SCIENCE COMMUNICATION IN HUNGARY : AN ANALYSIS OF POLICIES

By

MARKUS, Agnes Eszter

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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ABSTRACT

Science Communication in Hungary: An Analysis of Policies and Strategies

by MÁRKUS, Ágnes Eszter

The widely spread discourse on competitiveness and knowledge-based society in Europe became the basis for science policies and strategies. While communicating science is usually part of these documents, the issue is not elaborated and discussed much in Hungary even though science communication is a discipline in itself that has developed considerably in the last few decades.

While scholars of science and technology communication have claimed that there has been a large shift in the approach from the deficit model to the dialogue and participatory models, the analysis of Hungarian documents demonstrated that these models coexist. The dominant model, which the government policies and the strategies of the academics presented are based on, is the traditional public understanding of science (PUS) approach that considers the public an audience to be educated and persuaded.

Progressive policy approaches based on two-way communication are rarely identified in policy documents, so the author recommends the government to launch and support these modern science communication tools that would enhance strategic research and fit the concept of open government better.

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1. Introduction

Governments all over the world have placed scientific excellence, research and development (R&D) at the top of their agenda in order to ensure the economic development and increasing social welfare of their respective countries. Science is in the spotlight when it comes to innovative technology, industrial breakthroughs, or the global fight against infectious diseases.

No matter how hard we try, it is now simply impossible to detach research from society: innovation drives economic development, scientific discoveries affect our daily lives, and research responds to the needs of the industries and the needs of people. At the same time, society has to be informed about scientific achievements, discoveries and the possible future. Due to the interests of both sides there is always communication between science and society, and governments enact policies to ensure this interaction.

Moreover, not only society but also governments need science to provide them with data, systematic information and insights to design effective policies. It would, nevertheless, be misleading to think that interactions between government and science are enough to replace those between science and society.

Science policies are primarily created to support economic development and to further increase the competitiveness of the country. The assumption is that research will lead to useful scientific discoveries and innovation, while it helps to improve the quality of human lives. In this sense, society is the beneficiary of scientific advancement provided by science.

Does the public understand the advancements of modern science? Do people want to know about it? If yes, how can scientific knowledge reach them most effectively? Should they have a say in what scientists do, or would it ruin the autonomy of science and hinder

development?

The communication of science results, first of all, is initiated by the governments to raise awareness of and gain public support for their science policies, especially for the funding of science. Besides, scientists also have an interest in communicating science in order to recruit talent, build higher reputations, etc. Finally, society and citizens in general have an interest and a right to know what is going on in research. They are curious to find present or future solutions to their problems, and also to learn about the possible risks that research involves. Nowadays, more than ever, they even claim to have a right in setting science policy priorities, especially concerning safety and ethics.

Science policy has changed lately, and there was some development in the science-society interactions. The EU Science-in-Society program (2008) is a good example to demonstrate these changes. Hungary is one of the ten new member states that joined the EU in 2004, and during the last six years has spent much effort to "catch up" with the old member states. In this analysis of science policies I will explore the approach to communicating science in Hungary.

1.1. Science Communication in Hungary

There is a long tradition of science communication in Hungary. The Society for Dissemination of Scientific Knowledge is a nonprofit association established in 1841 with the aim of popularizing science in the years of enlightenment. For one century, they issued the Journal of Science, organized evening talks on current scientific developments, and had several hundred members. The Society kept on working even during the communist area, and nowadays organizes trainings, too.

The Hungarian Academy of Sciences was established in 1825 and nowadays it has eleven departments. According to surveys in 2004 and 2006 it is the most trusted institution of the country with a trust level of 3.09 of 4.00 (Fábri, 2007.).

The purpose of this study is to highlight the approach of the Hungarian government in particular and also the scientists to communication between science and society. Through the evaluation of policies, strategy documents and research, accompanied with the insights of science policy experts I will be able to identify the current situation and to outline recommendations to improve science communication.

When effective science communication policies are in place there is a higher chance for knowledge transfer accelerating the development of new technologies. A science-literate society that has an understanding of new and emerging technologies provides a skilled workforce necessary for economic competitiveness[1]. Ideally, science communication enables interaction between the relevant stakeholders: the government, the science community, companies, the interest groups, researchers and civil society. The study will examine if this is the case in Hungary, and in order to do that first we will have a closer look at the possible interpretation of 'communication' in the context of science and technology (S&T).

1.2. The One-way Street of Communication

Often, when it comes to science communication, most of us think about scientists talking about science to ordinary people (Burns, O'Connor, & Stocklmayer, 2003). People use the term to describe activities where scientists talk about their work to raise public awareness.

[1] See, for example, the reasoning of Dr. Mae Jemison at a public lecture: http://insightnews.com/education/4343-astronaut-dr-mae-jemison-create-science-literate-society

This view is dominant in the sense that the popularization of science and education gets most of the attention and support, eventually. Scientists have recognized that if their work is more visible it appears more credible to potential funders, and news coverage may also enhance individual scientists' career prospects (Peters, et al., 2008).

People are inherently interested in science. The 2007 Eurobarometer survey *Scientific research in the media*,[2] carried out by the Directorate- General for Research among approximately 27 000 persons in the 27 Member States[3], found that scientists are the favoured interlocutors in conveying scientific information. The survey also showed that most people are interested in scientific research and half of those interviewed consider that media coverage of research is sufficient and satisfactory. These results are reinforced by a survey which revealed that 20% of Hungarians watch at least one science popularization TV channel (Spektrum, National Geographic, Discovery Channel, etc.) several times a week (Fábri, 2007.).

1.3. Defining Science Communication

For the purpose of this research the study will use the definition of Burns et al. (2003). They defined science communication "as the use of appropriate skills, media, activities and dialogue to produce one or more of the following personal responses to science (the AEIOU vowel analogy): Awareness, Enjoyment, Interest, Opinion-forming, and Understanding." This definition is particularly useful for the research purpose as it provides a view from the outcome perspective.

[2] Scientific research in the media (summary): http://ec.europa.eu/public_opinion/archives/ebs/ebs_282_sum_en.pdf

[3] The survey "covers the population of the respective nationalities of the European Union Member States, resident in each of the Member States and aged 15 years and over. The basic sample design applied in all states is a multi-stage, random (probability) one. In each country, a number of sampling points was drawn with probability proportional to population size (for a total coverage of the country) and to population density." (ibid. p 27)

My research of science policies therefore starts by identifying communication activities and actions, and after, matching these with the policies, guidelines and – eventually – the actors determining them.

In this study we shall make a distinction between one-way and two-way communication. By one-way we mean a communication process which aims at broadcasting and transmitting some information, where the feedback from the recipient of information is confirmation and – if that is possible – clarification questions to absorb. Typically, these are lectures, television and radio programmes, etc. Hak-Soo Kim has called it a "unidirectional information flow model" (PEP/IS: A New Model for Communicative Effectiveness of Science, 2007) distinguishing between communication via the media (Path 1) and directly between scientists and the public (Path2) and visualized it as below in Figure 1.

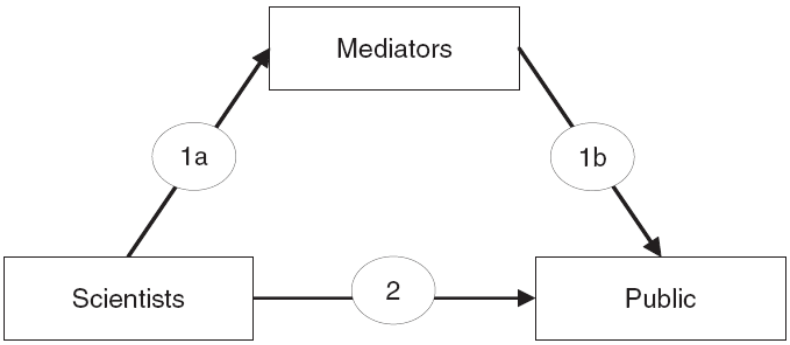

Figure 1: The Unidirectional Information Flow Model (Kim, 2007)

Two-way communication, on the other hand, is a communication process where the sender is a receiver and the receiver is a sender, too. This transaction, interaction may take several forms, e.g. in science cafés, blogs, deliberative polls. In this model we can also observe that the role of mediator is more complex, which we can grasp by comparing the role of a journalist with the role of the mediator in a deliberative conference.

