EUROPE, THE PAST

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ABSTRACT

This paper is a modification of the author's oral presentation at the 15th ECSMGE in Athens in 2011. It focuses on the European history of ISSMGE and underlines the interaction with other related societies. Presidents/chairpersons and founding data of the European Member Societies are listed, and several details to conferences are given. Though focusing on the Past, the paper illustrates also the links to the Present. A tribute to the late pioneers of soil mechanics and geotechnical engineering will be given within an extended version of this paper (available at ISSMGE).

RÉSUMÉ

Cet article est une modification de la présentation faite par l'auteur présent à la 15e ECSMGE à Athènes en 2011. Il se concentre sur l'histoire européenne de la SIMSG et souligne l'interaction avec d'autres sociétés. Les présidents et fondateurs de données des sociétés membres de l'UE sont présentés, et plusieurs détails concernant les conférences sont aussi introduits. Bien que mettant l'accent sur le passé, le document illustre aussi les liens avec le présent. Un hommage aux récents pionniers de la mécanique des sols et de l'ingénierie géotechnique sera donné dans une version étendue de ce document (disponible auprès de la SIMSG).

1. INTRODUCTION

The history of ISSMGE was formed by outstanding personalities, by international committees and conferences, by particular member societies, and by the worldwide rise of soil mechanics and geotechnical engineering since the 1930/1940ies. Nearly all early work was done by engineers rather than by geologists, for the simple reason that they were in every-day contact with engineering problems, and its value was obvious to them (R. Glossop in [6]). This situation has hardly changed during the decades, but the number of geotechnical engineers and scientists more interested in the solution of theoretical problems has clearly increased. This, on the other hand, has widened the gap between geotechnical practice and the academics.

In 2011 the 75th Anniversary of ISSMGE was celebrated at all Regional Conferences of ISSMGE. Consequently, this paper considers only the European Region, though close links and interactions have existed worldwide since the continental "ISSMGE Regions", were set up. Moreover, many personalities changed from one continent to another, mainly from Europe to North America (e.g. K. Terzaghi, A. Casagrande, J. Hvorslev, G.G. Meyerhof, G.P. Tschebotarioff).

2. FOUNDATION OF ISSMFE (NOW ISSMGE) AND NAMES

The publication of Karl Terzaghi's fundamental book "Erdbaumechanik" with the addendum "auf bodenphysikalischer Grundlage" (Mechanics of Earthwork based on Soils Physics) published in Vienna, 1925, is considered worldwide as the birth of modern Science of "Soil Mechanics". In 1929 K. Terzaghi (Fig. 1) was appointed full professor at the Technische Hochschule Wien (now Vienna University of Technology, i.e. TU Vienna), where he founded the Institute for Soil Mechanics and Ground Engineering as a new branch of the Department of Hydro Engineering. Hence, it was University-internally also called "Hydro-Engineering II", and this underlined from the very beginning the close link and interaction between soil and water, or soil mechanics, hydrogeology and hydro engineering, respectively. Moreover, Arthur Casagrande (1902 – 1981) – Fig. 2, also Austrian citizen, had studied civil engineering at the TU Vienna, and he was assistant at the Institute for Hydro Engineering I. Road engineering was another topic of common interest of K. Terzaghi and A. Casagrande.

EUROPE, THE PAST (CONTINUED)

Figure 1. K. Terzaghi (1883–1963).

Figure 2. A. Casagrande (1902–1981).

Consequently, the World Road Association (PIARC) and the International Commission on Large Dams (ICOLD) become their example to create a similar international association. Meanwhile A. Casagrande was teaching at Harvard University where he organized the First International Conference on Soil Mechanics and Foundation Engineering, June 22-26, 1936 (Fig. 12). This stimulating event was attended by 206 delegates from 20 countries, and K. Terzaghi was elected first president of the "International Society for Soil Mechanics and Foundation Engineering (ISSMFE). ISSMFE owes an enormous debt to A. Casagrande for his conviction, that the time was right for such a conference – a conviction not shared by K. Terzaghi before the event.

It might be of interest, that only two Englishmen attended this 1st ICSMFE at Harvard (L.F. Cooling, J.J. Bryan), whereas K. Terzaghi was accompanied by nine Austrians. In England geology as a discipline important in engineering science had been neglected and therefore soil mechanics as well [14]. However, this was the case elsewhere, except in Austria, the Netherlands and Sweden.

After the first International Conference on Soil Mechanics and Foundation Engineering held in Harvard in 1936, an Executive Committee was set up with Karl Terzaghi as President and Arthur Casagrande as Secretary. At the time of the Third ICSMFE in Zurich in 1953, Donald W. Taylor was Secretary (USA). In 1957 the Secretariat moved to the UK, and the post of Secretary was first held by M.A. Banister (1957 – 1961), and then by A. McDonald (1961 – 1965). Since then, the Secretaries General have been:

1965 – 1981	J.K.T.L. Nash
1981 –	J.B. Burland
1981 – 1999	R.H.G. Parry
1999 – to date	R.N. Taylor

The discussion about the Society's name has been older than ISSMFE/ISSMGE and is still topical in 2011. A mere translation of the short title of K. Terzaghi's fundamental book "Erdbaumechanik" would have over-stressed the term "earthwork", though indicating the interaction of practice (Erdbau) and Theory (Mechanik); but the wide field of foundation was missing. Moreover, the full title of this book included the word "soil", and as no alternative was offered, the term "Soil mechanics" became accepted instead of "Erdbaumechanik".

From about 1850 onwards geology had become more and more neglected in civil engineering practice of most countries. Therefore, Terzaghi's insistence on the importance of the geological background was widely revolutionary. This has stimulated again and again the question about terminologies and the name of ISSMFE/ISSMGE.

EUROPE, THE PAST (CONTINUED)

For instance, in a lecture at the Institution of Civil Engineers in 1945, R. Glossop proposed as an alternative to soil mechanics the term “Geotechnology”. This word was already established in Scandinavia and in France, but it was not generally adopted at the time [14].

The first publication ever using the word “geotechnical” was the final report of the Swedish State Railways Geotechnical Commission (1914 – 1922).

To sum up, during the past 75 years the following names were discussed for “Soil Mechanics and Foundation Engineering”, starting with “Geo-“ in order to underline the strong interaction with Geology (in alphabetical order):

- Geoengineering
- Geomechanics
- Geotechnics
- Geotechnical Engineering
- Geotechnology

Since 1936 “classical soil mechanics”, as it is now called, developed fast and was soon making important contributions to engineering practice. Between 1936 and 1961 (5th ICSMFE in Paris) the growth of interest in soil mechanics had been indeed explosive. In 1962 the International Society for Rock Mechanics was founded. Therefore, the term Soil Mechanics has remained until now, lastly also as a tribute to K. Terzaghi and to underline the roots of this society. At the 14th ICSMFE in Hamburg in 1997, the society’s name was changed to International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) because its activities had widened significantly since the 1970/1980s, mainly with regard to following aspects (in alphabetical order):

- Ground improvement
- Environmental geotechnics
- Hazard mitigation and prevention
- Land reclaiming
- Landfill and brownfield engineering
- Offshore geotechnics
- Preservation of historic sites
- Traffic and transportation infrastructure
- Tunnelling and underground space engineering
- Urban geotechnics
- Water and resources management

The term “Engineering Geology” goes back to F. Hochstetter (1829–1884), Professor for Mineralogy and Geology at the Technical University of Vienna (1860–1880). On occasion of his inaugurational lecture in 1860 he already coined the term “Ingenieurgeologie”, which corresponds exactly to the English “Engineering Geology”. At the TU Vienna there had been a close cooperation between the Institute “Art of Lanand Water-Engineering” (founded 1818) and the Institute for “Mineralogy and Geognosy (founded in 1843) leading to an early connection of Engineering and Geology. K. Terzaghi and J. Stini (1880 – 1958), a successor of F. Hochstetter intensified this synergy during their common activities at the TU Vienna (1928–1938). Their early definition of engineering geologists describes geologists cooperating with engineers, while geological engineering is performed by engineers with a geological background or in cooperation with geologists – widely corresponding to geotechnical engineering which is more devoted to the solution of theoretical problems. Meanwhile everything is overlapping, interacting or mixed – leading to the question

What – in the end is a name?

EUROPE, THE PAST (CONTINUED)

3 THE EARLY YEARS OF "SOIL MECHANICS" AND ISSMFE

Scepticism about soil mechanics on one side and growth of soil mechanics on the other side in the 1930/1940s can be described exemplarily when selecting the situation in Austria, Germany, Netherlands, Sweden and the United Kingdom (in alphabetical order). Considering the other countries of Europe, the acceptance varied between mere ignorance, neglect and enthusiasm.

Despite the stimulating effect of the Harvard Conference, soil mechanics was at first widely neglected or considered as an obscure (non-) science. Even K. Terzaghi himself had problems at his home University in Vienna, when P. Fillunger (1883–1937), Professor for Theory of Elasticity severely attacked him. Figure 3 shows the cover pages of P. Fillunger's polemic pamphlet and of the reply booklet of K. Terzaghi and O.K. Fröhlich. Some excerpts of Fillunger's pamphlet illustrate, how strongly some theoreticians attacked the young science of soil mechanics in those days: *"If one consults a specialist in soil mechanics, one of two things may happen: Either we hear what any experienced engineer could tell us with much more authority, or something misleading and erroneous. How could it be otherwise, because the theory is nonsense and the required laboratory experiments are quite impossible"*. And finally: *"There would be widely more to tell about soil mechanics, for wherever one opens their books, one finds curiosities"*. This "Terzaghi-Fillunger Dispute" as it is internationally known was indeed a tragedy, because P. Fillunger was a pioneer in porous media, described the equilibrium of a two-phase porous medium system in a complete and correct way, and had already formulated the effective stress principle in 1915. A cooperation between these two pioneers would have been unique and extremely promising.

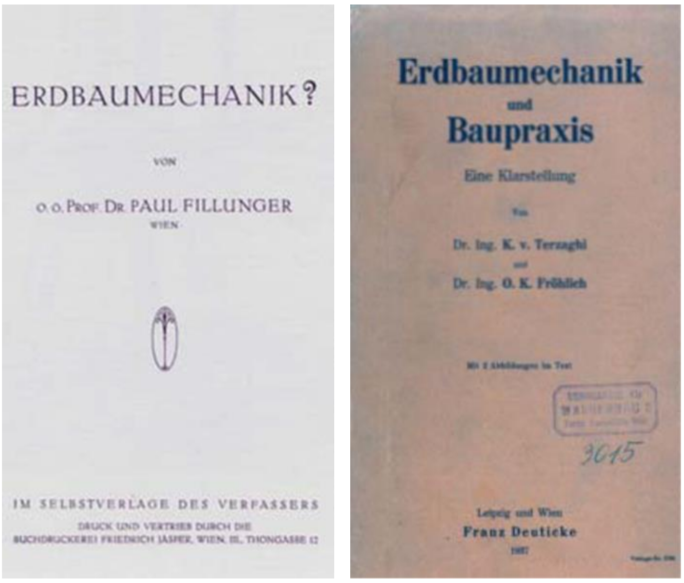


Figure 3. Cover pages of the relevant booklets of the Terzaghi-Fillunger dispute (1936).
Left: P. Fillunger's pamphlet; Right: K. Terzaghi's and O.K. Fröhlich's reply.

During the 1930s K. Terzaghi's Institute at the TU Vienna developed into the world intellectual centre of all circles interested in soil mechanics, thus stimulating the foundation of numerous soil mechanics laboratories in Europe and overseas (A. Casagrande: "Karl Terzaghi – His Life and Achievements" and 6th ECSMFE, Vienna 1976).

Due to pioneer works of F. Kögler (18821939) and students or assistants of K. Terzaghi in Vienna, the field for the young Soil Mechanics was well prepared in Germany. The country was intensively widening its traffic and transportation arteries in those years. Therefore, soil mechanics became important mainly for road and highway engineering ("Autobahnen"). For instance, Leo Casagrande (1903–1990), brother of Arthur Casagrande and assistant of K. Terzaghi in Vienna, was strongly involved there. Moreover, the comprehensive 1:1 tests on huge flat foundations in Berlin (performed by DEGEBO) lead to the development of design methods and codes, which were used during decades in Germany and many other countries. In 1936 vibroflotation for deep soil improvement was invented; heavy tamping and soil (peat) blasting and electroosmosis were used for road embankments on soft soil. Artificial ground freezing was applied already since the early 1860s (in mining).

EUROPE, THE PAST (CONTINUED)

The Netherlands had been forced during centuries to deal intensively with the ground, because its stratification consists of soft to very soft soils, and more than half of the country is located below sea level. Therefore, the interest in ground engineering had started rather early, especially after the train disaster in Weesp, 1918. Ground Engineering was taught already in the 1920s. Joosten introduced ground injection with waterglass in 1925 (patented in Germany), and in 1931 the Cone Penetration Test (CPT) came up. In 1934 the Laboratory of Ground Mechanics (LGM) was founded under the Ministry of Roads and Water Management, independent of TU Delft. In the late 1930 a chair for soil mechanics was offered to O.K. Fröhlich at TU Delft. O.K. Fröhlich lectured at the TU Vienna, when K. Terzaghi was outside and was co-author of their fundamental book “Theorie der Setzung von Tonschichten” (Theory of Settlement of Clays), Vienna, 1936. Moreover, he had a consulting office for soil mechanics in the Netherlands (‘s-Gravenhage) and spoke perfectly Dutch. When K. Terzaghi went to Harvard, O.K. Fröhlich decided to become his successor at the TU Vienna. For further details, see [1].

Sweden had been also a pioneering country of geotechnical engineering, already before the ISSMFE was founded. The establishment of an interdisciplinary “Geotechnical Commission” in 1914 consisting of geologists and civil engineers initiated the key role of geotechnical engineering in Swedish engineering. Already in 1926 W. Fellenius (1876 – 1957) introduced the concept of safety factors for foundations as they are used today, and he extended the slip circle method to soils with both cohesion and friction. Further details see [9].

