13: Information activities on RES / geothermal addressed to the public, the GEOCOM countries

In addition to the promotion and education on RES / geothermal addressed to the mentioned various public groups, it is essential to carry on regular programs of various levels at schools, academic institutions, as well as post-graduate studies. Own professional manpower is in fact essential for the optimal and faster RES / geothermal development in all countries, including GEOCOM states.

5. CONCLUSIONS, RECOMMENDATIONS

The results of research presented in this paper indicate that generally the public acceptance for RES and geothermal energy prevails in the GEOCOM countries. Its level can be evaluated as acceptable or partly even as high according to the opinion of about 60% of the experts from seven countries covered by the study. This is important information because the acceptance belongs to the main factors that contribute to the public perception and help to build a positive social approach to geothermal energy (as one of the renewable energy sources components), the development of investment projects and as a consequence – an increase in its use.

It should be noted that the formation of public awareness and acceptance for geothermal energy – one of the RES least commonly used so far (and with a current smaller share within the RES group) is a long-term process that requires consistent actions in different areas and application of different measures (especially that the energy issues occupy rather distant place in the hierarchy of issues important for European societies). This is the case for each new branch introduced for the wider circulation of public interest, which is at the beginning of its development and economic activity – in a large extent this statement applies to the RES

sector, especially geothermal. Geothermal energy has not yet been widespread, the learning and "convincing" of it by individuals and public groups take time. Almost every new project and a new, little-known technology always evoke different social attitudes, psychological and sociological reactions, especially in populated areas (which applies to most cases in geothermal; Cataldi, 1993).

The fact that public acceptance for geothermal energy prevails in the GEOCOM states, draws attention to the fact that the current level of respective knowledge is generally low there, even though the general public has correct orientation as to the main types of geothermal uses and its role in everyday use and energy systems. However, sufficient promotion and education activities targeting different social groups has been not conducted yet, what is more not everywhere has regular education programs been introduced in primary and secondary schools, and university education on RES / geothermal and is still limited (although in each of the GEOCOM countries it has been carried out in some academic centers).

What's significant, according to most of experts involved in research, the public in five out of seven countries consider the costs of renewable and geothermal energy as acceptable (or even low). This is also a very important element of perception. However, in this respect the situation is different in the two countries (FYROM (Macedonia) and Poland) where other traditional energy sources are cheaper (especially coal) or their actual costs are underestimated (because of subsidies or the fact that they do not include the external costs). This also applies to Serbia where low prices of electricity do not favor wider use of geothermal energy for agricultural needs even if there were a number of prospective geothermal water wells. Therefore, urgent need was indicated to introduce adequate supporting measures to make geothermal more market-competitive compared with other fossil and renewable energy sources.

Interest and positive attitude to the development of RES / geothermal energy shown by a number of local self-governments result also from their expectations that investments in that sector can generate several positive effects on the local economy, e.g. revenues to their budgets (taxes and fees), for local businesses, as well as places of employment, benefits for natural environment. Such a positive attitude observed among part of local administrations in their areas of operation results also from the need to fulfill their tasks in the sector of local energy management and requirements regarding the share of local RES in the energy mix. However, among the main obstacles to the involvement of local governments in investments one shall indicate the lack of sufficient own funds accompanied often by the lack of government support.

Public awareness and perception must be enhanced by education (as already mentioned), as well as demonstration sites and study visits available the general public, school children, students, administration, potential investors, journalists, and, last but no least, decision makers. In the case of a group of the GEOCOM states, for example, one shall arrange study visits and contacts among partners and groups of interested persons. The role of study visits was pointed out all the more that the implementation of new geothermal district heating projects in recent years also encouraged interest of further municipalities in prospective areas. Certain mistrust in geothermal energy uses is noticeable among employees of ministries, what is probably caused, among others, by the lack of information. Therefore excursions and site visits to existing successful geothermal applications should be organized and detailed information about the implementation and operation conditions should be provided.

Finally – one must also keep in mind the need to refer to the non-physical aspects and higher categories of motivation and action imperatives, emphasizing the responsibility of individuals and society for the environment and sustainable development, preservation of non-renewable resources for future generations (including those from families of local public). These categories are, and will certainly be important, at least for part of the societies and individuals.

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