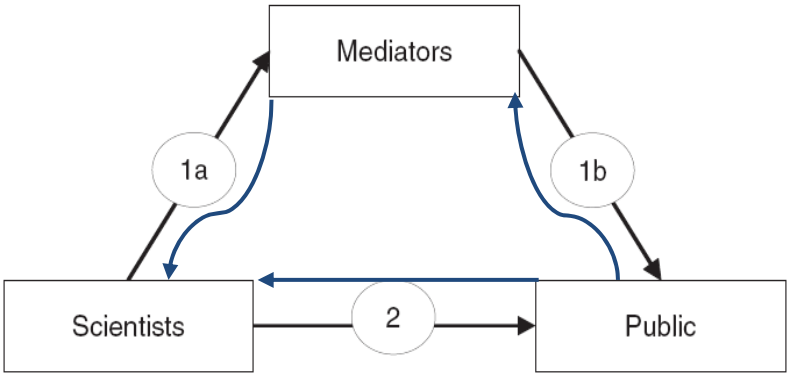

Figure 2: Two-directional Information Flow Model (Markus, based on Kim, 2007)

2. The recent history of science communication

- Literature Review -

Though science communication can be defined in simple terms, there are many factors that make the picture complex. Communication can be described by the classical Five W-s: Who? What? When? Where? and last, but not least Why? (Flint, 1917). In this case, the most intriguing question is this last one: Why to communicate science at all? In order to give an answer, this chapter explores who are the beneficiaries; and why, so far, we have seen science communication.

2.1. Science, the Endless Frontier

For centuries, science was perceived as a realm operating outside rather than inside society. (Latour, 1998) As Nowotny, Gibbons and Scott (2001) phrased it:

> "In traditional society science was 'external'; society was – or could be – hostile to scientific values and methods, and, in turn, scientists saw their task as the benign reconstitution of society according to 'modern' principles which they were largely responsible for determining".

Scientists and researchers were seen as peculiar people who lived and worked in an ivory tower overlooking the world from above. This image was persistent among lay people and scientists alike, embedded in a certain level of respect and, possibly, fears from the possible threats of science. (Wynne, 2006) The 'mad scientist' image that prevailed in the 20th century Hollywood films as well (Frayling, 2005) reflects this alienation: the outlook, the

language and the behaviour of scientists have been perceived as considerably different from those of ordinary people.[4]

Since the Second World War, and with the experience of the nuclear bomb that was produced with the contribution of respected scientists, a new regime of science governing emerged, sometimes called 'Science, the Endless Frontier', after the title of Vannevar Bush's 1945 report to the US President Roosevelt. In his 1944 letter, which invited Bush to write his report, FDR argued for the need to revisit the role of science as follows:

> "The information, the techniques, and the research experience ... should be used in the days of peace ahead for the improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living" (Bush, 1945)

According to the Bush report, health, prosperity and security all depend on the progress science can achieve. Its argument that as long as scientists are free to pursue truth "wherever it may lead" there will be a flow of new knowledge that leads to development, has prevailed for a long time. Even nowadays when serious scandals scatter the science community and the public trust (as in the case of Hwang Woo Suk in 2005[5]) some scientists and politicians seem to insist on this idea. The frontiers of science are supposed to not be restricted by the ethical or moral concerns of society.

[4] "The cinematic Who's Who of mad doctors, including Caligari, Rotwang, Frankenstein, Jekyll, Moreau, Cyclops and, of course, Strangelove, epitomised the stereotype: they worked alone, had unusual hairstyles, did not publish (too paranoid), were usually disabled, and were wont to say things like "it's a crazy idea but it just might work"." (Frayling, 2005)

[5] Until November 2005, Hwang, professor of Seoul National University, was considered one of the pioneering experts in the field of stem cell research, when his unethical practices and faked research have been unveiled. On 26 October 2009 he was sentenced to a suspended two-year prison term for partially fabricating data in papers for the journal Science, misappropriating research funds and illegally trading human eggs.

2.2. Public Understanding of Science

By the second half of the twentieth century, science education was well-established in developed countries for various segments of society. Policies since then have focused on educating the public so that it could understand science and scientific developments. Education provides a way of thinking in order to help people to take jobs that require certain levels of techno-scientific knowledge. The *Public Understanding of Science (PUS)* policy is often linked to the publication of the 'Bodmer Report' that laid out the theoretical basis of science popularization including the role of education, mass media communication, museums and other means:

> In a democracy public opinion is a major influence in the decision-making process. It is therefore important that individual citizens, as well as the decision-makers, recognize and understand the scientific aspects of public issues. To decide between the competing claims of vocal interest groups concerned about controversial issues such as 'acid rain', nuclear power, in vitro fertilization or animal experimentation, the individual needs to know some of the factual background and to be able to assess the quality of the evidence being presented. Wider understanding of the scientific aspects of a given issue will not automatically lead to a consensus about the best answer, but it will at least lead to more informed, and therefore better, decisionmaking. (The Royal Society, 1985)

The PUS model is based on the *deficit model* (Wynne, 1991) where people's heads are seen as empty cups to be filled with knowledge so that they become able to assess scientific evidence themselves. This policy was embraced by many governments, and by the European Commission's 2000-2006 Sixth Framework Programme in which this 'deficit model' focuses on the dissemination of results 'to promote knowledge sharing, greater public awareness, transparency, and education' (European Commission, 2004) .

Clearly, we can identify problems with this approach. First, scientists face the fact that it is hard for many people to grasp even basic scientific facts (European Commission, 2005). At the same time, the public finds it difficult even to understand the language of scientific articles. As the 2007 Eurobarometer *Scientific research in the media* survey concluded:

science information in the media is seen as reliable, objective, useful and varied but also difficult to understand, not very entertaining and unrelated to their concerns. The communication channels are therefore open, but the message received remains rather fuzzy.

According to the main conclusions of this survey the majority of the EU population is interested in scientific research. Of all the research fields, medicine attracts the highest degree of public interest but the environment also enjoys high interest levels. In contrast, certain areas do not get almost any public attention. European Union citizens have a positive view overall of the current presentation of scientific research in the media. However, in terms of ease of understanding there is a need for improvement, as virtually half of respondents say scientific news is difficult to understand.

Television is the most important medium in all aspects covered by the survey: Europeans encounter information of scientific research most frequently via television. They prefer to receive scientific information via traditional and thematic TV channels and TV is the information source they trust the most. EU citizens prefer programs on the topic – particularly documentaries – to be broadcasted during prime time on weekdays. In addition, the study reveals that Europeans would prefer scientists rather than journalists to present scientific information in the media as they consider this would be more trustworthy and precise.

Nevertheless, interest in science is not as stable as a once-in-a-year survey might reveal. Ordinary people, who generally are less interested in the recent developments of medical research, quickly become experts when they have an interest in doing so. According to the *contextual model* when an issue becomes relevant to people they demonstrate an excessive capacity to understand even complicated problems (Falk & Storksdieck, 2005). This is especially true for health-related issues, e.g. as the case study describes how a patient taking certain medication for years successfully, but then discovering that some risk is

involved becomes a "lay expert" of its field (Wyatt, Wathen, & Harris, 2008). This model was partly embraced by Kim Hak-Soo, who emphasizes the importance of engaging in successful communication with the public (Kim, 2007). The deficit and contextual models actually lead us to the direction of a more sophisticated approach, where the public is no longer seen with 'empty heads to be filled' but as a *partner* with whom dialogue and collaboration is eventually fruitful and desirable.