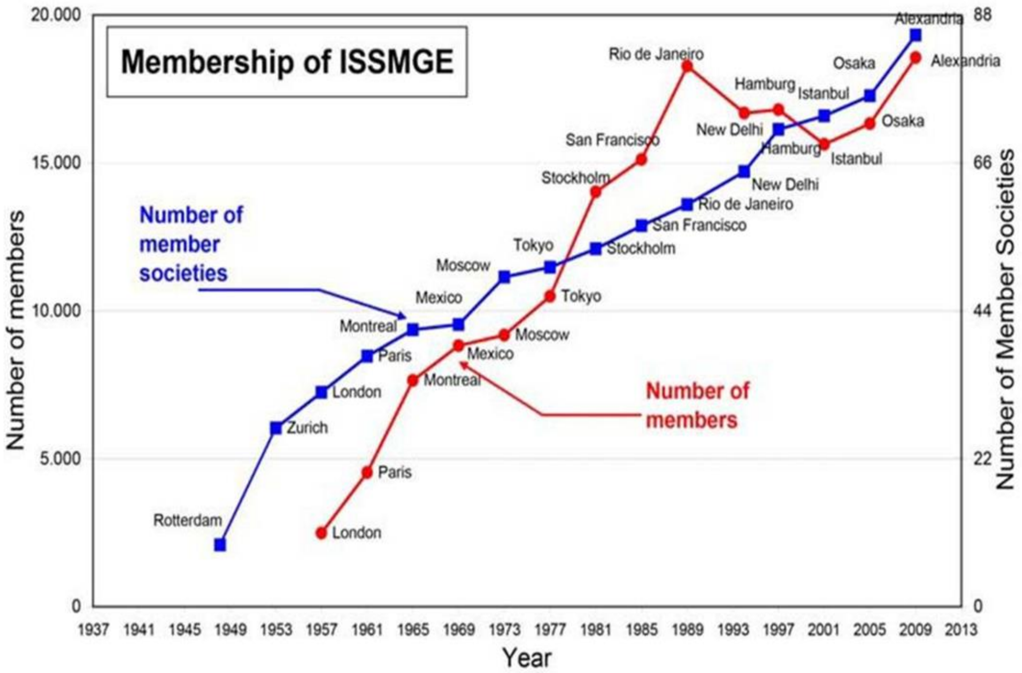


Figure 4. Change in members and Member Societies of ISSMGE (total numbers, worldwide).

EUROPE, THE PAST (CONTINUED)

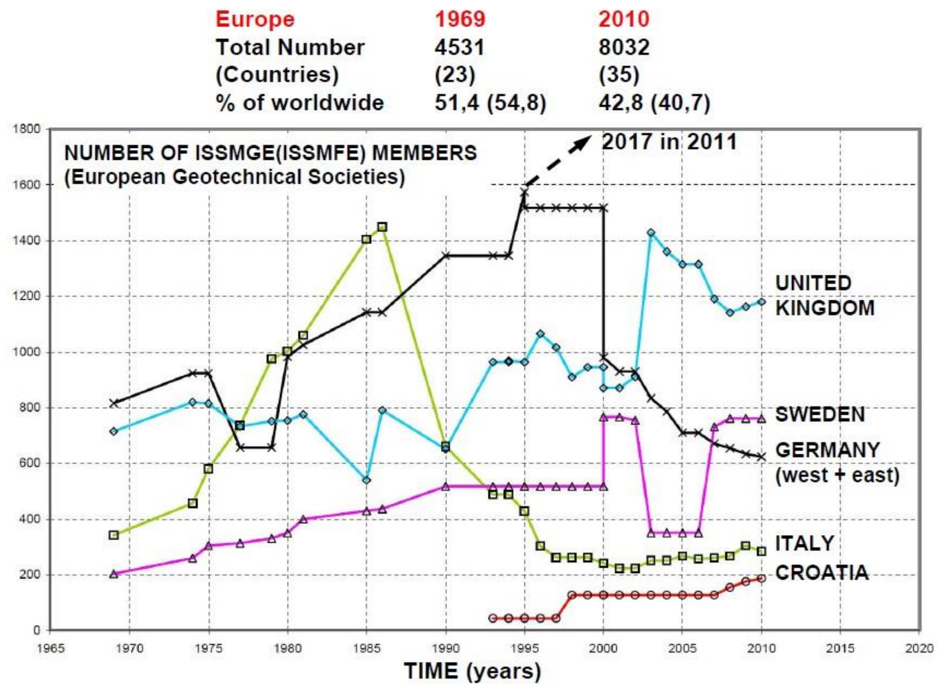


Figure 5. Change in members of some selected European Member Societies of ISSMGE

In the UK a laboratory devoted to research in soil mechanics was set up at the Building Research Station, shortly after the Harvard Conference – and two members of staff were recruited to work there; they were A.W. Skempton (1914–2001) and H.Q. Golder (1911-1990) [14]. Moreover, a slip of a large earth dam then under construction just east of the city of London and the involvement of K. Terzaghi on the Chingford project in 1938 significantly raised the interest in soil mechanics (an Earth Pressure Committee had already existed since 1925, but obviously without influence on the civil engineering community). Further details see [5], [14].

Despite the establishment of related societies as ISRM (1962), IAEG (1964), ITA (1974) and IGS (1983) the number of ISSMFE/ISSMGE members has increased worldwide (Fig. 4). Figure 5 illustrates this for four European Member Societies for the period 1969-2010. Previous data are not available or incomplete or somewhat uncertain. Several Geotechnical Societies/Associations have separate sections, and individual members can choose to either belong to ISSMGE or ISRM, or both. Therefore, Figure 5 represents only ISSMGE members, showing some "characteristics" in the curves, which are commented in alphabetical order:

Croatia, as the youngest member society grew in two main steps, the first one in connection with the 11th Danube-European Conference in Porec, 1998, and then after the 14th European Conference of ISSMGE in Madrid, 2007. About 190 individual members is a high number related to Croatia's population.

Germany had for many years the maximum of individual ISSMFE/ISSMGE members in Europe. Until the year 2000 all members of the German Geotechnical Society (DGGT) had been automatically members of ISSMGE, independently of their membership of particular sections. Actually, DGGT has six sections, and in the year 2000 all members were asked, which international society(ies) they would join. About 1000 persons decided for ISSMGE, thus causing a significant decrease of the hitherto ISSMGE membership number – and a reduction of annual ISSMGE fees for Germany. The other persons joined ISRM, IAEG or IGS, leading to a further increase of DGGT members: 2017 members in the year 2011.

EUROPE, THE PAST (CONTINUED)

Italy experienced a significant increase from 1973 to 1986, and then a large reduction of ISSMGE members during about 10 years; since then the number has stabilized. The reason of the drop lay in the decision of AGI (Associazone Geotecnica Italiana) in 1987, to distinguish between international members (ISSMGE, ISRM, etc.) and national members. Originally, AGI was established in connection with the foundation of ISSMFE: therefore all AGI members were automatically included in ISSMFE lists. This was partly similar to the procedure in Germany, 2000.

Sweden has not only a large tradition in soil mechanics and geotechnical engineering, but also a high number of ISSMGE members. In relation to its population Sweden has clearly the highest per head quota (even worldwide), followed by Norway and Denmark.

The European top ranking of ISSMGE Members per 1 Million inhabitants is:

81 Sweden
69 Norway
64 Denmark
46 The Netherlands
43 Croatia, Slovenia

Most other countries have a clearly smaller ratio (commonly below 10 to 20).

The *UK Member Society* of ISSMGE increased significantly between 2002 and 2003, then it decreased to the previous mean growth rate (since about 1983), but is still the largest in Europe (1180 members in 2011/12).

4. EUROPEAN MEMBER SOCIETIES OF ISSMGE

Table 1 summarizes relevant data of the European Member Societies of ISSMGE. It illustrates, that the founding year of the particular Geotechnical Societies was not always identical with the year of becoming an official Member Society of ISSMFE/ISSMGE. Austria (under K. Terzaghi) and Hungary (under J. Jáky) were forerunners followed by other countries during the 2nd International Conference (ICSMFE) in Rotterdam, 1948. The longest serving founding presidents were H. Peynircioglu from Turkey (35 years) and N.A. Tsytovich from the USSR (28 years).

Sometimes communist authorities behind the “Iron Curtain” ceased to provide financial support necessary for the payment of the national fees to the ISSMFE Secretariat in London. This led to temporary exclusions of ISSMFE Member Societies which are not considered in Table 1.

The Geotechnical Societies of the European Countries have rather different names, not only in their local language but also in English. This depends on historical backgrounds, structural organization, etc. In the following the name “Geotechnical Society” is commonly used by the author as a generic term.

The former Yugoslavia and its succeeding Republics are a special case: The Yugoslavian Geotechnical Society was founded in 1949 and joined ISSMFE in the same year. From 1949 to 1990 the Federal Republic Yugoslavia was represented by a united Yugoslav Society for Soil Mechanics and Foundation Engineering, with members of all Yugoslav Republics: Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia and Slovenia. After the disintegration of Yugoslavia in the early 1990s, the former Part Republics started to establish their own geotechnical societies as illustrated in Fig. 6 and Table 1. They were admitted to ISSMFE/ISSMGE, when the particular Republics had been recognized as independent States.

A similar situation existed in the Baltic Region, when Estonia, Latvia and Lithuania left the USSR.

EUROPE, THE PAST (CONTINUED)

Table 1. European Geotechnical Societies or Member Societies of ISSMFE/ISSMGE, respectively. In brackets: former states.

Country	Year of Foundation	ISSMGE Member	Chairperson / First	President Current (in 2011)
Albania	2000	2001	Luljeta Bozo	Luljeta Bozo
Austria	1936	1948	Karl Terzaghi	Heinz Brandl
Azerbaijan Rep.	1996	1996	Yagub a Eyubov	Mohammed B. Akhundov
Belarus	2011	2012	Dmitriy Sobolevski	Dmitriy Sobolevski
Belgium	1948	1948	Jacques Verdeyen	Flor de Cock
Bosnia and Herzegovina	2008	2012	Sabid Zekan	Sabid Zekan
Bulgaria	1948	1957	M. Manol Sakelaroff	Dobrin Denev
Croatia	1990	1992	Božica Marić	Antun Szavits-Nossan
Czech and Slovak Reps.	1959	1961	Alois Myslivec	Jana Frankovská
Denmark	1950	1950	Helge Lundgren	Anders T. S. Andersen
Estonia	1992	1993	Valdo Jaaniso	Peeter Talviste
Finland	1951	1951	Per Alenius	Jouko Viitala
France	1948	1948	Albert Caquot	Philippe Mestat
Georgia	2006	2006	Omar Kutsnashvili	Omar Kutsnashvili
Germany	1950	1961	Hans-Werner König	Georg Heerten
(DDR=Eastern Germany)	1973	1973	Gerhard Sperling	(Reunion in 1989)
Greece	1966	1969	Demosthenes Pippas	Christos Tsatsanifos
Hungary	1936	1948	József Jaky	József Mecsi
Iceland	1978	1985	Birgir Jónsson	Ingunn Sæmundsdóttir
Ireland	1977	1977	Frank Motherway	Michael Looby
Italy	1947	1948	Giovanni Rodio	Stefano Aversa
Latvia	1993	1994	Walters Celmius	Valdis Markvarts
Lithuania	1992	1993	Liudvikas Furmonavicius	Jurgis Medzvieckas
F.Y.R. of Macedonia	1999	2001	Vasil Vitanov	Vasil Vitanov
The Netherlands	1948	1948	J. P. van Bruggen	William van Niekerk
Norway	1950	1950	Suerre Skaven-Haug	Vidar Gjelsvik
Poland	1946	1953	Radzimir Piętkowski	Zbigniew Lechowicz
Portugal	1948	1953	Manuel da Rocha	Laura Caldeira
Romania	1966	1975	Emil Botea	Iacint Manoliu
Russia (USSR)	1957	1957	Nicolay A. Tsytovich	Vyacheslav A. Ilyichev
Serbia	1980	2006	Milan M. Maksimović	Milan M. Maksimović
Slovenia	1992	1992	Ivan Sovinc	Ana Petkovšek
Spain	1961	1961	D. Federico Turell	César Sagaseta
Sweden	1950	1950	Bernt Jakobsson	Stefan Aronsson
Switzerland	1956	1956	Armin von Moos	Martin Stolz
Turkey	1947	1950	Hamdi Peynircioğlu	Feyza Çinicioğlu
United Kingdom	1947	1948	William Kelly Wallace	Rab Fernie
Ukraine	2002	2003	Petro I. Kryvosheyev	Petro I. Kryvosheyev
(Yugoslavia)	1949	1949	Branko Žeželj	(Separated 1990/1999)

EUROPE, THE PAST (CONTINUED)

Figure 6. Former Yugoslavia with succeeding Republics and neighbouring countries. Year of foundation of National Geotechnical Societies. See also Tab. 1 with official dates of ISSMGE Memberships and Chairpersons.

The ISSMGE Member Society of Israel ("Geotechnical Chapter of the Israeli Association of Civil Engineers") was admitted to the European Region of ISSMGE at the Council Meeting in Toronto, 2011. Before it belonged to the Asian Region: Therefore comments to the pioneering phase of Israel's Geotechnics are given in the particular publication of this ISSMGE-Region.

Detailed information about the European Member Societies of ISSMGE and their pioneers will be given in the extended version of this paper (see ISSMGE homepage and ÖIAV (Austrian Society of Engineers and Architects).

EUROPE, THE PAST (CONTINUED)

5. REGIONAL SECTIONS AND TECHNICAL COMMITTEES OF ISSMFE/ISSMGE

At the meeting of the Executive Committee 1953 in Zürich (3rd ICSMFE) reference was made to other meetings held in the interim, and the first set of Regional Vice Presidents was voted with A.W. Skempton as Vice-President for Europe (Fig. 7). At the 4th ICSMFE in London in 1975 the Vice Presidency of Australasia was added, hence the Board was composed as follows:

- President: A.W. Skempton
- Vice-Presidents:
  - Africa K E B Jennings
  - Asia K.L. Rao
  - Australasia G.D. Aitchison
  - Europe A. Mayer
  - North America R.F. Legget
  - South America A.J. Bolognesi

Table 2 lists the hitherto ISSMFE/ISSMGE Presidents and the Vice-Presidents for Europe.

Figure 7. Prof. Alec Westley Skempton (1914 – 2001): First Vice-President for Europe (1953 – 1957) and Second President of ISSMFE (1957 – 1961).

Victor de Mello (1926 – 2009), ISSMFE President 1981-1985, provided the initiative to get International Technical Committees started and to get many TCs formed. The term "Technical Committee" was used the first time in a Council Meeting in Paris in 1983, and the reasoning behind the new name was to clearly separate technical from administrative issues. The President (V. de Mello) also referred to "Technical Sub-Committees" (for those of a regional basis). Exactly when regional TCs were formed is not clear, but it is most likely that they followed on from the International TCs.

Numbers and names of the International Technical Committees (TCs) and the Regional Technical Committees have changed more or less during the past decades. Presently, there are only five European Regional Technical Committees (ERTCs), because several others have become International TCs during the past 20 years. The presently active ERTCs are as follows:

- ERTC 3 – Piles
- ERTC 7 – Numerical Methods in Geotechnical Engineering
- ERTC 10 – Evaluation of Eurocode 7
- ERTC 12 – Geotechnical Evaluation and Application of the Seismic Eurocode 8
- ERTC 16 – Education and Training

Additionally, new European Regional Technical Committees have been proposed:

- Geothermal Energy,
- Utilization of Large Volume Waste in Geotechnical Applications,
- Ageing of Earth Structures in Transportation Engineering.