2.3. The transaction and PES models

The PUS model described above is based on one-way communication, where the information is flowing from the scientist to the public. While this approach is still persistent, the new science communication theory is based on a shift from the model of transmission to one of *transaction* (Hanssen & van Katwjik, 2007). This model, as well as the *Public Engagement in Science (PES) model*, puts emphasis on two-way interactions (Scoones, Leach, & Wynne, 2005). The underlying assumption is that scientists can also learn from the public, as "both have access to knowledge as well as having political and normative values that are relevant for scientific choices" (Siune & Márkus, 2009). In this way, the public no longer only has the knowledge deficit – instead, it is considered as an important stakeholder group with relevant potential input to the process of information exchange.

There are some concerns about the validity of these underlying assumptions, though. The various types of public deficit models are summarized by Wynne (2006) as he explores the gaping lacuna in the treatment of the 'public mistrust' problem. He emphasizes that contrary to the original 'cognitive' deficit model *public mistrust* "appears to be due to public awareness of unpredicted future consequences which the scientific institutions effectively

deny by referring only to risk assessment as an attempted means of public reassurance" (Wynne, 2006).

I	Public 'deficit' of understanding of scientific knowledge (e.g., non-GM tomatoes also contain genes)
II	Public 'deficit' of trust in science – more information, transparency, or explanation will restore trust (via 'understanding our motives')
III	Public 'deficit' of understanding of scientific process – science cannot *be expected to* give certainty or zero risk [see, for example, ref. 22]
IV	Public 'deficit' of understanding that 'real' science has no ethical/social responsibility for its applications or impacts
V	Public 'deficit' of knowledge of the benefits of 'science' [see, for example, ref. 28]: GM crops in the UK will help feed the global starving and avoid armageddon for British science
I–V	Public responses are emotional, dependent, epistemically empty, gullible to manipulation; no questions about 'our' scientific-institutional culture and its assumptions

Table 1: Public deficit models (Wynne, 2006, p. 214)

2.4. Contemporary Science Policy Challenges

The old days of the nineteenth century, when basic science was autonomous and the only thing that mattered was research excellence, are long over. According to Vladimir de Semir, we are experiencing a "current historical era, which sees a crucial passage, from the industrial society to the so-called society of knowledge. A society in which scientific and technological innovations are incorporated ever more quickly into our daily life. And in which investments in research and development become ever more crucial for the progress and the development of a country." (Ramani, 2009). Science is no longer seen as something only for the 'elite', it is an asset of the society, so all of us would like to enjoy its benefits.

The borders between basic research and applied research are diminishing, to the point where a new research form, called *"strategic research"* has emerged. The definition of Irvine and Martin indicates a specific character: "Strategic research [is] basic research carried out

with the expectation that it will produce a broad base of knowledge likely to form the background to the solution of recognized current or future practical problems." (Irvine & Martin, 1984) This form of research is expected to produce knowledge that can be useful, and allow excellence and relevance to coexist (Rip 1997). This concept is in resonance with the narrative of those government policies that argue for the relevance of science as the basis for economic development.

At the historical moment when the recently elected US President Barack Obama delivered his inauguration speech he outlined the role of science in technological development in a broad perspective:

> We'll restore science to its rightful place, and wield technology's wonders to raise health care's quality and lower its cost. We will harness the sun and the winds and the soil to fuel our cars and run our factories. And we will transform our schools and colleges and universities to meet the demands of a new age. All this we can do. All this we will do. (Obama, 20 January 2009)

Obama's speech has referred to using technology in order to "meet the demands of a new age" as an implicit reference to the need for strategic science. He implied that science, including basic research is to be carried out to solve problems of energy supply and health issues, for example. For scientists – in and outside the United States – the restoration of science to "its rightful place" is a call to pose the epistemological question: What is science's rightful place? At the same time, "consumers" of science rightfully ask if it is a vision that we, the people, can comfortably embrace (Jasanoff, 2009).

2.5. Why Communicating Science?

Scientific development is perceived as key to economic success in a globalized, highly competitive world, according to the Lisbon Strategy of the European Commission (COM, 2002:14). Research and technology are even considered to be the "twin pillars of

progress" (CERN, UNESCO, & ICSU, 2003). The importance of scientific expertise for decision-making under this global uncertainty is increasing, and the resulting pressures for 'sound science' – whatever that may be – require further skills, at least for some of the researchers. They must be able to provide expert narratives linked to (socially) robust evidence (Felt, 2007). Besides the economic relevance, science provides solutions for people's health problems and addresses other concerns of their daily lives. That is why the nature of innovation has changed in the OECD countries, having greater focus on user-driven innovation (Pilat, 2008). The requirement of societal robustness, rather than just scientific robustness, has to do with the changing position of scientific expertise in society (Nowotny, Gibbons, & Scott, 2001). Classical advising activities as technology assessment have to reflect these developments and to create adequate responses and new or modified approaches.

Science has been placed in the context of society, thus, it is 'contextualized' in a way so that it cannot be isolated either from the actors of economy or from the people. These changes resulted in the emergence of the concept of Mode-2 science (Limoges, Schwartzman, Nowotny, Trow, & Scott, 1994). Ideally, science is embedded in society, a driving force of development and a resource for addressing people's concerns at the same time.

Science has changed in such a way that communication became part of research processes. In view of the above, literally, science should both **tell us** where to go and also **listen to us** to know where it should go. This seemingly contradictory dual role sets the scene of science communication as inherently a two-way street.

3. Research Methods

In this chapter I will briefly overview the design of my research that aimed to explore the contemporary attitude and approach to science communication in Hungary. First, I will argue for the use of qualitative approaches and present the research design in detail. Second, I will describe the data collection procedure. Finally, I will explore the validity and the recognized limitations of my research methodology.

3.1. Research Design

Communication is a mature scientific discipline of which science and technology communication is identified as a branch, so first I tried to identify science communication policy papers, regulations or strategies in Hungary. Unfortunately, I have not find any of these (neither a study that deals with the topic exclusively and thoroughly), so I had to find another way to expose the background of what is going on in this field. I supposed that even if there is no written policy exclusively dealing with communicating science, the science and technology (S&T) policy documents must have references. Consequently, the first task of the research was to collect the strategies and policies determining science policy.

Science communication is a part of science policies that is quite visible for anyone interested and may be analyzed with quantitative methods, e.g. by measuring the audience of a TV program, the number of visitors to science shops and museums. Nevertheless, this study takes a qualitative approach in order to investigate perceptions, attitudes, and motivations. This approach, at the same time, allows us to understand the implicit formulation of science

communication policies. We can also hope that this exploratory research of attitudes will provide a sound basis for later quantitative evaluations.

Besides exploring contemporary attitudes, the study also aimed to describe the policy documents, strategies, and other available official documents on science communication in Hungary. It identified Trench's Analytical Framework of Science Communication Models, as shown in Table 2 (Trench, 2008) a useful tool to perform the policy analysis. This framework for public communication of science and technology (PCST) is useful in the sense that it helps to analyze the communication based on motivations and perceptions about the public.

Base communication models	Ideological and philosophical associations	Dominant models in PCST	Variants on dominant PCST models	Science's orientation to public
Dissemination	Scientism Technocracy	Deficit	Defence Marketing	They are hostile They are ignorant They can be persuaded
Dialogue	Pragmatism Constructivism	Dialogue	Context Consultation Engagement	We see their diverse needs We find out their views They talk back They take on the issue
Conversation	Participatory democracy Relativism	Participation	Deliberation Critique	They and we shape the issue They and we set the agenda They and we negotiate meanings

Table 2: Communication models in S&T (Trench, 2008, p. 133)

After the collection and overview of the documents I realized that in Trench's framework some minor additions are needed that fit the Hungarian policy documents' analysis. The first base model "Dissemination/Deficit" includes that science's orientation to the public is the need to educate, or "to fill empty heads". This we may call the "Education" variant of the Deficit model. Also, the Participation model is based on the democratization of

science, which I considered not only as an ideological association but as a variant of the model.

Therefore, during the analysis of documents I used a modified version that is presented in Table 3.

Dominant science communication model	**Variants on the dominant models**	**Science's orientation to public**
Deficit	Defence	*They are hostile*
	Ignorance	*They are ignorant*
	Education	*Their head is empty*
	Marketing	*They can be persuaded*
Dialogue	Context	*We see their diverse needs*
	Consultation	*We find out their views*
		They talk back
	Engagement	*They take on the issue*
Participation	Democratization	*They and we shape the issue*
	Deliberation	*They and we set the agenda*
	Critique	*They and we negotiate meanings*

Table 3: Communication models in S&T (Markus, based on Trench, 2008)

Experience surveys with key experts of the area were designed with the use of structured interviews. The interviews used open-ended questions allowing and encouraging interviewees to elaborate their views not only on the issues explicitly asked, but on anything which they found relevant. In a way, the interviews functioned as brainstorming sessions to elicit as many ideas as possible. The number of interviews was limited to four to ensure the representation of the three key sectors – the government, the academics and the NGOs – and the European dimension. As the aim of the interview was rather to give ideas and a perspective to the desk research, the researcher considered that there is no need to further increase this number.

The first question of the guided interview is designed to set the scene of interview in the framework of science communication policies. The second question aims at eliciting

ideas on the current dominant approach in science communication. The third question explores the attitude of both the interviewee and his/her peers toward communication. I did not directly ask about the attitude of the interviewee, as inherently, I supposed that science communication is important for him/her. The fourth question is designed to explore which government and non-government actors are active in science communication. Deliberately, none of the possible institutions were explicitly mentioned. However, during the interview, I posed further questions if important possible actors were forgotten (e.g. universities). The fifth question was designed to encourage the interviewee to give details on activities that match the engagement and participation PCST models. The questionnaire is attached in Annex A.

3.2. Data Collection Procedure

As part of the desk research policy papers, strategies and other documents were first sought on the internet and in the library of the Parliament of Hungary. Second, after the initial identification of key government institutions of the area, I contacted the offices to provide us with information. Finally I identified the Ministry of Education and the Ministry of Economy in the central government, the Hungarian Academy of Sciences, as well as the National Office for Research and Technology (NKTH) as main institutions responsible for science communication. They provided me with policy documents, and helped to identify all legal and fiscal instruments in science policy.

The desk research focused on the following types of policy tools:

- strategies and strategic policy papers of government and non-government institutions,
- legislation (laws and regulations),

- fiscal policy (grants, operational programes),
- others (discussion papers, reports).

In order to collect ideas of diverse relevant contemporary experts in the science communication field, one key person in each of the institution types was contacted: one academic researcher of science policy (working for a research institution of the Hungarian Academy of Sciences), one person responsible for the design and implementation of government policies (head of cabinet at the Ministry of Economy responsible for R&D policies), one NGO representative with relevant experience in carrying out science communication projects (working at Science Café and former leader of the Encompass project), and one expert of both EU and Hungarian science policies (former S&T attaché at Hungary's Permanent Representation to the EU in Brussels). This way I could identify recognized experts in three areas of science communication: policy-analysis, policy-making and policy implementation.

The names, positions and affiliations of interviewees and the dates of conducting the interviews are summarized in Annex A. The translated transcripts of interviews are attached as Annex B.

3.3. Validity, reliability and limitations

The methodology described above ensures a balanced way to explore the answer to our research question. These sources provided a solid framework to identify the mainstream policy approach.

The interviews complemented the desk research in two ways. First, they called my attention to issues that I did not come across in the documents. Second, they helped to map science communication practices that were not explicit or not mentioned in those documents.

The combination of the two methods resulted in higher reliability of the results that could have been achieved by using only one of the methods.

The desk research has covered the policies and strategies, but it did not aim at researching the practices of science communication. The analysis of these activities, covering the overview of projects supported by the government grants, and the effectiveness of these fiscal tools would require a further research supported by quantitative analyses. This future research would be supported by a considerably larger number of interviews that could overcome the limitations of the current limited range.

4. Results

During the research, first, the parts of science policy documents dealing with or referring to science communication were identified. As outlined in the previous chapter, I have then analyzed these references to science communication using the framework of Trench (2008). The structured interviews were conducted in May 2010 and in November 2010, and their main findings are summarized below.

4.1. Overview of policy documents

For the policy analysis I have studied more than twenty policy documents, most of which proved to be useful. Below, I will give a brief overview and outline the relevant references to science communication. The documents in each sub-chapter are presented chronologically. In Chapter 4.2 I will analyze the documents in a different structure that fits better the framework of Trench.

4.1.1. Strategies and concept papers

In 2000 the Ministry of Education has issued **Science and Technology Policy 2000: The concept and the implementation plan of the government** (Oktatási Minisztérium, 2000). In this paper, which was never adopted as a legal document, there is a reference to communication by declaring the need "to establish the institutional framework of knowledge flow and interoperability between the research institution networks, higher education and the

corporate world". Also, it has highlighted international cooperation as one area of action. However, there is no reference to communicating with the public.

A draft science strategy document of the National Office for Research and Technology **Knowledge, Creation, Value** (NKTH; GKM; OM, 2005) was also analyzed. According to the 4th priority the social recognition of R&D&I should be enhanced via science popularization tools, by prizes and awards and by interactive methods (such as science and technology museums).

Based on the above document, two years later, the government adopted resolution 1023/2007 on its mid-term **strategy in science, technology and innovation (SSTI)**. One of its strategic priorities was the "culture of embracing and utilizing the results of scientific research". Similarly to the draft document of 2005 the tools included popularization by traditional and interactive means, as well as prizes and awards. Besides, the decree urged to increase the social dialogue about the advantages and risks of the application of new scientific results and technologies. The SSTI was later supported by two government resolutions of SSTI action plan, which we will discuss below.

In a recent study, a group of well-known academics and researchers active in the field of innovation has outlined a concept paper **Science, Innovation and Growth** (Pakucs, 2010). They claim that by embracing the results of research and innovation into the life of people we can establish their respect and a "science-friendly social environment". The concept paper does not mention the need of communicating science in any way.

4.1.2. Laws and regulations

There are three major laws which are of interest in the scope of our analysis. The first law was adopted on the **Hungarian Academy of Sciences** (HAS) (1994). In the first

paragraph it is declared that one of the tasks of HAS is the "representation" of science. In § 3 the tasks are described in detail, declaring that HAS supports the publication of scientific books and journals, organizes scientific events and conferences and ensures the freedom of expressing scientific opinion.

The **Law on the Research and Technology Innovation Fund** (2003) says that funded programs can be used to organize conferences and exhibitions, to print publications on the topic of R&D and technological innovation and to support prizes of innovation. Interestingly, the **Law on Research, Development and Technological Innovation** (2004) dedicates Chapter VIII, which is altogether one paragraph in length, to the communication of research, development and technological innovation (R&D&I) in a much broader sense. The law declares that support should be given for popularization of science and other activities that reveal the advantages and possible risks of R&D&I, for combating false perceptions and for forums that enhance public control. Besides, dialogue between R&D&I and other actors of society should be reinforced. The rationale, according to § 30, is to increase the social awareness, acceptance and recognition of research, and to increase the attractiveness of science and technology careers.

The 251/2002 government decree on the **rules of procedure of the National Research and Development Funds** is explicit about the role of science communication. The resources of the Funds shall be used to distribute information on the call for proposals and on the results of R&D activities, using up to 5% of the Fund's resources. The results of the Funds' programmes should be communicated to the public as necessary, minimum once a year.

The **National Office for Research and Technology (NKTH)** is a government funding agency established by the 216/2003 government decree. According to this decree the

role of NKTH with regard to communication is to popularize modern technology advancements and to support the awareness- and recognition-raising activities of R&D.

The **first action plan of SSTI** was adopted as the 1066/2007 government resolution for the years 2007-2010. It has identified four measures for science communication in Hungary. Measure V.1. *"Accented representation of science, technology and innovation (STI) in government communication"* targets at results, good practices and success stories to support positive information on government activities. Measure V.2. *"Enhancing the social attitude and acceptance of technological innovation and R&D"* supports, among others, the popularization of scientific work, the distribution of results and establishing prizes that recognize scientific advancement in society. Measure V.3. *"Adequate representation of STI for society"* also supports prizes and similar means of recognition of STI, science and technology museums and exhibitions. Besides, it ordered a "thorough examination and elaboration of proposal for the publication of scientific work in Hungary"[6]. Measure V.4. *"Supporting initiatives popularizing science and innovation"* lists a couple of distinctive actions to be organized and supported (World Science Forum, Hungarian Science Festival, Researchers' Night, Student Olympics, etc.)