Experience has shown that in large Technical Committees only a handful of members are really active. This does not mean that the others are not needed. Commonly, committee members follow and promote the TCs' outputs (guidelines, etc.) in their country; therefore ISSMGE considers membership even without active participation as beneficial and effective.

The period before ISSMFE had Technical Committees is characterized by the formation of separate international Societies, partly coming out from ISSMFE (ISRM, ITA, IGS) Tab. 3.

EUROPE, THE PAST (CONTINUED)

Table 2. Presidents and European Vice-Presidents of ISSMFE/ISSMGE. K. Terzaghi was President from 1936 to 1957. Vice-Presidency for Europe was established in 1953.

Year	President	Vice-President for Europe
1936 1957	K. Terzaghi (Austria, USA)	A.W. Skempton (UK)
1957 1961	A.W. Skempton (GB)	A. Mayer France)
1961 1965	A. Casagrande (USA, Austria)	L. Bjerrum (Norway)
1965 1969	L. Bjerrum (Norway)	J. Brinch Hansen (Denmark)
1969 1973	R.B. Peck (USA)	E.E. De Beer (Belgium)
1973 1977	J. Kerisel (France)	A. Kézdi (Hungary)
1977 1981	M. Fukuoka (Japan)	B.B. Broms (Sweden)
1981 1985	V.F.B. de Mello (Brazil)	A. Croce (Italy)
1985 1989	B.B. Broms (Singapore, Sweden)	N. Krebs Ovesen (Denmark)
1989 1994	N.R. Morgenstern (Canada)	U. Smoltczyk (Germany)
1994 1997	M. Jamiolkowski (Italy)	W.F. Van Impe (Belgium)
1997 2001	K. Ishihara (Japan)	H. Brandl (Austria)
2001 2005	W.F. Van Impe (Belgium)	P. Seco e Pinto (Portugal)
2005 2009	P. Sêco e Pinto (Portugal)	R. Frank (France)
2009 2013	Jean-Louis Briaud (USA)	I. Vaniček (Czech & Slovak Reps)

Table 3. ISSMGE and some related International Societies and Associations. Founding name ISSMFE (International Society for Soil Mechanics and Foundation Engineering) was changed to ISSMGE (International Society for Soil Mechanics and Geotechnical Engineering) in 1997.

ISSMGE	International Society for Soil Mechanics and Geotechnical Engineering (founded 1935)
ISRM	International Society for Rock Mechanics (founded 1962)
IAEG	International Association of Engineering Geology and the Environment (founded 1964)
IGS	International Geosynthetics Society (founded 1983)
ITA	International Tunneling and Underground Space Association (founded 1974)
ICOLD	International Commission on Large Dams (founded 1928)
PIARC	World Road Association (founded 1909)
IABSE	International Association for Bridge and Structural Engineering (founded 1929)
EFIB	European Federation of Soil-Bioengineering (founded 1995)

6. ISSMGE AND RELATED SOCIETIES

6.1 Overview

Tables 3 and 4 give an overview of the memberships of ISSMGE and some related societies per 2011.
A direct comparison of all international societies is somewhat difficult, because of partly different kinds of memberships: Individual members (e.g. clearly dominating for ISSMGE, ISRM), corporate members (e.g. clearly dominating for ITA and ICOLD). ISSMGE certainly plays a dominating role – not only in Europe but also worldwide.

The national branches of the international Societies have different names; for instance:

ISSMGE .... Member Societies
ISRM, IAEG, IABSE...... National Groups
IGS .... Chapters
ITA .... Member Nations
ICOLD, PIARC .... National Committees
ISWA .... National Members

EUROPE, THE PAST (CONTINUED)

In all societies the number of European members or member societies is worldwide clearly leading – compared to other continental regions. However, the percentage of European members and member societies, respectively, has decreased since the foundation of these international societies. For instance, ISSMFE/ISSMGE, ISRM and IGS had about two third of Europeans in their early phase. In 1965 the 50 % value was reached for the part of European member societies of ISSMFE, and now it is 41 %. IAEG, IABSE and ISWA have still a significantly high percentage of Europeans, clearly exceeding 50 % contrary to ICOLD, which has many international committees from elsewhere (e.g. Honduras, Ivory Coast, Burkina Faso, etc.).

The World Road Association (PIARC comes from its former name “Permanent International Association of Road Congresses”) has members in 118 countries, but only 38 National Committees, because several countries have joined to respectively one national committee (similar to early SEAGS of ISSMGE). This leads to a great difference of the European part: The percentage of European members is about 75 %, but the percentage of European Member Societies (“National Committees”) is only 40 %.

Regarding ISSMGE, Asian memberships have increased most. A special case is the Southeast Asian Geotechnical Society (SEAGS), founded in 1967 as “Southeast Asian Society of Soil Engineering” (new name adopted in 1982). It was formed to “Cater to the needs of geotechnical engineers in countries of SE Asia which do not themselves have national societies”. It does not comprise national groups but is officially only one Member Society of ISSMGE. In recent years, several of the original countries comprising SEAGS have grown to such an extent that they have formed their own national geotechnical groups.

In 1973 at E.E. De Beer’s instigation a Permanent CO-Coordinating Secretariat was set up to coordinate the activities of the three sister geotechnical societies ISSMGE, ISRM and IAEG [5]. Since then there has been a strong attitude to enhance synergies. An example is the joint event at the end of the Second Millennium: the International Conference on Geotechnical and Geological Engineering (GeoEng2000) in Melbourne. In 2005 an umbrella organization, the Federation of International Geoengineering Societies (FedIGS) was set up. The agreement was found and signed by the sister societies in 2005, and in 2008 W.F. Van Impe was elected first President. In 2011 IGS joined this federation; however, a merging of these societies is not intended.

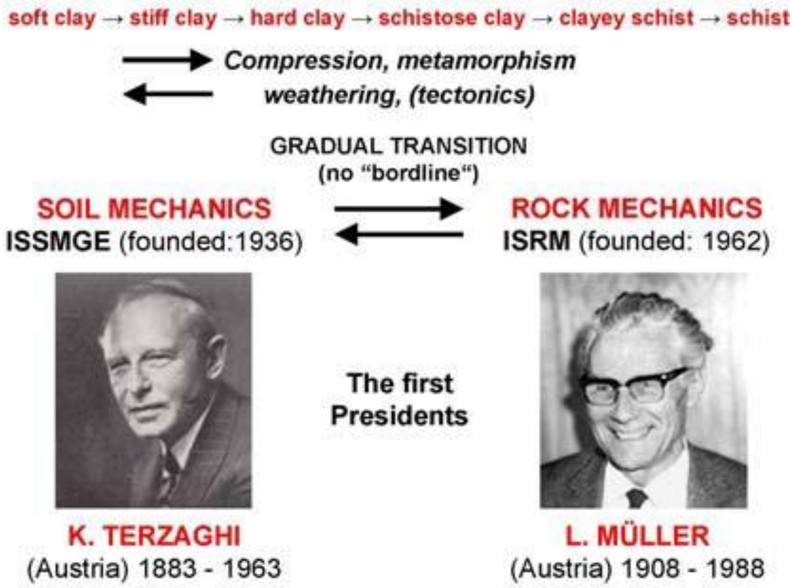


Figure 8. Soil and Rock Mechanics: ISSMGE and ISRM, and their founding Presidents.
Scheme of gradual transition between soil and rock and vice versa; hence no borderline.

EUROPE, THE PAST (CONTINUED)

6.2 International Society for Rock Mechanics (ISRM)

In the 1950s discussions about differences between soil and rock behaviour rose more and more, starting with the meetings of Austrian civil engineers and geologists in Salzburg under Leopold Müller (1908 – 1988). He had studied civil engineering at the TU Vienna (under K. Terzaghi, J. Stini) and was strongly involved in the foundation of dams in mountainous regions. Manuel C.M. da Rocha (1913 – 1981), Director of the National Laboratory of Civil Engineering (LNEC), Lisbon, strongly supported L. Müller's idea of a society exclusively devoted to rock mechanics, outside ISSMFE.

Consequently, in 1962 the International Society for Rock Mechanics was founded, and L. Müller became its first president. He published also as "Müller-Salzburg", using the place of his birth, just as "Müller-Breslau" in Germany, because Müller is a very common German family name. The 1st International Congress on Rock Mechanics was hold in Lisbon in 1966, chaired by M. Rocha.

However, there is no "borderline" between soil mechanics and rock mechanics, and the basic laws of ground physics are identical; moreover discontinuities exist also in several soils (e.g. overconsolidated tertiary sediments). Figure 8 illustrates the gradual transition from soil(mechanics) to rock(-mechanics) and vice versa. Consequently, K. Terzaghi considered rock mechanics a part of soil mechanics (better "ground mechanics"), but not a separate discipline. L. Müller complained of this opinion several times to the author, but meanwhile ISSMGE and ISRM have found together more and more (especially in tunnelling and slope engineering).

6.3 International Association for Engineering Geology and the Environment (IAEG)

ISSMGE, ISRM and IAEG are the primary "Three Sister Societies", in the year 2011 joined by IGS within the FedIGS. All these four societies organize their International Conferences/Congresses every four years, and geotechnical engineering is represented in each of them. Many events have an overlapping character, e.g. ISSMGE's International Symposia on Landslides (Tab. 10).

IAEG was founded in 1964, hence shortly after ISRM. It promotes the advancement of Engineering Geology and the international cooperation among geologists and engineers, focusing not only on engineering geology but also on related environmental issues. The IAEG is affiliated to the International Union of Geological Sciences (IUGS).

Table 4. Number of members and member societies of ISSMGE and some related societies: Total (worldwide) and for Europe; also percentages for Europe. Numbers rounded because changing during the year (2011).

SOCIETY	ISMMGE	ISRM	IAEG	IGS
Members/ Worldwide	19400	6400	3500	3300
Members/ Europe	8100	3100	1900	1500
% European Members	42	48	54	46
Member Societies, Worldwide	86	48	54	35
Member Societies in Europe	35	23	33	17
% European Member Societies	41	48	61	49

EUROPE, THE PAST (CONTINUED)

6.4 International Geosynthetics Society (IGS)

The IGS was founded in 1983, developing from an ISSMFE-Technical Committee for Geotextiles. All main founders and personalities of this society have come from geotechnical engineering. Figure 9 shows the end of the 3rd International Conference on Geosynthetics in Vienna, 1986: The founding President Ch. Schaerer (Switzerland) handed the IGS Presidency to J.P. Giroud (USA). Since the early 1970s J.P. Giroud had been the driving motor behind synthetics in geotechnical engineering. He created the names "geotextiles", "geomembranes", etc. to illustrate that these products are used as "geo-materials". Following the prestigious journal "Geotechnique", IGS established the periodical "Geotextiles and Geomembranes", which combines soil mechanics and geotechnical engineering with topics of geosynthetics. Meanwhile this journal has reached the highest impact factor of all geotechnical and geoenvironmental journals.

6.5 International Tunnelling and Underground and Space Association (ITA)

Since the late 1960s tunnelling has gained increasing importance worldwide. Consequently, the OECD organized in Washington, 1970, a conference for consulting the UNO in the field of tunnelling. On this occasion the establishment of an international organization for tunnelling was recommended. In following this initiative, the ITA was founded in Oslo, 1974, comprising 20 countries. Meanwhile ITA has 65 member societies ("Member Nations"). In 1997 the annual "General Assemblies" were changed at the suggestion of the Austrian Member Nation to "World Tunnel Congress", starting in Vienna. Since then this annual event has attracted an increasing number of delegates, because it favours rather the practitioners' side than the academics' views. The recent World Tunnel Congress 2011 in Helsinki was attended by 1400 persons.

6.6 International Commission on Large Dams (ICOLD)

The foundation of ICOLD in 1928 in Paris gave the main example to establish ISSMFE in 1936, because K. Terzaghi and A. Casagrande were strongly involved in dam engineering and had close contacts to this young international society. K. Terzaghi's Institute for Ground Engineering and Soil Mechanics at the Technical University of Vienna even had the second name "Wasserbau II", i.e. "Hydro Engineering II", and there was an intensive cooperation with "Hydro Engineering I" in the entire field of dam engineering. Typically, the first Rankine Lecture, delivered by A. Casagrande in 1961, was also devoted to Dam Engineering.

Since the late 1960s ICOLD has focused on dam safety, monitoring of performance, reanalysis of older dams and spillways, effects of ageing and environmental impact.

ICOLD has 95 National Committees ("Member Societies") worldwide and different forms of membership; therefore a precise number of individual members is not available. Many European pioneers of geotechnical engineering were members of ISSMGE and ICOLD as well, and there has always been a close cooperation of Technical Committees. From the ISSMGE side this refers to the today's TC 201 ("Dykes and Levees") and TC 210 ("Dams").

6.7 World Road Association (PIARC)

PIARC is the oldest of all international societies with relations to soil mechanics and geotechnical engineering. Founded already in 1909 it was – together with ICOLD (founded in 1928) – an example for the foundation of ISSMFE: K. Terzaghi and A. Casagrande (and others) were intensively involved in road engineering at that time. For instance, A. Casagrande's freezing criterion" is still in use, and L. Casagrande's activities for roads on very soft soil or peat were pioneering works.

EUROPE, THE PAST (CONTINUED)

There have been always excellent synergies between PIARC and ISSMGE, mainly within the World Road Congresses and the International and Regional Conferences of ISSMGE. Even the Danube-European Conferences of ISSMFE started with the title “Soil Mechanics in Road Engineering” (1964).
The European Technical Committee ETC 11 of ISSMFE was another link, already 25 years ago. In 2000 the ETC 11 became the Technical Committee TC 202 of ISSMGE (“Transportation Geotechnics”). This enhancement underlines the cooperation of both societies, which meanwhile comprises also Geotechnics in railway engineering. Furthermore, TC 216 (“Frost Geotechnics”) of ISSMGE provides valuable information for road and railway engineering.

6.8 International Association for Bridge and Structural Engineering (IABSE)

This Association was founded in Vienna 1929 (600 delegates from 31 countries), and – as recommended then by K. Terzaghi – it considers also the foundation of bridges and other structures. Consequently, the annual IABSE Symposia (World Congresses) usually contain a special section on geotechnical engineering, just as it is the case at World Road Congresses of PIARC. IABSE’s logo is still three-lingual (English, French, German), but meanwhile English has become the only official language. There are excellent synergies between IABSE and the Technical Committee TC 207 (“Soil Structure Interaction”) of ISSMGE.

6.9 European Federation of Soil-Bioengineering (EFIB)

The “Father” of Soil-Bioengineering is the Austrian engineer H.M. Schiechtl (1922 – 2002). In addition to his civil engineering education he studied botany in Innsbruck/Austria, and created unique mappings of the Alpine vegetation (covering 30 000 km^2). His developments in the fields of Geobotany and Engineering Biology were first used by the “Austrian Service for Torrent and Avalanches Control”, in slope and rockfall engineering, for nature preservation, and then in landscaping and for high highway embankments (Fig. 10). H.M. Schiechtl influenced “Soil-Bioengineering” in several countries, finally leading to the foundation of the EFIB in 1995 with member societies from Austria, France, Germany, Italy, Portugal, Russia, Spain and Switzerland. Its Secretariat General is situated at the University of Natural Resources and Applied Life Sciences (BOKU) in Vienna.

Soil-Bioengineering is of interest for the ISSMGE Technical Committees TC 208 (“Landslides”) and TC 213 (“Soil Erosion”).

6.10 Snow Mechanics

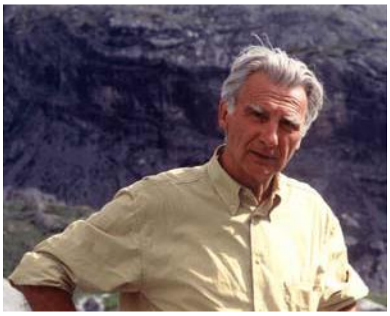
The Alps, mainly regions with glaciers and high potential of avalanches in Austria and Switzerland, raised the interest in the mechanical behaviour of snow and ice. The “Father” of snow mechanics is undoubtedly R. Haefeli (1898 – 1978), who had established a soil mechanics laboratory at ETH Zurich in 1935. There he carried out fundamental studies on the shearing resistance of soil, snow and ice (since 1935), comprising laboratory and field tests. Indeed, his doctoral thesis, published in 1939, was entitled “Snow mechanics with reference to soil mechanics” (Fig. 11). He was appointed a Professor at ETH Zurich in 1947 and lectured on soil and snow mechanics together with avalanche mitigation and preventive measures. Additionally he devoted his interest to glaciers. R. Haefeli was one of the founders of “Geotechnique” [5].

The International Commission on Snow and Ice (ICSI) focuses on glaciological aspects and hardly on snow mechanics in the sense of soil mechanics. This society was founded in 1948, and R. Haefeli served as its President between 1954 – 1957. The precursor of ICSI was already founded in 1894 in Zurich, when the Council of the 6th International Geological Congress decided to create an International Glacier Commission.

EUROPE, THE PAST (CONTINUED)

Until now there is no international society for snow mechanics, but several institutes for soil mechanics have contributed to this topic for decades.

Figure 9. Closing of the 3rd International Conference on Geosynthetics of IGS in Vienna, 1986. More than 1300 delegates. From the right: Founding President Ch. Scherer (Switzerland), Conference Chairman H. Brandl (Austria), Conference Secretary H. Schneider (Austria), 2nd President of IGS J.P. Giroud (USA).



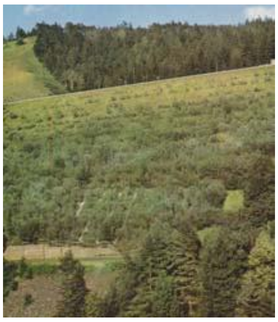


Figure 10. Soil-Bioengineering and its "Father" M. Schiechtl (1922 – 2002), Austria. Examples of living soil reinforcement for highway embankments up to 60 m height (1963).

SCHNEEMECHANIK
MIT HINWEISEN AUF DIE
ERDBAUMECHANIK

Snow mechanics with reference to soil mechanics

Von der
Eidgenössischen Technischen Hochschule
in Zürich
zur Erlangung der
Würde eines Doktors der technischen Wissenschaften
genehmigte
Promotionsarbeit
vorgelegt von
R.Haefeli, Dipl.-Ing.
aus Zürich

Figure 11. Snow Mechanics and its "Father" R. Haefeli (1898 – 1976), Switzerland. Cover page of his Doctoral Thesis (English title is added by the author).

EUROPE, THE PAST (CONTINUED)

7. CONFERENCES OF ISSMGE

7.1 International Conferences of ISSMGE ("World Conferences")

The main conferences of ISSMGE are undoubtedly the international ones (ICSMFE/ICSMGE), running in four-years intervals, only interrupted by World War II and lightly delayed in 1994 (see Tab. 5).

Table 5. International Conferences ("World Conferences") of ISSMFE/ISSMGE.

No.	CITY	COUNTRY	YEAR
1	Cambridge, MA (Harvard University)	USA	1936
2	Rotterdam	The Netherlands	1948
3	Zurich	Switzerland	1953
4	London	UK	1957
5	Paris	France	1961
6	Montreal	Canada	1965
7	Mexico City	Mexico	1969
8	Moscow	USSR	1973
9	Tokyo	Japan	1977
10	Stockholm	Sweden	1981
11	San Francisco, CA	USA	1985
12	Rio de Janeiro	Brazil	1989
13	New Delhi	India	1994
14	Hamburg	Germany	1997
15	Istanbul	Turkey	2001
16	Osaka	Japan	2005
17	Alexandria	Egypt	2009
18	Paris	France	2013

After Harvard in Cambridge, Massachusetts, with 206 delegates, mainly from Europe and North America (Fig. 12), Rotterdam organized in 1948 the 2nd ICSMFE, already attended by 596 delegates, despite the difficult post-war situation and political restrictions. This was a tribute to the high level of Dutch geotechnics and it played a key role in establishing European (Member) Societies of Geotechnics and of ISSMFE, respectively.

At the meeting of the Executive Committee in Rotterdam, in 1948, the first set of Statutes were discussed, and the final agreed draft covered the management of the Society (Fig. 13). Thus, the Rotterdam Conference was the official launch of the International Society for Soil Mechanics and Foundation Engineering (ISSMFE).

The number of delegates increased from one conference to another and reached its maximum at the 8th ICSMFE in Moscow, 1973 with about 1500 delegates (Fig. 14). However, the main reason for this "peak value" was hardly geotechnics but rather the political situation, as could be observed by the author personally: The world was in the midst of the "Cold War", and there were severe restrictions to enter the Soviet Union (USSR). This 8th ICSMFE now provided for the delegates from abroad an unique chance to pass the "Iron Curtain", to visit Moscow and attend post conference tours into regions, which normally were "closed" for foreigners. "Accompanying persons" from the KGB were omnipresent practicing a special version of the "observational method".

EUROPE, THE PAST (CONTINUED)

Figure 12. Partial view of the registered delegates at the 1st ICSMFE at Harvard University, Cambridge, MA, June 22 – 26, 1936.

Figure 13. Meeting of the Executive Committee of ISSMFE at the 2nd ICSMFE in Rotterdam, 1948. From the right: E.E. De Beer, A.W. Skempton, K. Terzaghi, T.K. Huizinga.

At the beginning of the Executive Committee on occasion of the 3rd ICSMFE in Zürich, in 1953, reference was made to other meetings in the interim. Already one year before this decision the 1st Australasian Region Conference had taken place in Melbourne. Usually, these Regional Conferences have been organized in four years intervals since the 1950s (see Chapter 7.2).

The 11th ICSMFE in San Francisco, 1985, was held in commemoration of the jubilee year "50th Anniversary of ISSMFE". In the opening session the newly installed awards were bestowed for the first time: The K. Nash Gold Medal on H.B. Seed (1922 – 1989) and the Terzaghi Oration on W. Lambe (1920 –). K. Nash (1922 1981) had been Secretary General of ISSMFE from 1965 to 1981 and Professor of Civil Engineering at King's College, London (Fig. 15).

EUROPE, THE PAST (CONTINUED)

Figure 14. Cover page of the conference proceedings of the 8th ICSMFE in Moscow, 1973 (with the hitherto maximum number of attendees).

Figure 15. J.K.T.L. Nash (1922 – 1981). Secretary General of ISSMFE from 1965 to 1981 and Professor of Civil Engineering at King's College, London.

A special event was the "International Conference on Geotechnical and Geological Engineering (GeoEng 2000)" at the end of the Second Millenium in Melbourne under the auspices of ISSMGE, ISRM, IAEG. On occasion of this joint conference a merging of these societies or at least a series of common international conferences was discussed. However, the international eagerness for a unification has been rather limited until today; FedIGS has been the hitherto maximum of approaches.

Comprehensive details on all 17 International Conferences of ISSMFE/ISSMGE (Harvard, 1936 to Alexandria, 2009) can be found in [8]. The 18th ICSMGE will be again in Paris (2013), which after the 5th ICSMFE in 1961 will be the first capital having organized twice this event.

7.2 Continental Regional Conferences

At the Execution Committee Meeting (now Council Meeting) in 1953 in Switzerland Vice Presidents were elected and urged to organize Regional Conferences in the mid-year between the four-yearly International Conferences.

The European Regional Conferences of ISSMFE/ISSMGE started in Stockholm 1954, (Table 6), in recognition of the pioneering Swedish geotechnics. The 6th ECSMFE took place in Vienna in 1976 on occasion of the 50th Anniversary of K. Terzaghi's fundamental book "Erdbaumechanik" (Vienna, 1925), which is considered the birth of modern soil mechanics. Until now, Madrid is the only capital, that organized two European Conferences (ECSMFE, 1972 and ECSMGE, 2007).

The other Regional Conferences of ISSMFE/ISSMGE started as follows:

- ✧ African Regional Conferences in Pretoria, South Africa, in 1955.
- ✧ Asian Region Conferences in New Delhi, India, in 1960
- ✧ Panamerican Region Conferences in Mexico, 1959.

The name of the Australian Regional Conferences was changed in "Australasia and New Zealand Conferences on Geomechanics" in 1971, and the first of this series was again organized in Melbourne.

EUROPE, THE PAST (CONTINUED)

Table 6. European Regional Conferences of ISSFE or ISSMGE respectively.

No.	CITY	COUNTRY	YEAR
1	Stockholm	Sweden	1954
2	Brussels	Belgium	1958
3	Wiesbaden	Germany	1963
4	Oslo	Norway	1967
5	Madrid	Spain	1972
6	Vienna	Austria	1976
7	Brighton	England	1979
8	Helsinki	Finland	1983
9	Dublin	Republic of Ireland	1987
10	Florence	Italy	1991
11	Copenhagen	Denmark	1995
12	Amsterdam	The Netherlands	1999
13	Prague	Czech Republic	2003
14	Madrid	Spain	2007
15	Athens	Greece	2011
16	Edinburgh	United Kingdom	2015

7.3 Danube-European Conferences

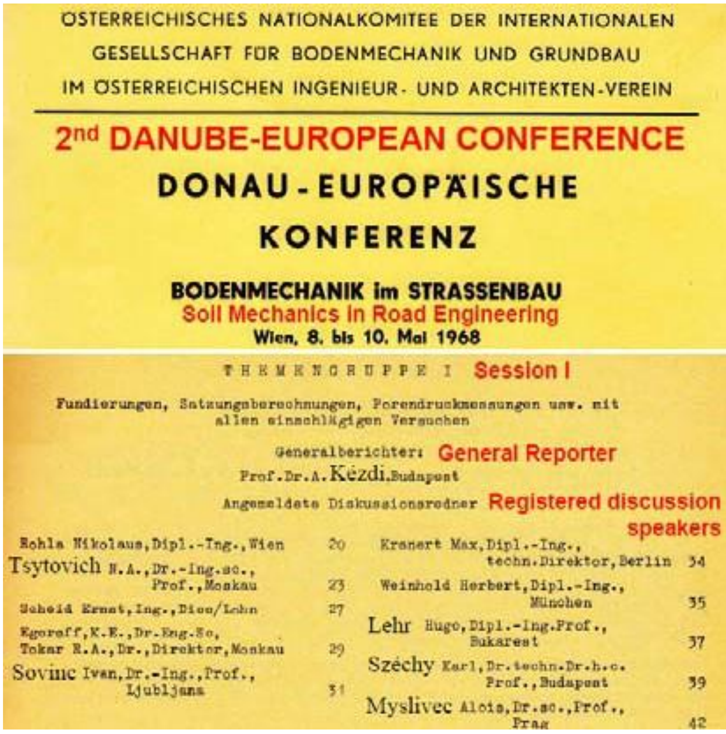
In addition to the continental Regional Conference smaller regional conferences were established with the aim to bring together colleagues mainly from neighbouring countries. The first were the Danube-European Conferences, starting in Vienna, 1964 (Tab. 7), comprising not only the Danube Region but also the countries with tributaries of the River Danube from Switzerland to the Black Sea. This region has had close cultural and historical connections since centuries, and the Danube-European Conferences of ISSMFE became an outstanding example how to overcome political problems (i.e. the Iron Curtain). This required not only reliable personal contacts but also sensitive diplomacy. For instance, the official representatives of all countries were sitting on the podium during the Opening Ceremony of the Conference (Fig. 16).

Commonly, at least one official delegate from another country was placed between the representatives of Western and Eastern Germany; otherwise the eastern colleague could have become political problems at home.

From the very beginning the Danube-European Conferences were attended by high ranking personalities from Eastern Geotechnics as can be seen from the conference proceedings Vienna, 1968 (Fig. 17). Austria was politically neutral, and Vienna the somewhat nostalgic capital of a former Empire that had unified different regions and cultures (like a smaller predecessor of the today's European Community). After Vienna (1964, 1968) until 1986 (Nuremberg) the Danube-European Conferences had taken place always in Eastern countries, which made it easier for their delegates to attend. Moreover, the national language could be used officially. All these conditions created a "geotechnical family" in this region. In 2014 the 50th Anniversary Conference will be celebrated in Vienna.

EUROPE, THE PAST (CONTINUED)

Figure 16. Formal Opening Session at the 8th Danube-European Conference of ISSMFE in Nuremberg/Germany,1986. Official representatives of ISSMFE Member Societies in alphabetical order (in German) on the podium. Krebs Ovensen, Vice-President for Europe had just delivered his Opening Address.



ÖSTERREICHISCHES NATIONALKOMITEE DER INTERNATIONALEN GESELLSCHAFT FÜR BODENMECHANIK UND GRUNDBAU IM ÖSTERREICHISCHEN INGENIEUR- UND ARCHITEKTEN-VEREIN

2nd DANUBE-EUROPEAN CONFERENCE

DONAU-EUROPÄISCHE KONFERENZ

BODENMECHANIK im STRASSENBAU

Soil Mechanics in Road Engineering

Wien, 8. bis 10. Mai 1968

THEMENGRUPPE I Session I

Fundierungen, Setzungsberechnungen, Porendruckmessungen usw. mit allen einschlägigen Versuchen

Generalberichter: General Reporter

Prof.Dr.A. Kézdi, Budapest

Angemeldete Diskussionsredner Registered discussion speakers

Rohla Nikolaus, Dipl.-Ing., Wien	20	Kranert Max, Dipl.-Ing., techn.Direktor, Berlin	34
Tsytovich N.A., Dr.-Ing.sc., Prof., Moskau	23	Weinhold Herbert, Dipl.-Ing., München	35
Scheid Ernst, Ing., Dies/Lahn	27	Lehr Hugo, Dipl.-Ing.Prof., Bukarest	37
Egoroff, K.E., Dr.Eng.Sc, Tokar R.A., Dr., Direktor, Moskau	29	Széchy Karl, Dr.techn.Dr.h.c. Prof., Budapest	39
Sovinc Ivan, Dr.-Ing., Prof., Ljubljana	31	Myslivec Alois, Dr.sc., Prof., Prag	42

Figure 17. Cover page of the Proceedings of the 2nd Danube-European Conference of ISSMFE in Vienna, 1968. English translation (in red) and the enlargement of surnames of dominating personalities added for this paper.