The **second action plan of SSTI** was adopted as the 1019/2009 government resolution for the years 2009-2010 partly because the first action plan was not implemented successfully. That is why the second document mainly repeats most of the measures with modified deadlines, and makes some additions to further proposed actions. In general, the measures in science communication remained the same as in the 1066/2007 government resolution.

[6] The action plan does not allocate any money for this "examination", and neither mentions the term **scientometrics**, which is a quite recent type of research with Hungarian researchers taking the lead. E.g. Peter Vinkler (HAS) received the Prince Prize of the Paris *Observatoire des Sciences et des Techniques* institute in 2009 for his pioneering work in the field.

4.1.3. Grants

The resource map of R&D&I grants of 2009-2010 (Dr. Molnár, 2009) identified two grant schemes that are dedicated to science communication.

Mecenatura is a grant scheme managed by NKTH (Mecenatúra pályázat, 2009). In order to increase the competitiveness of the country the aim of the program, among others, is to support

- conferences, exhibitions, publications
- prizes of innovation
- the recognition of the importance of innovation
- and the distribution of technical knowledge and R&D results.

According to the report of NKTH on 2009 (NKTH, 2010), out of 1,552 applicants 641 (41.3%) were supported with an average grant of 1.93 million HUF (cca. 9,500 USD) per proposal.

TAMOP 4.2.3 is a grant scheme in the **Social Renewal Operation Programme** (TAMOP) of the Structural Funds (2009) managed by the National Development Agency under the supervision of the Ministry of Economy. The overall objective is to increase labour market participation. The fourth priority axis of the programme is the creation of a knowledge-based economy, and one of the targets of this axis is to increase the number of S&T undergraduate students. In order to increase the "awareness and recognition of research results" scheme 4.2.3 supports "publishing and circulating information dissemination documents" and "researchers' and innovation awards in the interest of reinforcing social awareness and recognition of scientific results".

In the **Action Plan 2009-2010** (Akcióterv 2009-2010), which is the basis for announcing calls for proposals, the TAMOP 4.2.3 scheme is described in detail. The communication activities that can be supported are described in detail:

1. Popularization of maths, technical, IT and science majors
2. Events that encourage the dialogue between science and society and researchers' participation in society.
3. Interactive exhibitions, shows and events developing scientific knowledge and other health and social competences.
4. Events popularizing scientific work in a wide audience
5. Development and launch of electronic science journals
6. Events and exhibitions popularizing STI
7. Publications, programmes and multimedia content development presenting the results, use of R&D and the life of researchers
8. Science web-portal development
9. Presentation and adaptation of themes related to ethics and equality in science in the public discourse
10. Establishing prizes for scientific achievement, especially for women and for lecturers and researchers in the S&T field.

The only TAMOP 4.2.3 call for proposals was published in the 4th quarter of 2008. The National Development Agency managing the call received 41 proposals, 26 of which were supported (by a maximum 85% of total cost). The total grant these organizations received was 1,854 million HUF (cca. 9.17 million USD), which means more than 350,000 USD per each grant on average.

4.1.4. Other policy documents

The Hungarian Academy of Sciences (HAS), as defined in the law constituting the organization, has a task in the field of communicating science. In 2005 the HAS has adopted a document for discussion, the **Science Policy of Hungary in the Union** (Magyar Tudományos Akadémia, 2005). In the introductory chapter it describes the new synthesizing attitude needed in a new, more interdisciplinary world.

> We should not simply fight non-scientific views, lecturing to society, but rather learn to »think together« with society. It tackles the democratization of science: there is a need for the transparency and accountability of science for its legitimacy in the wider public. (Magyar Tudományos Akadémia, 2005, p. 7)

Also, they refer to the need to answer the expectations of society and economy. They claim that it is the duty of the R&D&I sector "to inform the public and to »validate« new science and technology results".

The reform of HAS was launched to modernize the institution based on the above document. In 2007 the general assembly has adopted a decree (Az MTA 177. közgyűlésének határozata az Akadémia reformjának III. szakaszáról) that, contrary to the discussion paper, does not mention communication or dialogue with the public at all.

Another key institution in the field of science grants that also has a role to communicate with the public is **NKTH**. In their **report on activities in 2009** (NKTH, 2010) they dedicate a chapter to describe "social partnership and communication". First, they mention the **Council on Research, Technology and Innovation** (KUTIT) as their most important partner providing social control. It is a council established by the government decree 216/2003 with members of different ministries and other members nominated by the minister responsible for R&D based on the proposal of research institutions, universities and research / innovation / economic organizations. The council deals with the strategic issues of the Research and Technological Innovation Fund.

In 2009 the NKTH had consultations with interested partners before issuing the calls for proposals. This way they ensured that before finalizing draft calls, feedback was incorporated in the documents, thus increasing the transparency of grant procedures.

NKTH regularly organized national and international conferences, press events besides managing funding programs of science communication activities.

4.2. Analysis of policy documents

The analyzed policy documents were not only different in length, style, but – more importantly – different in the ways they determined actual science communication activities or the ways they reflected the intentions and attitudes of policy-makers. Therefore, during the analysis, performed by the modified framework of Trench, I wanted to indicate the type of policy document. The analyzed policy documents, listed below, are attributed with an abbreviation reflecting their classification in Table 4 below.

Policy type	**Abbrev.**	**Name of policy document**	**Year**
Strategy	S1	Science and Technology Policy	2000
	S2	Knowledge, Creation, Value	2005
	S3	Strategy in Science, Technology and Innovation	2007
	S4	Science, Innovation and Growth	2010
Law	L1	Law on the Hungarian Academy of Sciences	1994
	L2	Law on the Research and Technological Innovation Fund	2003
	L3	Law on Research, Development and Technological Innovation	2004
Regulation	R1	National Research and Development Fund	2002
	R2	National Office for Research and Technology (NKTH)	2003
	R3	Action plans of SSTI	2007 2009
Funding	F1	Mecenatura (grant of NKTH)	2009
	F2	Social Renewal Operation Programme (TAMOP)	2007
	F3	Action Plan of TAMOP 2009-2010	2009
Other	P1	Science Policy of Hungary in the Union	2005
	P2	Report on activities of NKTH in 2009	2010

Table 4: Summary of policy documents

There was only one science policy document (S1) that has made no reference to science communication with the public at all; still it is included in our analysis to demonstrate that not all science policies, not even strategies, consider this aspect of science policy. Besides, R1 has made a reference to the need to distribute information only relevant to the calls and results of the Fund and not science results in general.

First, I will take a look at each of the variants of the PCST models in detail.

4.2.1. Results in detail

DEFICIT – DEFENCE There is not much reference to the hostile attitude of the public in the documents, except for the most recent strategy (S4) and the law on HAS. S4 sets the aim to establish a science-friendly environment, implying the presence of aversions. Anti-scientist attitude is not dominant in Hungary, but recently there were some cases (GMO and H1N1) that may explain its appearance in the most recent strategy paper. The law on HAS expresses its intention to defend the freedom of expression of scientists, which is explicable with the fact that the law was adopted five years after the collapse of communism. The law on R&D&I only makes a reference to "false perceptions" that scientists shall confront, but it is not defence in the classical sense.

DEFICIT – IGNORANCE All strategy documents referred to this aspect (except S1) by expressing the need to enhance the "recognition" and "acceptance" of science. While in S2 it was the main reason, and S3 has also elaborated it, S4 has just referred to it. The decrees of R3 were the only legal documents that implied the ignorant attitude of public, while the funds F1 and F2 both highlighted it by issuing calls to increase the recognition of science.

DEFICIT – EDUCATION Clearly this was the most popular variation, thus it can be considered as the dominant approach. All laws and all policies on funding have referred to the need to disseminate information and results to the public (using conferences, off-line and on-line publications, web-portals, etc.) in order to educate them and to build a "knowledge-based" society according to the EU values. P1 intends to "inform the public" in general, which mainly resonates with the terminology of most other documents.

DEFICIT – MARKETING S3 is the only strategy that mentions the need of popularization. L3 and R2 of 2004 and action plans of R3 consider the need to raise awareness, popularize science and persuade the public. R3 even mentions the task of S&T representation in government communication. Besides, all funding policies attempt to support marketing and public relation activities (e.g. exhibitions, prizes of recognition), too. Notably, F3 even supports special prizes for women in science.

DIALOGUE – CONTEXT P1, the 2005 policy of HAS recognized that "the needs and expectations of society should be answered" by science. In the 2007 strategy (S3) this attitude – "to understand the concerns" – was still present, but it was embedded in the consultation discourse.

DIALOGUE – CONSULTATION The 2004 law (L3) already declared that "dialogue should be reinforced" and "forums to enhance social control" should be established to identify needs and to understand the advantages and risks of science. The 2007 strategy (S3) has embraced this ideology "to increase the social dialogue about the risks and applications", too. The F3 funding encourages dialogue between science and society and the presentation of ethics and equality in science. The report on 2009 (P2) deals with dialogue in a different way; consultations were used in NKTH as part of managing the calls for proposals.

DIALOGUE – ENGAGEMENT This variant of the dialogue model was not present in any policy documents analyzed.

PARTICIPATION – DEMOCRATIZATION While the 1994 law on HAS (L1) was stuck with the deficit model, the 2005 policy of HAS (P1) – dated 11 years later – showed the most modern approach of the analyzed documents to science communication: the participation model. As the policy document described, the democratization of science and a "new synthesizing attitude" is necessary to meet the new demands of a new scientific world. Unfortunately, this concept of the 2005 HAS policy was not embraced by the later strategy documents and legislations.

PARTICIPATION – DELIBERATION & CRITIQUE No policy document has referred to these variants of the participation model.

4.2.2. Overview of results

Overall, the documents outlined the following policies according to the modified framework of Trench (2008) summarized in Table 5.

Dominant PCST model	Variants on the dominant models	Strategies	Laws	Regulations	Funds	Others
Deficit	*Defence*	S4	L1, (L3)			
	Ignorance	S2, S3,(S4)		R3	F1, F2	
	Education		L1,L2,L3	(R1,R2)	F1,F2(F3)	P1
	Marketing	S3	L3	R2,R3	F1,F2,F3	P2
Dialogue	*Context*	(S3)				P1
	Consultation	S3	L3		F3	P2
	Engagement					
Participation	*Democratization*					P1
	Deliberation					
	Critique					

Table 5: Analysis of policy documents

The analysis thus revealed that the dominant approach to science communication in Hungary is the elaboration of the deficit model, especially the marketing and education variants. This suggests that the people constituting "the public" are – according to scientists – to be persuaded and taught. There are limited attempts to engage in dialogue, while the participation model has been embraced only by one non-legal document of the Academy.

4.3. Interview results

The interviewees described current government science communication policies in different ways. The NGO expert said there is no central science communication policy, whereas the government expert said that the foundation of this policy is laid, and the problem is that implementation is lagging behind. Our EU expert referred to government science policy as a mean to shape the public's opinion. The academic expert described the SSTI policy determining the area as something that remained "just a paper", as institutional interests determine the field. According to the government expert the failure can be explained by the fact that motivation to communicate comes from science, and others do not see the need for it.

All interviewees agreed that the PUS approach (deficit model) that has a long tradition is dominant, though the academic expert added that it is not even PUS, and many scientists do not even want to "educate the people". The ideology as they perceive is the popularization and promotion (marketing) of science and themselves. The NGO expert thinks that scientists consider education and popularization as a moral duty. The S&T attaché believed that the PUS approach will remain strong. The academic expert also mentioned some examples when we can observe dialogue, e.g. in techno-science and ethics.

According to the government expert scientists seem to have an elitist approach and look at communication as "anti-science" not finding it relevant at all. The others, however, said that scientists have a positive attitude to communication, and they realize the importance of good image and public support. The European expert added that researchers may also need expert help to facilitate dialogue with the public.

There are several institutions dealing with science communication, among which the HAS and NKTH were both mentioned by all of the interviewees. Universities and research institutions were mentioned alongside with some NGOs and scientists that are especially dedicated to communication.

In Hungary there are no science issues to be on the agenda of engagement activities, and one consensus conference (with a topic in humanities and not in S&T) is all the interviewees could mention. Besides, they mentioned several activities (science cafés, researchers' night, science festivals), which – according to the Framework of Trench – we can consider either as marketing or consultation, but definitely not engagement, as in these cases the public does not "take on the issues".

Overall, interviewees agreed that there is a large space for improvement in science communication policies and practices.

4.4. Consistencies and inconsistencies

When I compared the interviews and the perception of scientists with the policy documents analyzed I found that the experts were consistent with policies in the sense that they reflected the same deficit-model-driven science communication rationale. Generally, they all indicated the lack of coordinated central communication policies, which we could see

by analyzing the policy documents most of which contained a vague discussion of science policies.

The interviewees described the "elitist" approach of scientists to communication, consistent with the dissemination model of PCST, and mentioned the few exceptions of consultation as examples that go against policies. Nevertheless, none of them mentioned that some policies, especially the funding in TAMOP Action Plan (F3) do support the dialogue model.

I also identified some inconsistencies in the policy documents. Education is the most widespread variant of the deficit model; still, while the SSTI (S3) found it relevant, the action plans of SSTI (R3) seemingly did not apply this argument, and instead referred to the needs of popularization and establishing the recognition of science. Similarly, all laws used the education argument, but regulations and funds were less explicit and did not embrace the language of the law.

The ignorance variation of PSCT was presented in all of the strategies, but laws did not even give a hint on this aspect. The funds of TAMOP (F2) described ignorance and marketing on the Operational Programme level, but the Action Plan (F3) that should be based on the above shifted its focus only to marketing and consultation, the latter which variant is absent from F2.

In the final chapter I will conclude our findings and outline some recommendations for the government and other stakeholders, too.

5. Conclusions and Recommendations

Based on the analysis of policy documents and the interviews conducted with researchers focusing on science communication the analysis concluded that in Hungary the major focus is still on one-way communication, especially on its marketing and educational aspect, while there are fewer examples for consultation and public engagement in science policies. In this chapter detailed conclusions and recommendations on modifications and possible future science communication policies are presented.

5.1. The dominant approach: deficit model

In Hungary, like in many other countries, science and technology (S&T) policy has, for a long time, remained an arena where a small group of civil servants and techno-scientists have largely dominated the central aspects of decision-making, including the strategic direction and overall funding priorities as well as the selection of research programs and themes. The role and power of civil servants and what we might call bureaucratic 'policy culture' (Elzinga & Jamison, 1995) has consistently been salient in the S&T policy-making. This is partly explained by the fact that socioeconomic development under the communist regime has, wittingly or unwittingly, strengthened the influence and power of bureaucrats in a diversity of policy areas including S&T policy. Even after the changes in the 1990ies, the bureaucracy of science could not change substantially, partly due to the traditional governance and internal structure of the Academy of Sciences.

There has also been a prevailing 'deficit model' at work, in the sense that S&T issues are too complex and difficult for lay people to understand and accordingly to participate in

policy decision-making and debates about them. The science communication policies were based on the assumption that it is best to leave science and technology decision-making to those experts who have professional knowledge of S&T and that lay people are not to be allowed to participate in or engage with policy/decision making. This attitude is made explicit, for example, not only in the above mentioned documents, but also in the Constitution of the Republic of Hungary § 70/G (1949), according to which "only scientists are entitled to decide in questions of scientific truth and to determine the scientific value of research."

5.2. Attitudes to communication

Apparently instigated by the international academic and practical trends, since lately the necessity and desirability of dialogue, consultation and public participation in S&T has been increasingly discussed among STS scholars in Hungary. Responding to these trends, the government has gradually introduced elements of public dialogue in the S&T policy making process such as in the law on innovation (2004) and later in the SSTI strategy (2007).