EUROPE, THE PAST (CONTINUED)

Prof. A. Kezdi (1919 – 1983) from Hungary was not only an outstanding geotechnical personality but also an excellent singer, and the wife of Prof. M.V. Malyshev (1922 – 2011) from USSR even an opera singer. Therefore, many Danube-European Conferences were enriched by excellent music performances. Together with dancing evenings this helped a lot to overcome the political barrier of the Iron Curtain and to establish permanent friendship among geotechnical colleagues.

Table 7. Danube-European Conferences of ISSMGE.

No.	CITY	COUNTRY	YEAR
1	Vienna	Austria	1964
2	Vienna	Austria	1968
3	Budapest	Hungary	1971
4	Bled	Yugoslavia (now Slovenia)	1974
5	Bratislava	Czechoslovakia (now Slovakia)	1977
6	Varna	Bulgaria	1980
7	Kishinova	Soviet Union (now Moldavia)	1983
8	Nuremberg	Germany	1986
9	Budapest	Hungary	1990
10	Mamaia	Romania	1995
11	Poreč	Croatia	1998
12	Passau	Germany	2002
13	Ljubljana	Slovenia	2006
14	Bratislava	Slovakia	2010
15	Vienna	Austria (50th Anniversary)	2014

7.4 Baltic(Sea) Conferences and Nordic Geotechnical Meetings

Following the foundation of Danube-European Conferences (1964) the Baltic Republics of the USSR established Baltic Conferences in 1968. The first took place in Kaunas, Lithuania 1982, and Belarus joined this series of geotechnical events (Tab. 8). At the 10th Baltic Sea Conference in Riga, 2005 it was decided to change its name to “Baltic Sea Conferences” which in the future should take place around the Baltic Sea. Consequently, Gdansk (2008) and Rostock (2012) followed; the next will be in Vilnius (2016).

While the Baltic(Sea) Conferences always have taken place under the auspices of ISSMFE/ISSMGE, the Nordic Geotechnical Meetings exhibit rather a private or “family character” with strong links among the Scandinavian countries since 1950. This “team spirit” could have been observed also at ISSMFE/ISSMGE Council Meetings for decades.

7.5 European Young Geotechnical Engineers’ Conferences

In 1987 the first Young Geotechnical Engineers’ Conference (YGEC) took place in Copenhagen, initiated by N. Krebs Ovesen, Vice President of ISSMFE. It became the precursor of the Regional Young Geotechnical Engineer’s Conferences; therefore the 1st YGEC can be also considered the 1st European Young Geotechnical Engineer’s Conference (EYGEC) – Tab. 9.

For 25 years now this European conference series has become a successful meeting event of the younger geotechnical generation, enhancing international contacts and cooperation. During his term as Vice-President of Europe the author always selected conference places, where the participants had to stay together (e.g. former military barracks in Estonian woods, mountain monastery in Bulgaria, Island of Santorin, Greece). This made the young geotechnical generation an international family with permanent friendships. Experience of life has confirmed that friendship of one’s youth are commonly the most stable ones.

EUROPE, THE PAST (CONTINUED)

Table 8. Baltic (Sea) Conferences of ISSMFE/ISSMGE.

No.	CITY	COUNTRY		YEAR
1	Kaunas	Lithuania	USSR at time of conference	1968
2	Tallinn	Estonia		1972
3	Riga	Latvia		1975
4	Kaunas	Lithuania		1978
5	Minsk	Belarus		1982
6	Tallinn	Estonia		1986
7	Riga	Latvia		1991
8	Vilnius	Lithuania		1995
9	Pärnu	Estonia		2000
10	Riga	Latvia		2005
11	Gdansk	Poland	Name change: Baltic Sea Conference	2008
12	Rostock	Germany		2012
13	Vilnius	Lithuania		2016

Table 9. European Young Geotechnical Engineers' Conferences of ISSMFE/ISSMGE.

No.	CITY	COUNTRY	YEAR
1	Copenhagen	Denmark	1987
2	Oxford	UK	1988
3	Raubichi (Minsk)	USSR (now Belarus)	1989
4	Delft	Netherlands	1990
5	Grenoble	France	1991
6	Lisbon	Portugal	1992
7	Boeblingen	Germany	1993
8	Stara Lesina	Slovenia	1994
9	Ghent	Belgium	1995
10	Izmir	Turkey	1996
11	Madrid	Spain	1997
12	Tallinn	Estonia	1998
13	Santorini	Greece	1999
14	Sts Cyricus und Julitta Monastery	Bulgaria	2001
15	Dublin	Ireland	2002
16	Vienna	Austria	2004
17	Zagreb	Croatia	2006
18	Ancona	Italy	2007
19	Györ	Hungary	2008
20	Brno	Czech Republic	2010
21	Rotterdam	The Netherlands	2011
22	Gothenburg	Sweden	2012

EUROPE, THE PAST (CONTINUED)

7.6 Other Conferences, Congresses and Symposia of ISSMGE

International Symposia on Landslides started in Kyoto, 1972 (Tab. 10), and the International Congresses on Environmental Geotechnics in Edmonton, 1994 (Tab. 11). Both events inevitably overlap with topics of the International Association of Engineering Geology and the Environment (IAEG).

Technical Committees of ISSMGE have increasingly organized their particular conferences or seminars since about 2000. In 2010, for instance, the International Geotechnical Conference "Geotechnical Challenges in Megacities" took place in Moscow, organized by TC 18, TC28, TC32 and TC41.

Forensic Geotechnical Engineering has become another new field for ISSMGE, and since 2003 International Workshops and Symposia were organized by the Technical Committee TC 40, now TC302 ("Forensic Geotechnical Engineering").

The International Conferences on Education and Training in Geotechnical Engineering were established in Sinaia (2000) by the Romanian Member Society of ISSMGE. In the year 2008 the International Conference on Education and Training in Geo-Engineering Sciences followed, organized by the European Technical Committee ERTC 16 also in Romania (Constanza).

7.7 National Conferences, Symposia, Lectures

Many Geotechnical Societies in Europe have organized national conferences, symposia, lectures, etc., sometimes under the auspices of ISSMGE, sometimes not.

National conferences are of great local importance for bridging the gap between theory and practice, and therefore they are mostly combined with exhibitions from universities, research institutes, contractors, consultants, etc.

The largest national conference has been the biannual "Deutsche Baugrundtagung" (literally translated: German Construction Ground Conference), established in 1950 and attracting about 1300 delegates from about 10 to 15 countries.

Frequently, the national geotechnical conferences are combined with a special lecture honouring their pioneers. For instance, the biannual Austrian Geotechnical Conference with the "Vienna Terzaghi Lecture" commonly attracts 500 to 600 persons from 20 – 25 countries.

Table 10. International Symposia on Landslides of ISSMFE/ISSMGE.

No.	CITY	COUNTRY	YEAR	
1	Kyoto	Japan	1972	
2	Tokyo	Japan	1977	
3	New Delhi	India	1980	
4	Toronto	Canada	1984	
5	Lausanne	Switzerland	1988	
6	Christchurch	New Zealand	1992	
7	Trondheim	Norway	1996	
8	Cardiff	UK	2000	
9	Rio de Janeiro	Brazil	2004	
10	Xi'an	China	2008	(Name change in 2008)
11	Banff	Canada	2012	

EUROPE, THE PAST (CONTINUED)

Table 11. International Congresses on Environmental Geotechnics of ISSMFE/ISSMGE.

No.	CITY	COUNTRY	YEAR
1	Edmonton	Canada	1994
2	Osaka	Japan	1996
3	Lisbon	Portugal	1998
4	Rio de Janeiro	Brazil	2002
5	Cardiff	UK	2006
6	New Delhi	India	2010

Sometimes national conferences are organized on occasion of particular anniversaries, e.g. the two days Symposium “70 Years in Soil Mechanics” in Istanbul, 1995, reminding of the publication of K. Terzaghi’s book “Erdbaumechanik” in 1925 and on his activities in Turkey.

A recent example was the Geotechnical Memorial Conference, organized at the State’s University in Ghent, 2011 honouring the late Prof. E.E. De Beer, Father of Belgian Soil Mechanics, on occasion of his 100 years’ birthday.

Additionally, many ISSMGE Member Societies, or National Geotechnical Societies, respectively, have their own Special Lecture named after national pioneers following the Rankine Lecture of the British Geotechnical Association (BGA). This prestigious series started in 1961 with A. Casagrande as first Rankine Lecturer (“Control of seepage through foundations and abutments of dams”) and attracts about 600 to 700 persons. In 1984 the M. Rocha Lecture followed in Lisbon with F. Borges (Professor and Past Director of LNEC) as first speaker. Some other examples are (in alphabetical order):

- Croce Lecture – Italy
- Nonveiller Lecture - Croatia
- Šuklje Lecture – Slovenia
- Széchy Lecture – Hungary
- Vienna Terzaghi Lecture – Austria

Besides conferences under the auspices of ISSMGE or national conferences many universities and institutions have established additional conferences, symposia, etc. “with international participation”. This splitting reduces the number of participants at major conferences and leads more and more to a repeating of already known. Such activities are widely caused by the main criteria for evaluating the academic career or departments and less by niches for specialists.

7.8 Languages

After the 2nd ICSMFE in Rotterdam in 1948, it was agreed upon that French be officially adapted as the second ISSMFE language. Consequently, English and French have been the official languages since, at least at the International, Continental and Regional Conferences. However, the percentage of French papers in the conference proceedings has decreased significantly during the past thirty years. A similar situation could be observed by the International Society for Rock Mechanics: Due to the strong pioneering group from Austria (under L. Müller) and the then still wide spread of German it became the third founding language of ISRM. In 2010 the ISRM decided to omit French and German, simply for pragmatic reasons. Also IGS, ITA and IABSE use only English as official language. On the other hand, IAEG and ICOLD still use English and French, and PIARC has added Spanish to English and French (at the 24th World Road Congress in Mexico City in 2011). Sometimes countries provide additional conference proceedings translated into their local language.

EUROPE, THE PAST (CONTINUED)

Danube-European Conferences and Baltic Conferences have been special cases: In their early phases German and Russian were widely spread around the Baltic Sea, in Eastern Europe and on the Balkan. The first fundamental books and other relevant papers on soil mechanics (Terzaghi, Fröhlich, Kögler-Scheidig) were nearly exclusively published in German. Consequently, Russian, German and English were official Conference languages in the Baltic countries during USSR-times (Fig. 18), and simultaneous translation was provided. Since the political change English has become the only official conference language.
In the Danube Region German was like the common “Esperanto” until about 2000, and therefore dominating during the first two to three decades of Danube-European Conferences (Fig.19), though English was also official conference language. At that time most eastern colleagues hardly spoke English. Even privately the delegates from different (Eastern) countries preferred to communicate in German rather than in Russian. Furthermore, the national language of the hosting country could be used (also in the proceedings). At the end of the 4th Danube-European Conference (1976) Russian came in as additional official language, remaining until 1983 (Fig. 19). Until 2010 simultaneous translation was provided during the meetings. Meanwhile the English language is clearly dominating, but German is still in use.
At the Nordic Geotechnical Meetings the Scandinavian languages (Danish, Norwegian, Swedish) and English are used.
The National Geotechnical Conferences use their local mother tongue, but invited speakers from abroad commonly use English – sometimes with simultaneous translation.

8. GENERAL REMARKS

Most new disciplines, whether in engineering, medicine, or other sciences pass through stages of development. Often there is a period of early rapid growth, followed by a struggle of acceptance. Even soil mechanics was not spared this. Over-conservative civil engineers and geologists, and pure theoreticians, were rather sceptic until the 1960s. The author still remembers the nickname “magicians” for practicing geotechnicians.

The advances in geotechnical engineering between 1936 and 2011 may be characterized as “*From Revolution to Evolution*” (Fig. 20). The revolutionary period was between 1936 (actually since 1925) and about 1980, when the full potential of this discipline was realized. Since then the advances have had rather an evolutionary than revolutionary character. This should, however, not be considered depreciative (derogative); it is just a normal process of development.

One of the main targets of ISSMGE has been to bridge the gap between theory and practice, between academics and practitioners. It seems, that this gap has rather widened during the past twenty years. Main reasons are, for instance, lack of site experience, over-reliance on numerical methods, the focus on basic research and publication intensity as the only ruling criteria for evaluating the academic career (“publish or perish”); career impact of Journal papers versus Proceeding papers. Already in 1991 R.B. Peck (1912 – 2008) – Fig. 21, predicted: “*Researchers will take refuge in increasingly esoteric investigations, practitioners will pay little attention to the research results. Reading learned journals will become less interesting and profitable to practitioners, scientific oriented workers will find themselves more or less writing to each other.*”

Screening the conference papers by an international expert review committee in order to upgrade the main level of contributions could help the academics career as proposed by H. Poulos in 2005 already.

K. Terzaghi was always concerned, that students, and others, would put too much reliance on the theoretical aspects of Soil Mechanics, at the expense of developing judgement in the manner in which Soil Mechanics should be used to solve real problems in soil engineering. Many of this writings reflect this concern [6].

EUROPE, THE PAST (CONTINUED)

R.B. Peck's well known complaint *"Where has all the judgement gone"* [12] already in 1980 goes in the same direction. And further *"The most fruitful research grows out of practical problems"*. This statement should be combined with a quotation of the famous German philosopher I. Kant (1724 – 1804): *"There is nothing more practicable than a good theory"*.

R.B. Peck addressed at the 8th ICSMFE in Moscow, 1973 a warning on the increasing reliance on computer works.

Over-reliance on pure calculations was already criticized by the German poet J.W. Goethe (1749 – 1832), when in his "Faust II" he has Mephisto saying: *"They think, what cannot be calculated cannot be true"*. Today, a modified sentence could be added: *"They think, what cannot be found electronically does not exist"*. The latter often leads to a "re-inventing of the wheel" like in other disciplines (e.g. structural engineering).