Social movements and civil NGOs actively and successfully demand public participation in policy design and decision making, yet, they have not started to demand that the public should be consulted and heard in the S&T policy making. That explains in part why it had so far been regarded as the exclusive realm of a small group of policy makers (bureaucrats) and experts. And while the need of democratization and the pressure for deliberation can be observed in most policy areas research and science policies have remained untouched.

The attitudes of most scientists – according to most of our interviewees – seem to be intact from these trends. The common perception is that the public first of all does not care, second is not competent, and finally would "just hinder" the policymaking process, which is

already too slow to react to the rapidly changing economic environment, S&T developments, etc. Most striking, we found that science policies do not realize the importance of the involvement of society in research design. The PES and transaction models are based on the realization that scientists could learn from the public, but Hungarian scientists still consider non-researchers students and not stakeholders.

Strikingly, the "risk-argument" is missing not only from analyzed policy documents, but has not been mentioned by any of the interviewees. Potential risks of research and development have proved to be a serious issue in the past, still, dialogue and involvement of NGOs and other stakeholders as a mean to avoid conflicts is not recognized.

Moreover, user-driven innovation (Pilat, 2008) that leads to ensure the achievement of the "economic development and competitiveness" goals is based on two-way communication between the researchers and the economic (or social) actors. Strategic research (Irvine & Martin, 1984) also derives from the exchange of information, but neither of these concepts is reflected in the current discourse on science communication.

One way to change this dominant attitude would be an increasing pressure from non-academic stakeholders of the public, and the advocacy of NGOs for the democratization of science. Unfortunately, we have not seen much in this field with only a few exception esp. in the research of environmental and health related issues having risks or strong ethical dimensions. But even in these rare occasions the public pressure was not strong enough to break into mass or mainstream media. It would be worth analyzing why it was the case.

5.3. Challenges

Current inconsistencies of legislation can hinder not only the implementation of the policies (which are non-consistent themselves), but may create illegal or unjustified

implementation. It is especially so when the Action Plan of the TAMOP funds includes actions to be funded that are not in line with the Operational Program approved in Brussels.

The latest official science strategy document dealing with science communication, the SSTI of 2007, is not supported with an action plan that embraces all aspects of the strategy, and it has not incorporated the modern communication theories that were outlined by HAS in 2005. The science communication aspects in all strategies are marginal, and their importance and potential is underestimated. Consequently, there are no consistent policies in the field.

Most importantly, there are only a few science policy experts aware of and understanding the latest changes and the future role of science in society and its effect on science communication. The Hungarian scientific community, as well as its prominent leaders, still guard their ivory tower – allowing only companies financing research and development to enter. Though applied research has opened up for business to set priorities, basic research still claims to be a "job of scientists only". Society is not allowed even to peep in to check if research ethics is in line with the ethics of society.

It is crucial for the development of the country for the policy makers and the STS experts to understand that if research priorities are defined by consultations, and controversies (including ethical dilemmas), expectation, needs of society and economy are deliberated during the research design process then results of research would be better utilized. Not only the developments would meet the expectations better, but there would be fewer conflicts to solve later and – most importantly – the return of investment would be higher.

Certainly, even though in other policy areas public engagement is gaining legitimacy as Hungarian laws encourage civil participation in decision-making processes in general, e.g. the XC. Law on the Freedom of Electronic Information (2005. évi XC. törvény az

elektronikus információszabadságról), but science policy is lagging behind. If the attitudes of the elite of science were translated to the language politics, we would say that scientists still live in feudalism, where the ruling house is the Academy of Sciences.

5.4. The future: Recommendations

Hungarian science communication should be gradually transformed in a way so that public engagement and deliberation activities could gain more support. Research policies should not only reflect the need for strategic research and the economic priorities but also the place of science **within** society. Similarly to the change of the EU 6th Framework Program of Science ***and*** Society programs into the 7th Framework Program's Science ***in*** Society programs, Hungary needs to reconsider its science communication policies to maintain and strengthen its position in economic and scientific excellence.

After the systematic review of the currently sporadic science policies, there is a need to design a coherent and well-established **science communication policy** of its own. This policy should embrace the argumentation of dialogue and participation models that support the goal of responsiveness of science to the needs of society and economy. The 2005 strategy of the Academy is a good basis to start this process of planning involving the government, the innovation stakeholders and the Academy.

There is also a need to conduct some further research to map the interests and attitudes of S&T stakeholders, eg. by conducting a survey and an opinion poll. As we have seen above, the scientific community and policy makers should become more familiar with the practical and theoretical basis of new science communication models in order to consider these methods seriously. That is why a campaign to change their attitude is essential.

Obviously, science policies should be harmonized and coordinated. A new **strategy on research, development, science, technology and innovation** should be on top of the hierarchy of policy documents. A chapter on science communication could set a new framework for policies, regulation and institutions. Laws and regulations should be modified so that they harmonize with the strategy. The funding mechanisms of the Research and Technology Innovation Fund (Mecenatura) or similar construction shall support the implementation of the new strategy, and the priorities could be issued in a government decree. The EU Structural Funds (TAMOP) should also be made consistent with the national strategy and legislation, while it would be also necessary to revise the Action Plan for the coming years accordingly.

The current science communication funding mechanisms do not include measurable indicators and project outcomes on the project level. This way we cannot measure the effectiveness of these policy interventions. In the forthcoming calls for proposals clear measures for project outcomes shall be set, while monitoring and evaluation shall become regular in this field.

The Hungarian Academy of Sciences should be taken on board in the line of reforms. Based on their 2005 paper we can see that they have the openness and willingness to a modern approach in communication. Even though most scientists are not familiar with the potential and the methods of dialogue and deliberation, the HAS could be a facilitator and a mediator of the process.

Science communication may be reinforced by establishing an institution – or at least a department in the government research agency – that aims to popularize and support communication activities, especially by promoting modern models, such as public engagement and deliberation in S&T. The activities of this science communication institution could include research, development of a Hungarian language curriculum, launching a post-

graduate course, organizing awareness-raising campaigns, workshops, trainings for scientists, publishing methodology-oriented articles, social media activities, and so on.

The new government of Hungary that started its work in June 2010 has expressed that the reform of science, research and development policies is necessary. We sincerely hope that science communication will be recognized as a key area, and this study will be useful in re-designing government policies of the field.

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ANNEXES

Annex A: Guided Interview – Questionnaire and List of Interviewees

Questionnaire

1. How would you describe science communication policies in Korea? Are these policies well planned and implemented? What do you think the rationale is behind these policies?

2. The Public Understanding of Science (PUS) approach is based on the deficit model, where the 'public' is seen as people that should be taught. Is this a dominant approach in science communication?

3. How scientists and researchers perceive science communication? Generally, do they see it important to their work?

4. Which institutions are the main actors in the implementation of science communication activities?

5. Are there examples for two-way communication? Are there Public Engagement in Science (PES) activities in practice?

Other issues

List of Interviewees

NAME	TITLE	ORGANIZATION	Date of the interview
ALFÖLDI Kata	**Former S&T Attaché**	**Permanent Representation of Hungary to the EU**	**10 November 2010**
BALLA Gergely	**Chief of Cabinet**	**Ministry of Economy**	**20 May 2010**
FÁBRI György	**Communication expert**	**Knowledge Society Foundation**	**14 May 2010**
MOSONINÉ Fried Judit	**Professor, Deputy director**	**Research Policy Institute of the Hungarian Academy of Sciences**	**28 May 2010**

Annex B: Guided Interviews Transcripts

ALFÖLDI, Kata *10 Nov 2010*

1. How would you describe science communication policies in Hungary? Are these policies well planned and implemented? What do you think the rationale is behind these policies?
In order to speak about science communication policy, we need to know about science policy, as I believe science communication policy should be a part of the latter. The Hungarian Government Midterm strategy on research, technology and innovation adopted in 2007 lists, among its priorities, "the culture of the use of scientific research results" where it speaks about supporting the social inclusion of RTDI by using all means for shaping the public's opinion (conferences, publications, exhibitions, etc).

2. The Public Understanding of Science (PUS) approach is based on the deficit model, where the 'public' is seen as people that should be taught. Is this a dominant approach in science communication?
The most frequent way of communicating science is indeed a teaching method used in the most well-known scientific TV programs (Duna TV's Heureka, Mindentudás egyeteme) and internet pages (Origo, Index). Though they usually mention what could be the practical usefulness of a given research, but they hardly deal with the public needs. I have never seen a program where questions, knowledge needs would have come from the public, from the so called "man on the street". I believe the deficit model will remain strong, as science needs to be made understood but it should be balanced more. Questions, knowledge gaps, uncertainties born by everyday activities are translatable into scientific problems.

3. How scientists and researchers perceive science communication? Generally, do they see it important to their work?
I believe scientists and researchers are aware of the importance of communicating their work, as this is a must in every profession today. There are many layers of communication, from the presentation at a scientific conference to the discussion with the public. This is why communication cannot always be the researcher's or scientist's task especially when its aim is to facilitate dialogue with the public.

4. Which institutions are the main actors in the implementation of science communication activities?
National Office for Research and technology (NKTH), Hungarian Academy of Sciences (HAS), universities, research institutes and other research organizations.

5. Are there examples for two-way communication? Are there Public Engagement in Science (PES) activities in practice?
There are some initiatives like "Tudáspresszó"(Science Café) on science and research related topics. "Mindentudás egyeteme" (Encompass) a vivid university lecture on selected scientific topics provided by leading scientists, researchers, Csodák Palotája (Palace of

Wonders) interactive science museum, "THE" (Scientific, Useful, Human) high school road-show performing scientific experiments to teenagers and Science Shops (Environmental Social Sciences Research Group – Budapest, Szent István University, Gödöllő) that could be listed.

Other issues: *I think science communication as a two-way activity is in its early childhood in Hungary. Though communication about research and researchers exists in every day media, it does so in a one-way mode where iteration with the public is minimal. This way of communication keeps a distance between those who create knowledge and those for whom the knowledge is created. Though initiatives for intensifying the dialogue exist in different forms (see previous answer) there is clearly a large space for improving.*

BALLA, Gergely *20 May 2010*

1. How would you describe science communication policies in Hungary? Are these policies well planned and implemented? What do you think the rationale is behind these policies?
The basis for the policies is laid down, but there are not actions. Science communication is not explicit in the TTI strategy. Reason: the motivation to communicate comes from the world of science, but they do not see its need clearly. The approach is still communication within the boundaries of science.
Not satisfied with the traditional approach of the media to science, they should use new approaches. There is not enough motivation for science communication in the public.
On science policies: Basic research is research for its own sake which is a faulty theory. Rather, it should be needs of society → priorities → research to be funded.

2. The Public Understanding of Science (PUS) approach is based on the deficit model, where the 'public' is seen as people that should be taught. Is this a dominant approach in science communication?
Yes, they do not know modern approaches. People are scared of novelties, we should "sell" it to them.

3. How scientists and researchers perceive science communication? Generally, do they see it important to their work?
*They do not see its reasoning having an elitist attitude. The ENCOMPASS (*ENCyclopedic knOwledge Made a Popular ASSet*) was a good example that started with lectures from the front, but it improved.*

4. Which institutions are the main actors in the implementation of science communication activities?
NKTH, HAS, Ministry of Education, Hungarian Federation for Innovation, THE programme (Science program and online magazine for teenagers), vocational federations, communication directors of universities.

5. Are there examples for two-way communication? Are there Public Engagement in Science (PES) activities in practice?
E.g. the oncothermic radiology was not allowed. There are exhibitions and festivals. "Palace of Wonders" science museum. Resarchers' Night. THE roadshow (science popularization in secondary schools). Technological assessment at companies (product development).

Other issues: *Key policy paper: Innovative Hungary Program (2009) in which science communication was a chapter.*

FÁBRI, György *14 May 2010*

1. How would you describe science communication policies in Hungary? Are these policies well planned and implemented? What do you think the rationale is behind these policies?
Said there is no central policy. The Hungarian Academy of Sciences (HAS) and the Science Popularization Association (SPA) play major roles in the field. The grants of the New Hungary Development Plan (NHDP) supported science communication (e.g. grant scheme TAMOP 4.2.3.). Also, universities present their research results.

2. The Public Understanding of Science (PUS) approach is based on the deficit model, where the 'public' is seen as people that should be taught. Is this a dominant approach in science communication?
This model is not recognized. Researchers consider popularization and enlightenment as a moral obligation to present the advances of science, because "it is good".

3. How scientists and researchers perceive science communication? Generally, do they see it important to their work?
Many of them perceive it as important. It has a strong culture (SPA). It is an obligation and is also driven by the vanity of the scientist. They can convey their work, their result and their own importance.

4. Which institutions are the main actors in the implementation of science communication activities?
*HUS, the academic institutes of HAS (esp the Technical and Material Science Inst., the Chemical Research Institute of Szeged, the Kompoly-Tege Astronomical Institution), the SPA, universities, the "Palace of Wonders" science museum, TV programmes: ENCOMPASS (*ENCyclopedic knOwledge Made a Popular ASSet*), Delta, Prizma, Heuréka, Mentor, Magellan...*

5. Are there examples for two-way communication? Are there Public Engagement in Science (PES) activities in practice?
Science Cafés (Paks and Budapest), medical organizations

Other issues: *The NKTH Mecenatura grant scheme is important for the popularization of science, supports TV programs, journals, etc.*

Professor MOSONINÉ, Fried Judit *26 May, 2010*

1. How would you describe science communication policies in Hungary? Are these policies well planned and implemented? What do you think the rationale is behind these policies?
In these policies we can see the interests of certain institutions. The Strategy for Science, Technology and Innovation remained just a "paper". The Law on Innovation proclaimed that 1.5% of project support should be spent on communication. If we review science policies of the last ten years we can see that party politics and interests of politicians have determined the policies. There were lots of personal conflicts.

2. The Public Understanding of Science (PUS) approach is based on the deficit model, where the 'public' is seen as people that should be taught. Is this a dominant approach in science communication?
Would not even say it is the "deficit model", as there is no intention to educate. But we can observe it on the local level when there is a conflict. Also, the reaction of HAS with regard to the H1N1 vaccination is an example. The interaction between science and the public can be observed, too: In techno-science we can see ethical dilemmas. On the Researchers' Night people ask scientists. There is dialogue between medical researchers and patients of transplantation or cancer.
In policies, communication was not at all important. The main motivation to communicate was the fear of losing public support (so there would not be anti-science sentiment). Still, the main attitude is that science is in the ivory tower. There are only a few exceptions (e.g. GMO) but scientists think that "people don't understand the stakes". The scandals of Chernobyl and the mad cow disease all became tabloid news.
Civil society is weak, and they don't take it seriously. The media sets (and could determine) the agenda.

3. How scientists and researchers perceive science communication? Generally, do they see it important to their work?
Generally, there is a positive attitude to science communication. They enjoy public presentations, which increases their visibility. Universities and academic institutions perform a public role, so they like to prove and demonstrate this.

4. Which institutions are the main actors in the implementation of science communication activities?
HAS. Universities. Communication Dept of NKTH. The Mecenatura Grant of NKTH is for popoularization of science (TV, radio, journals). There is no Ministry of Science, and the HUS is counter-interested. LivingLabs Budapest was a recent example of science communication.
We can see examples of doctor-patient dialogue, too.

5. Are there examples for two-way communication? Are there Public Engagement in Science (PES) activities in practice?

There are no issues for debates, there "are no doubts". Practically, it is not part of the way we think. "- Getting involved? – No way."

There was one big consensus conference on Roma issues organized by a sociologist, Antal Örkény. Also, the "Week of Brain Scientists" is organized by Tamas Freund, director of Institute of Experimental Medicine of HAS (KOKI).

Other issues: *Before, science policy debates were documented. There were questions to be answered, and alternatives were discussed. Now, we have a strategy (TTI) but by the time it was finished, nobody took it seriously, it has not been enforced.*