In the 1930s, when the young science of soil mechanics was severely questioned and even opposed by many academics, K. Terzaghi stated: *"The present opponents of soil mechanics will die out; so this problem will solve itself biologically. But the worst harm to soil mechanics will come once it is discovered by pure theoreticians because the efforts of such persons could undermine its very purpose, especially if they don't distinguish between idealization and reality."*

At the Board Meeting in St. Petersburg in 2008 it was decided to label the "International Journal of Geoengineering Case Histories" as a journal of ISSMGE. This journal bridges the gap between theory and practice, as it follows K. Terzaghi's recommendation included in the foreword of the first issue of Geotechnique (1948): *"A well documented case history should be given as much weight as ten ingenious theories"*. Deliberations about this journal started in 2003, the first issue was published in 2006, and it exists only in electronic format.

Since the 1990s the volume of codes, standards, regulations, etc. has increased significantly within the entire civil engineering discipline, hence also in geotechnical engineering. In Germany, for instance, the number of code pages has trebled within the past 15 years. Therefore, they founded in 2011 an association "Initiative Practice-orientated Codes in Civil Engineering" to reduce this excess ("Who shall read all these codes?").

Over-regulations hinder innovation in geotechnical engineering (Fig. 22). They act like a brake, slowing down new development and advancement. Furthermore, there is the danger that our professional activities are going to be degraded to a mere fulfilling of regulations. Overspecifications may also have a detrimental impact and pretend that there is no residual risk left. Furthermore, engineers are increasingly afraid to design outside of standards or codes, because they fear legal problems in case of a failure. This also has dramatically reduced the willingness to take responsibility. Fear of liability or litigation is stifling innovation in civil engineering, especially in geotechnics, and pushing engineers towards over-reliance on standards. But over-reliance on standards or codes hampers also engineering judgement and kills "engineering intuition" – and creative thinking.

Another disadvantage of too detailed codes is that anyone, whether they understand the geotechnical and construction ramifications or not, can perform the calculations (or think so) and effectively come up with a seemingly technically legitimate answer. Too complex codes tend to give the user a false sense of security. Moreover, the onset of computers has made getting results of calculations quickly. However, simply getting an answer to six decimals places does not make it more accurate or precise.
In his K. Nash lecture J.B. Burland stated [4]: *"It is both arrogant and dangerous to believe that ground engineering can be carried out solely on the basis of numbers given from site investigation coupled with codes of practice. It is necessary to study case histories, learn about local experience, examine the soil and visit the site"*. There is nothing to add.

EUROPE, THE PAST (CONTINUED)

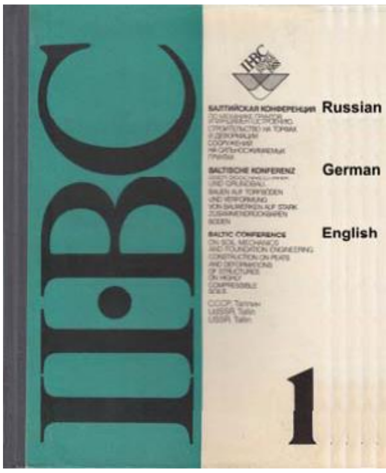


Figure 18. Cover page of the Proceedings of the 6th Baltic Conference on Soil Mechanics and Foundation Engineering (ISSMFE) in Tallinn (then USSR, now Estonia) in 1988. Official conference languages: Russian, German, English.

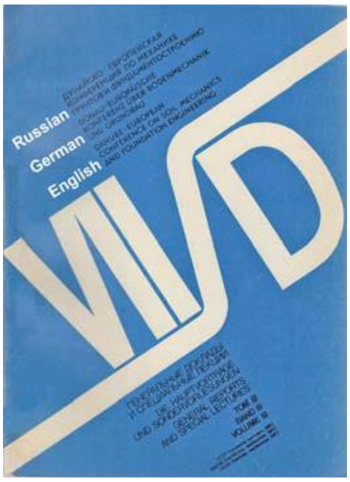


Figure 19. Cover page of the Proceedings of the 7th Danube-European Conference on Soil Mechanics and Foundation Engineering (ISSMFE) in Kishinev (then USSR, now Moldavia) in 1983. Official conference languages: Russian, German, English.

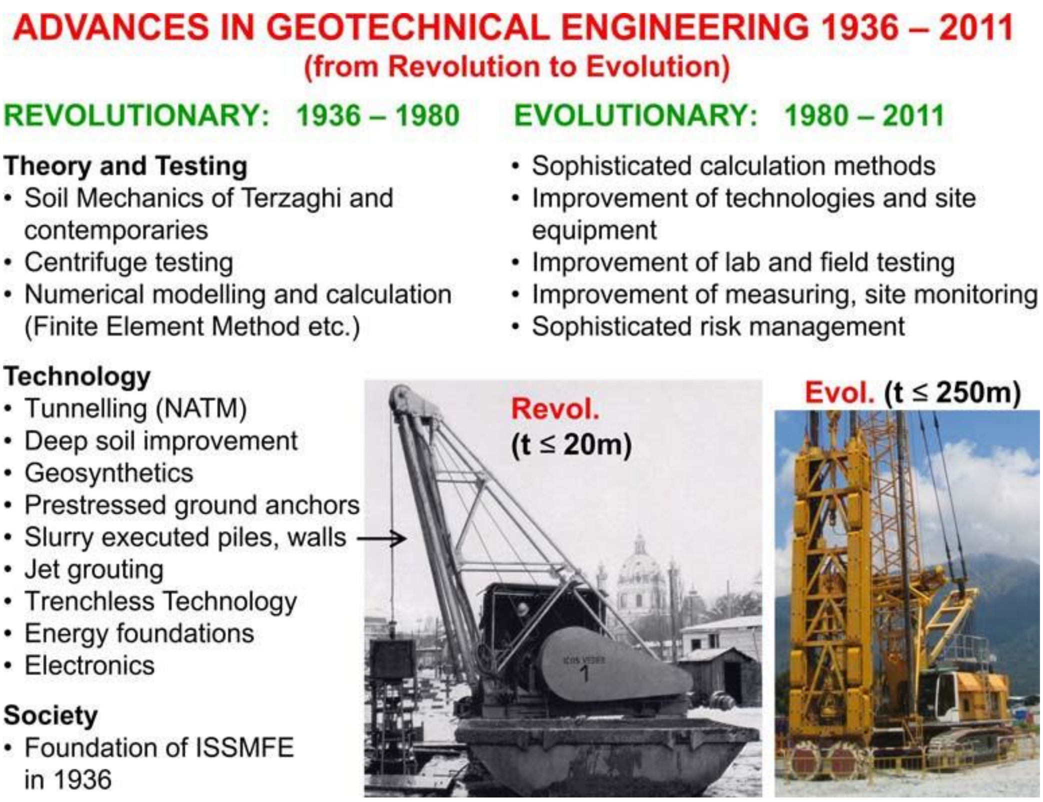


Figure 20. Advances in Geotechnical Engineering 1936 – 2011: “From Revolution to Evolution”. Slurry trench wall as an example of technology.

EUROPE, THE PAST (CONTINUED)

Figure 21. Ralph B. Peck (1912 – 2008).

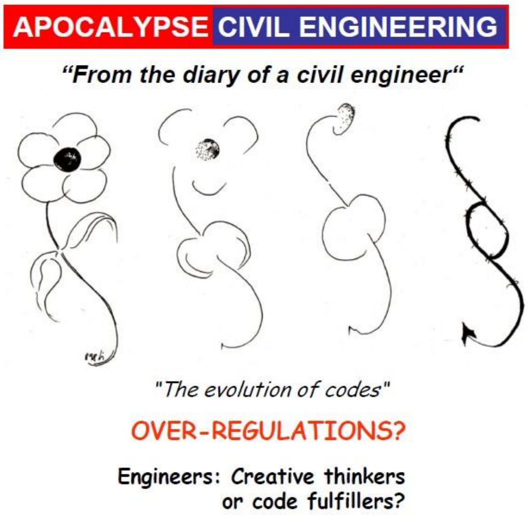


Figure 22. Over-regulations hamper innovation and the willingness to take responsibility (Caricature "The evolution of codes" after K. Stiglat, 2010).

9. CONCLUSION AND OUTLOOK

Since the birth of ISSMFE/ISSMGE in 1936 (formally established in 1948) the development of soil mechanics and geotechnical engineering has been on the road to success. Rarely has the rise of one discipline been so much the result of the efforts of a single individual like K. Terzaghi. Though K. Terzaghi laid the basis, many outstanding personalities contributed to this success and to the meanwhile worldwide acceptance of an engineering branch which is science and art likewise. Therefore, one has to pay tribute not only to the internationally well known late "Giants" of Soil Mechanics and Geotechnical Engineering but – posthumously – also to local pioneers of European ISSMFE/ISSMGE Member Societies (and their precursors). This will follow in the frame of an extended version of this paper, available at the homepage of the ISSMGE and the ÖIAV (Austrian Society for Engineers and Architects). A Russian version will also follow.

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GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT

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1 EUROPEAN NATIONAL SOCIETIES

At the moment in Europe is 34 ISSMGE National Societies. Situation is stable; many activities are spread between nearly all national societies. In May 2011 the Israel Society asked to be part of European group, not Asian. Members of the board accepted this proposal which will be on the ISSMGE Council Meeting programme in Toronto. There are two other countries from the last Soviet Union which should be contacted in near future: Belorussia and Azerbaijan.

By the end of June 2013 Belorussia and Bosnia and Herzegovina are new members of our ISSMGE.

	Member Society	No of members
1	ALBANIA	31
2	AUSTRIA	95
3	BELGIUM	231
4	BULGARIA	63
5	CROATIA	186
6	CZECH & SLOVAK REPUBLICS	47
7	DENMARK	345
8	ESTONIA	26
9	FINLAND	187
10	FRANCE	473
11	GEORGIA	38
12	GERMANY	624
13	GREECE	123
14	HUNGARY	115
15	ICELAND	10
16	IRELAND	22
17	ITALY	283
18	LATVIA	31
19	LITHUANIA	40
20	MACEDONIA, FYR	46
21	NETHERLANDS	759
22	NORWAY	360
23	POLAND	334
24	PORTUGAL	214
25	ROMANIA	149
26	RUSSIA	319
27	SERBIA	43
28	SLOVENIA	88
29	SPAIN	372
30	SWEDEN	761
31	SWITZERLAND	208
32	TURKEY	167
33	UKRAINE	100
34	UK	1180
	TOTAL	8070

2 ACTIVITIES IN EUROPE

- International Conference next 18th IC SMGE will be arranged in Paris, September 2013
- European Conference, now we are attending XVth in Athens, next one will be arranged in Edinburgh, September 2015
- Regional Conferences

Danube Geotechnical Conference - the last was arranged in Bratislava, June 2010, next will be arranged in Vienna, 2014 on the occasion of 50 anniversary of these conferences; Serbia declares the intention to arrange 16th Danube Conference in Belgrade, 2018.

Baltic Sea Geotechnical Conference – the last one was arranged in Gdansk and the next will be organized in Rostock, 31 May -2 June 2012, by German Geotechnical Society. At the end of very successful conference in Rostock the Lithuanian national society was selected as society responsible for the next one in 2016.

Nordic Geotechnical Meeting – in May 2012 the 16th NGM was arranged in Copenhagen, Denmark with a great success. Icelandic Geotechnical Society invited professional colleagues to Reykjavik for the 17th NGM in 2016.

GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT (Continued)

3 EUROPEAN YOUNG GEOTECHNICAL CONFERENCES

- 20th Brno, Czech Republic – 2010
- 21st Rotterdam, The Netherlands – September (4-7) 2011
- 22nd Gothenburg, Sweden – 2012 (26 – 29 August)

Next 23rd EYGEC will be arranged in Barcelona 2014. British Geotechnical Association is willing to invite young geotechnical engineers to Durham University, UK in 2015 and to combine this activity with EGC in Edinburgh similarly as 20th EYGEC 2010 in Brno was combined with DEC in Bratislava.

4 EUROPEAN REGIONAL TECHNICAL COMMITTEES

After International Conference in Alexandria all existing European Regional Technical Committees declared their wish to continue in work:

- ERTC 10 – Evaluation of Eurocode 7 – UK + Ireland – Andrew Bond, Trevor Orr -
- ERTC 12 Geotechnical Evaluation and Application of the Seismic Eurocode 8 – Italy – Michele Maugeri
- ERTC 7 – Numerical methods in geotechnical engineering - Spain – Cesar Sagaseta –
- ERTC 3 - Piles – Belgium – Noel Huybrecht (Maurice Bottiau)
- ERTC 16 – Education and Training – Romania – Iacint Manoliu (Marina Pantazidou)

For a great significance of the Regional TC the new ones are proposed to establish in Europe. The proposals are for:

- Geothermal Energy
- Utilization of large volume waste in Geotechnical applications
- Ageing of Earth Structures in Transport Engineering

National societies will be informed about this intention and their interest will have the final impact on their establishment. The idea is to propose this new ERTC with some research activity which is also supported from EU.

At the end of 2011 new ERTC Geothermal Energy was established in Darmstadt, Germany and arranged first workshop in July 2012.

5 OTHER ACTIVITIES AT THE INTERNATIONAL LEVEL

- Workshops of Technical Committees.
- International seminars were arranged in countries such as Spain, Russia, Switzerland, Hungary, Italy, Croatia, France, Germany, Ireland, Belgium, Romania, Albania, Estonia, Sweden, Finland and Denmark.
- Conclusion – nearly all European countries are involved in some international activities.

GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT (Continued)

6 COMMON SENSITIVE PROBLEMS IN EUROPE

- Geotechnical Engineering Education
- Geotechnical Design - according to EC 7-1
- Risk associated with Geotechnical Engineering Profession and Professional Prestige

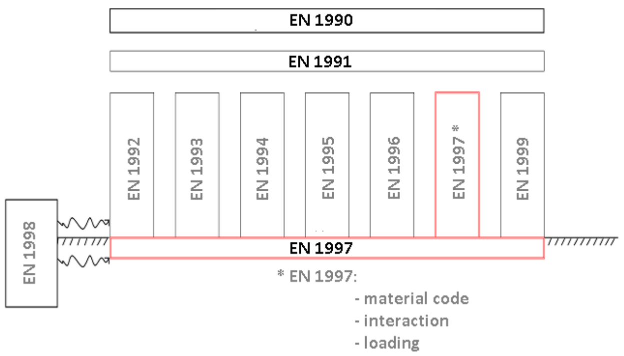
As the first two problems are on the programme of the European Conference the main attention will be given to the problems associated with professional prestige.

7 ATTRACTIVENESS OF THE GEOTECHNICAL ENGINEERING PROFESSION

There are two main aspects which have the significant impact on the attractiveness of our profession. They are;

a) Special position in the frame of Civil Engineering profession, which is expressed e.g. in Eurocode 7-1

b) Special position in society in general, as is able to react on up-to-date society demands



8 SPECIAL POSITION IN CIVIL ENGINEERING PROFESSION

Eurocode 7 unambiguously declares that in comparison with other Eurocodes, EC 7 is not only material code, but also the code for interaction (with practically all other structures), as well as code for loading (loading of soil or rock on other structures).

9 SPECIAL POSITION IN SOCIETY IN GENERAL

Geotechnical Engineering is falling under the limited group of professions which to the high extent are able to react not only on classical construction problems but also to new society demands, namely with respect to:

- Protection against natural hazards - floods, landslides, earthquakes
- Energy savings - especially with respect to Geothermal energy, e.g. energy piles or diaphragm walls;
- Raw materials savings - with high potential for waste and recycled material utilization, e.g. ash, slag, construction and demolition waste
- Protection of greenfields - as GE is playing significant role in the field of “Construction on brownfields”
- Environmental protection in general - where even GE established new branch “Environmental Geotechnics” - in 2010 6th International Congress on Environmental Geotechnics

10 RISK IN GEOTECHNICAL ENGINEERING

Risk connected with Geotechnical investigation is very clearly expressed in EC 7-1: 2.4.5.2.:

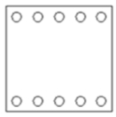
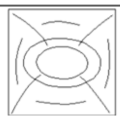
(7) The zone of ground governing the behaviour of a geotechnical structure at a limit state is usually much larger than a test sample or the zone of ground affected by in situ test. Consequently the value of the governing parameter is often the mean of a range of values covering a large surface or volume of the ground. The characteristic value should be a cautious estimate of this mean value.

GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT (Continued)

Therefore, there is legal basic question – how large part of ground we can observe and test?? 1: 1,000,000 ???

11 UNCERTAINTIES FOR DIFFERENT STRUCTURES

As we are usually able to examine only limited part of geological environment, let's say one millionth, uncertainties for geotechnical structures are much higher than for other structures. The uncertainties connected with steel structures for simple cases can be in the range of 3-5 %, for concrete structures 5-10%, for timber structures 10-20%, however for earth structures it can be up to 50%. In addition the quality of earth structures during construction is usually not controlled by parameters which are later on used during design, but indirectly, with the help of moisture content and dry density.

Steel Structures		3-5%	E, σ_d, σ_t
Concrete Structures		5-10%	
Timber Structures		10-20%	
Earth Structures	 Embankment (borrow pit) 1/1 000 000 from the whole volume Indirect methods	cca 50%	E_{def}, φ, c, k

12 RISK IN GEOTECHNICAL ENGINEERING

Risk in geotechnical engineering is above all connected with three models through which the geotechnical design should pass.

- ❑ Geological Model
- ❑ Geotechnical Model
- ❑ Calculation - Numerical Model

The responsibility for the high quality of these models is falling on persons responsible for geotechnical investigation and for geotechnical design. Contractor is responsible for the interaction with neighbouring structures (together with designer) and for the construction technology.

Therefore the main question here is – for what is responsible investor?

GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT (Continued)

13 ACCEPTABLE RISK

Frequency (rate) of failure is very different for different geotechnical structures. For spread foundations it is roughly 1: 1,000,000, and the probability of failure is 0.0001 %. For large dams according to ICOLD 1900 – 1975, it is roughly 1:80 – 1:100. It means 1.25 – 1.0 %. For shallow city tunnels, especially in soils (soft rock) it is with high probability 1:10 up to 1:20. It means probability of failure is about 5 to 10 %.

14 WHERE IS THE MAIN PROBLEM?

- Society demands only solutions which are able to guarantee 100 % safety
- This condition can not be fulfilled as in principle we are counting with acceptable risk – we are accepting some probability of failures – as it is basic approach of design (limit state approach).

Comparison:
Medical doctor
- is working with high risk – however openly declares probability of failure – and is accepted

Geotechnical engineer
- is also working with high risk – however failures are not accepted

GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT (Continued)

15 SUMMARY

- Geotechnical Engineering keeps very good position not only between civil engineers but also in society generally. This reality should be emphasized as much as possible
- The profession of geotechnical engineering is connected with an extremely high risk which is not fully accepted in society
    - This high risk is first of all connected with our ability to realistically model the behaviour of a geological environment due to the changes induced by new construction activity;
    - The natural task of geotechnical engineers is to decrease this risk with the help of new investigation, testing, design and construction methods.

16 POSSIBILITIES FOR IMPROVEMENT OF THE GEOTECHNICAL ENGINEERING POSITION

The general discussion to the point of professional prestige started already and some positive examples can be mentioned, as:

- ISSMGE Bulletin publishes many interesting examples of practical problems, similarly as the International Journal of Geoengineering Case Histories (IJGCH);
- TV Discovery Science Channel under the headline "Building the Biggest" is presenting many specific projects where our profession is playing very important roles, e.g. Busan-Geoje Project, Oresund Bridge and tunnel, tunnel under Amsterdam railway station, tunnel in Singapore under existing metro station, foundation of bridge over narrow sea in Greece with very strong seismic attack etc.

GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT (Continued)

- "Geotechnical – Geological Park" areal was opened in Vienna by H.Brandl, describing e.g. activities of K. Terzaghi, O.K. Fröhlich, A. Casagrande, L. Müller, and affiliated the name of the specific way to them; see photos above.
- The Geo-Impuls program started in the Netherlands, in which some 30 large clients, contractors, engineering consultants, universities and institutes do participate. The target of the Geo-Impuls program is halving geotechnical failures by 2015 – with expected savings around 500 Mil. EUR. But there are another positive examples (e.g. from Sweden) of good cooperation of 3 main partners (client- owner-investor + designer + contractor) who are sharing the risk with the main aim to decrease potential risk and to decrease bidding price.

However, to be more successful in our effort we have to combine our forces namely on

a) Information level - two positive examples were mentioned already (ISSMGE Bulletin and IJGCH journal). With respect to the questionnaire to the European societies – most of them positively evaluated ISSMGE webinars, but up to now they are reserved with respect to the other ISSMGE changes as are new web pages and GeoWord network as these activities are still at the opening phase. Nevertheless also the intention of this report should be to help to improve the information level.
b) Professional level – namely on the level of the sister learned societies as IAEG and ISRM or on the level of the sister practical societies as ITA/ITES – International Tunnelling Association, IGS – International Geosynthetic Society, EFFC – European Federation of Foundation Contractors – in Europe). This cooperation is very good at the national level. German Geotechnical Society can be mentioned as a positive example, which has sub-committees working in close contact with these sister societies. Therefore some international activities are arranged together with these sister societies. Again a few examples: ITA/AITES Congress in Finland, Helsinki, 2011 or EuroGeo – geosynthetics, in Spain, Valencia, 2012. However the cooperation at the international level still needs some improvement.
c) Academic and research level - with the main aim to achieve higher recognition of geo-engineered subjects at the university level or to achieve higher recognition of our research activities. All our achievements which are published in different journals, proceedings, books should be evaluated and registered on some official lists (e.g. on the list of Thomson Reuters).
d) National level – not only on the level of our profession but also on the level of National Civil Engineering Institutes, different government departments, information media and policy makers. Activities on our professional level will be described further as are most important parts of our activities.

For Europe a specific problem is connected with common European codes. Eurocode 7 – "Geotechnical design" is playing the most important role and is subject of many discussions. ERTC (European Regional Technical Committee) No.10 – Evaluation of Eurocode 7 – UK + Ireland – Andrew Bond, Trevor Orr – did in this field many positive steps. Very interesting was workshop in Athens during European conference, where also problem of numerical methods applied for the geotechnical design according to EC 7 was discussed. Nevertheless it is recommended for each national society to have some representative on the level of CEN/TC 250/SC7. Many national representatives are also working at many different "Evolution groups" of SC 7 the aim of which is to find some common approach to the new version of EC 7 which is expected to be prepared roughly in 2019.

GEOTECHNICAL ENGINEERING IN EUROPE, THE PRESENT (Continued)

Geotechnical education is discussed under the umbrella of ERTC 16 – Education and Training – Romania (Greece) – Iacint Manoliu (Marina Pantazidou). The main aim is to define basic demands for different levels of study according to the Bologna agreement. Just to help to increase student (and later on engineer) mobility, to be sure that students from each country will know basic principles on which other activity can be based in all Europe. But for an individual country very important question is how to attract best students to study our profession. In this way some activities of ISSMGE can be used, namely with respect to the professional prestige. The proposal to prepare database of short presentations about extremely important projects in which our profession is playing the most important role obtained very strong support in replies to the above mentioned questionnaire. These short presentations (about 5-7 minutes) can be used at the first course level of geotechnical engineering education.

Future Position of Geotechnical Engineering – From the European Perspective

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ABSTRACT
In this paper, the future position of Geotechnical Engineering (GE) is discussed through considering the relevance for the GE profession of four significant societal challenges the world is facing: demographic ageing, urbanization, natural hazards and resource efficiency. It is demonstrated that GE can have significant contributions to these challenges. However, the future position of GE in Europe depends to a significant extent on how the profession deals with the consequences of demographic ageing. Therefore, the GE profession (and the ISSMGE) should have a proper focus on inspiring students, by explaining the added value of GE in these global challenges. Inspiration of young people will require honest communication with regard to the uncertainties in the properties of our profession's building material: soil. Moreover, the significance of the field of GE shall increase if interfaces with relevant scientific disciplines are further strengthened, and disciplines like ICT and social sciences are further explored. This highlights the importance of involving young geotechnicians. Recent and future generations have an inherent affinity with modern technologies and have already been trained to work on a multi-disciplinary level. Therefore, young professionals should have a prominent role in ISSMGE activities. Subsequently, the involvement of young people may lead to vivid commitment, which secures a bright future for GE.

1 INTRODUCTION

As a representative of young geotechnical engineers in Europe, I was asked to share our view on the future of Geotechnical Engineering (GE). While it is impossible to get input from every single young colleague, I build upon the experiences I gathered through my involvement in several international GE-related networks.

1.1 *SYMPG of ISSMGE*

Professor Jean-Louis Briaud, current ISSMGE President, is active in making the Society more attractive to young geotechnical engineers in the future. In 2010 he established the Students and Young Members Presidential Group (SYMPG), to give students and young members a chance to voice their opinion directly to the President. This working group consists of 18 members from all over the world (3 members per region) and meets directly with the President about 4 times a year by conference call. In addition to the SYMPG, there is a group of corresponding members.

In May 2011 the SYMPG put forward their first detailed ideas for increasing the attractiveness of the ISSMGE and the involvement of students and young members. These ideas were discussed by the Board and, in some cases, have contributed to the task of other ISSMGE parts.

1.2 *Young ELGIP*

Since 2002, major European research organizations in GE – each with a strong national position and working both in research, development and innovation – have joined forces in the European Large Geo-engineering Institutes Platform (ELGIP, www.elgip.net). One of the aims is to support the interest of young professionals. To that end, a network of young professionals (Young ELGIP, in short YELGIP) was established in 2005, to stimulate the development of mutual understanding between ELGIP members and strengthen the European network. In order to reach their goals, YELGIP meets twice a year and, regularly, they organize thematic workshops: Soil Improvement (2006), Innovative Geo-monitoring (2007) and Landslides (2011).

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

1.3 ECTP; EU Construction Sector and FP7

European Technology Platforms (ETPs) provide an industry-led framework for European stakeholders to define visions, research priorities and action plans on a number of technological areas where achieving EU growth, sustainability and competitiveness requires major research and technological advances in medium to long term.

The European Commission that supported their creation is engaged in ETP's structural dialogues. ETP deliverables constitute valuable input to define the Commission's research funding schemes. Since 2007 the 7th Framework Programme (http://cordis.europa.eu/fp7/) (FP7) has been the main funding scheme for demonstration and European research cooperation, both part of the ISSMGE aims. Its successor Horizon 2020 will be launched in 2013. It is up to all stakeholders (including the ISSMGE) to which extent this funding scheme is used for demonstrating the added value of the GE profession. To create these opportunities in Brussels, knowing how to connect foreseen GE developments to EU policy targets is essential. Currently, (research) policy of the European Commission follows the Europe 2020 Strategy (http://ec.europa.eu/europe2020/).

The ETP for the European Construction Sector (ECTP, www.ectp.org), also representing a major part of GE's research interest in Brussels, is constantly analyzing the major challenges this sector faces in terms of society, sustainability and technological development. Within the ECTP a significant part of the work takes place in discussion groups called Focus Areas (FA) several of which are relevant to GE: FA Underground Construction, FA Networks and FA Quality of Life.

2 FUTURE OF GEOTECHNICAL ENGINEERING

Considering the broad scope of GE, it is not an easy task to briefly present a common view on its future. This scope captures both academics and practitioners, and encompasses state-of-the-art expertise as well as traditions of our profession. The fact that many different GE traditions in soil investigation methods, execution procedures, et cetera, suited to the local subsoil conditions exist, and that many different models have been developed, is to a great extent due to large differences in geology. GE is decidedly linked to tradition. In looking ahead, knowledge on the influence of these traditions on daily practice is essential. As the following example illustrates:

2.1 Influence of GE traditions; Eurocode 7

Focusing on Europe, the attempt to harmonize different European GE design traditions has shown that, up to now, European consensus about geotechnical models is very difficult. According to (Schuppener, 2007) Eurocode 7 is an umbrella code, since analytical geotechnical models are given in informative national annexes instead of in the normative text. Moreover, Eurocode 7 contains a number of options, which have to be decided upon by the national standard bodies, such as the three Design Approaches for the verification of geotechnical Ultimate Limit States and the values of the partial factors.

Although Eurocode 7 has not yet led to a complete harmonization of geotechnical design in Europe, it should be considered as a firm step forward. Most importantly, it is (more or less) a common framework in which countries with substantial differences since decades of national geotechnical traditions speak the same language and use a common safety philosophy.

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

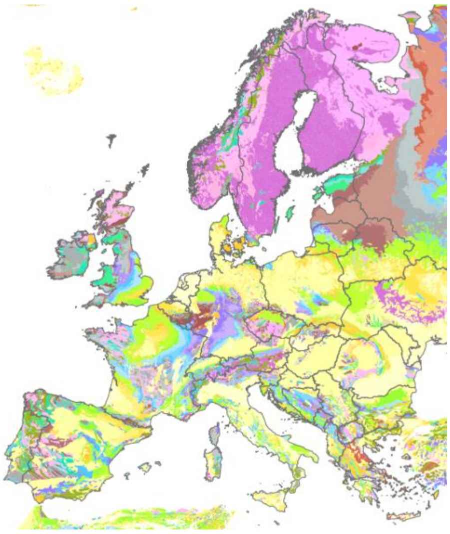

Figure 2.1: Stratigraphic geological map. Continental part of IGME5000 (IMGE5000: The 1:5 Million International Geological Map of Europe and Adjacent Areas, BGR (Hannover)) after Asch, K. (2005)

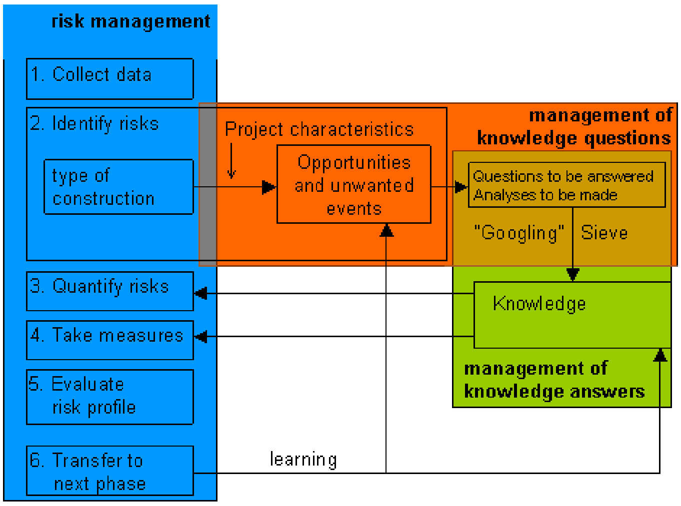

Figure 2.2: ELGIP's EuroGeosystems framework

For the European construction sector, uniform safety levels are of great importance. This originates from its complex and fragmented structure, in which many (small) players have to operate in a heavily regulated environment and have to take account of the 'general interest', i.e. in comfort, health and safety. As a consequence, there is an incremental approach to innovation and the sector needs a long overall clock-time (average 10 years) to come from research to an innovative, marketable and approved product, process or method in the benefit of the end user.

Future GE harmonization efforts could be facilitated by a collective European geotechnical design environment, in which stakeholders can use their common geotechnical language. To encourage international cooperation, this design environment should focus on actual geological differences instead of 'virtual' national borders in geotechnical practice, see Figure 2.1.

2.2 INSPIRATION: EGS design environment

Besides supporting the interest of young professionals, ELGIP aims to lead the transition of the GE sector by facilitating the new generation of geo-engineers with the EuroGeoSystems (EGS) framework. Possibly, a framework for facilitating further Eurocode 7 harmonization.

The anticipated EGS framework should aim to clarify the added value of GE. Thus, better explain the soil-related uncertainties and the potential of GE in the context of societal values. Based on risk management thinking EGS should guide its users to ask the right 'knowledge questions' and subsequently give the right 'knowledge answers', see Figure 2.2. This knowledge management system (connected to state-of-the-art methods and systems) could leads to best practices and the expertise required, offer a link between Centers of Excellence and provides a platform for support and quality assessment in construction, maintenance and policy processes, and so combines the best of many worlds.

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

Besides such inspiring ideas on facilitating further Eurocode 7 harmonization, major stakeholders like the industry (e.g. EFFC, ECTP), the European Committee for Standardization (e.g. CEN/TC 250 on Structural Eurocodes, CEN/TC 341 on Geotechnical investigation and testing and CEN TC 288 on Execution of special geotechnical works) and European members of the ISSMGE should take a role in this process.

3 GEOTECHNICAL CHALLENGES

3.1 *DEMOGRAPHIC AGEING*

Demographic ageing, i.e. the increase in the proportion of elder people, is one of the main challenges that the EU will have to face in the years to come, see (Commission of the European Communities, 2006). A predicted consequence of not taking any measures (e.g. raising the retirement age) would be, that the working-age population (15 to 64) will dramatically fall from about 60% in 2010 to just over 50% in 2060, see Figure 3.1. Particularly, due to an increase of the share of those aged 80 and above: at present around 4% of the total population, but rising to 12% in 2060, see (European Commission, 2011).

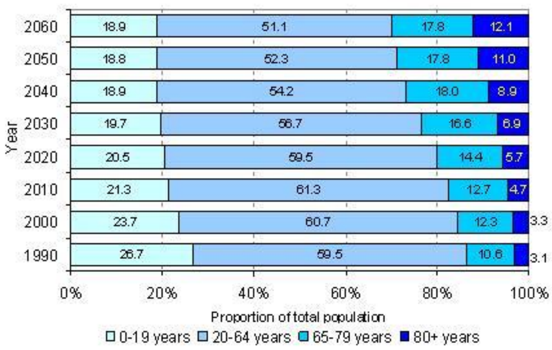

Figure 3.1 Division of EU population per age group, European Commission (2010)

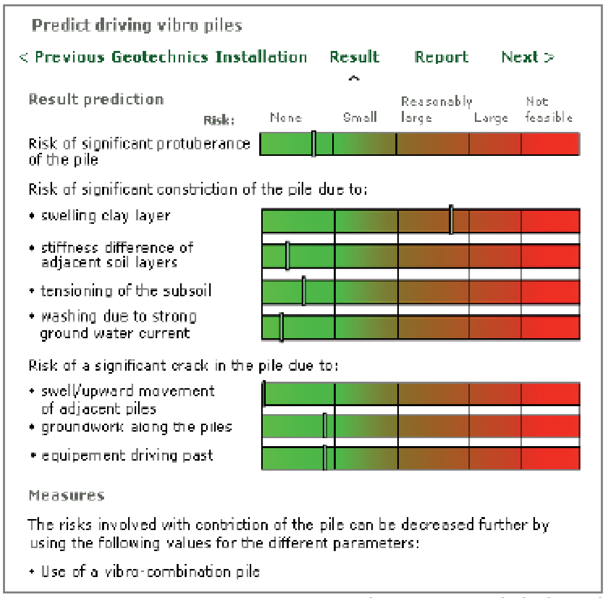

Figure 3.2. GeoBrain prediction model for driving vibro piles

Regarding the future of GE, demographic ageing has influence on the way the profession will need to organize its internal knowledge transfer, and on the emphasis of further GE developments in the coming decades.

3.1.1 *Consequence GE knowledge transfer*

With the expected decrease in the European labor force in mind, scientific disciplines should feel a proper sense of urgency with regard to attracting young people and, more importantly, efficient transfer of knowledge from experienced workers to young colleagues. The importance of knowledge transfer is particulary true for the GE profession, in which empirical laws still have significant influence on daily practice, and on enabling efficient knowledge transfer to prevent a 'Geotechnical Experience Drain'.

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

Attracting young people to the field of GE in competition with other disciplines will be tough. Therefore, the GE profession should have a clear focus on inspiring young colleagues, i.e. inspiration from projects and initiatives that leads to involvement and commitment of young people (in the ISSMGE).

3.1.2 *INSPIRATION: The GeoBrain concept*

Until recently, most practical knowledge about several geotechnical aspects of the construction process was locked up in the brains of individual specialists working for contracting companies, engineering consultancies and research institutes. The GeoBrain concept aims to provide engineers centralized and systematic access to this expert knowledge, through which every engineer can make better decisions and hence avoid problems during implementation.

More and more designers are using the Internet every day to tap into this 'collective brain'. Apart from the experience database, the Foundations module also has a prediction model (see Figure 3.2) that can be used to assess feasibility and damage risks.

Validation of the GeoBrain model for sheet piling showed that this 'foundation brain' enables designers to predict risks more accurately than using the current formulae in CUR guidelines (commonly used in the Netherlands).

GeoBrain reduces costs and improves quality. The result is a unique, interactive database that bridges the gap between theory and practice.

3.1.3 *Consequence GE development*

A substantial increase in the proportion of elder people will lead to an increased pressure on public spending related to pensions, health and services for the elderly. In 2006 it was projected that between 2004 and 2050 age-related public spending will represent an increase of 10% in public spending, see (Commission of the European Communities, 2006). Subsequently, the required increase in public spending will decrease future budgets available for knowledge development. Therefore, like any other profession, GE will be compelled to shift its emphasis in research, development and innovation activities more to cost-effectiveness.

While the uncertainties in the properties of our profession's building material – soil – are much greater than those in other parts of Civil Engineering, further developments in risk management could provide the field of GE a vital step forward in cost-effectiveness.

3.1.4 *INSPIRATION: Knowledge management*

Knowledge management is an essential component in the implementation of risk management. (Van Tol, 2007) clearly illustrated this aspect in his evaluation of the construction of building pits. Van Tol's analysis of undesirable events (leading to unforeseen costs, not by definition damage) recorded in 40 cases in the Netherlands brought forward that in only 7 cases (18%) the knowledge required for predicting the event was not available. Moreover, in 3 of those 7 cases (8%) the unknown event could have been observed in time by using proper monitoring.

3.1.5 *Related ISSMGE activities*

Apart from the fact that all TCs aim to disseminate GE knowledge and practice, ISSMGE has developed several specific activities to address the challenges that demographic ageing brings and show the impact

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

that GE can have in solving its negative effects: TC302 (Forensic Geotechnical Engineering), TC304 (Engineering Practice of Risk Assessment and Management) and TC306 (Geo-Engineering Education).

3.2 *URBANIZATION*

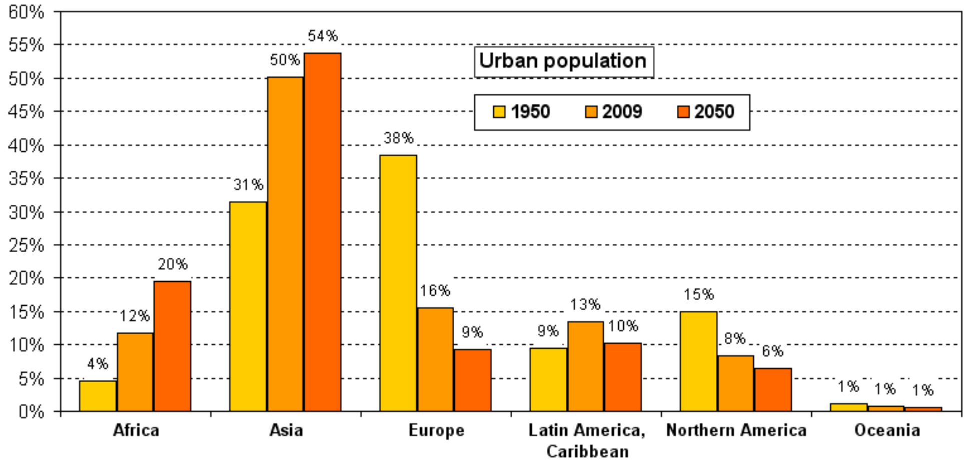

Figure 3.3: Development urban population by major area, (United Nations, 2010)

Table 3.1: Top list of megacities in the world in 2025, including ranking in 2007 (United Nations, 2008)

	Megacity	Continent	People [1)]
1.	Tokyo (1)	Asia	36.4
2.	Mumbai (Bombay) (4)	Asia	26.4
3.	Delhi (6)	Asia	22.5
4.	Dhaka (9)	Asia	22.0
5.	São Paulo (5)	S. America	21.4
6.	Mexico City (3)	N. America	21.0
7.	New York-Newark (2)	N. America	20.6
8.	Kolkata (Calcutta) (8)	Asia	20.6
9.	Shanghai (7)	Asia	19.4
10.	Karachi (12)	Asia	19.0
20.	Istanbul (19)	Europe	12.1
23.	Moscow (18)	Europe	10.5

1) amount in million people

According to the United Nations' definition, urbanization is the movement of people from rural to urban areas. At this moment, the world population is currently slightly more urban than rural, since the level of world urbanization crossed the 50% mark in 2009, see (United Nations, 2010). This process is expected to proceed. Figure 3.3 shows that by mid-century, most of the urban population of the world will be concentrated in Asia (54%) and Africa (20%).

Urbanization leads to an increase in so-called megacities, i.e. metropolitan area with a total population in excess of 10 million people. Table 3.1 suggests that the biggest megacities are located outside Europe.

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

3.2.1 *Consequences of urbanization*

From an economical point of view, urbanization is not a negative trend. It occurs naturally when reducing time and expense in commuting and transportation while improving opportunities for jobs, education, housing, and transportation. Historically, productive activities in industry and services cluster in cities. The importance of megacities and other urban areas is further underlined by the estimate from the UN that 80% of the world's GDP is generated in urban areas, see (United Nations, 2010).

However, from an environmental point a view, urbanization can have negative effects. Urban Heat Island effects have a significant impact on citizen's health and the surroundings. Brownfield sites within urban areas require proper remediation before re-use. Furthermore, outward spreading of urban areas often implies inefficient and unsustainable land-use patterns, in which people are highly dependant on their car for transportation, i.e. (sub)urban sprawl. Subsequently, this causes traffic congestion and air pollution in urban areas.

In the future, underground construction will keep improving its ability to contribute in a sustainable way to cost-effective solutions for the negative effects of urbanization. And thereby support more efficient land-use concepts, such as the Compact City and Smart Growth. In many Europe cities (such as the Crossrail route in London) examples of this contribution can be found. An inspiring example of underground construction contributing to the urban quality of life can be found on the other side of the Atlantic Ocean.

3.2.2 *INSPIRATION: Boston's Big Dig (http://www.massdot.state.ma.us/highway/bigdig)*

Recognized as the largest, most complex, and technologically challenging highway project in the history of the United States, the Central Artery/Tunnel Project significantly reduced traffic congestion and improved mobility in Boston, one of America's oldest and most congested major cities. In addition, it helped improving the environment, and established the groundwork for continued economic growth for Massachusetts and all of New England.

Figure 3.4: Boston after completion of The Big Dig (http://www.massdot.state.ma.us/highway/bigdig)

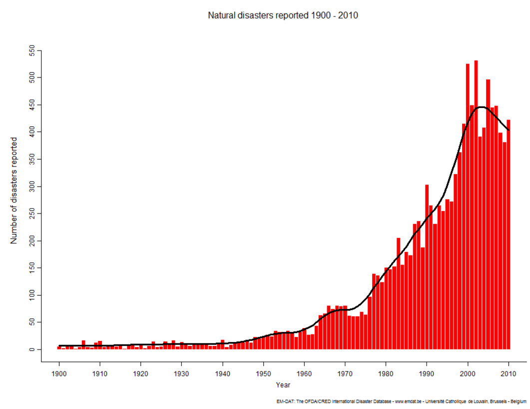

Figure 3.5: Number of reported natural disasters, worlds wide, between 1900-2010 (www.emdat.be)

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

The Project replaced Boston's deteriorating six-lane elevated Central Artery (I-93) with an eight-to-ten lane state-of-the-art underground highway, two new bridges over the Charles River, extended I-90 to Boston's Logan International Airport, and Route 1A, created more than 300 acres of open land and reconnected downtown Boston to the waterfront, see Figure 3.4.

3.2.3 Related ISSMGE activities

ISSMGE has developed several activities to address the challenges that urbanization brings and show the impact that GE can have in solving its negative effects. First of all, TC305 (Geotechnical Infrastructure for Megacities and New Capitals) was established in 2010. In connection to this initiative, the Conference "Geotechnical challenges in Megacities" was organized from 7-10 June 2010 in Moscow.

3.3 NATURAL HAZARDS

A natural hazard is an unexpected or uncontrollable natural event of unusual intensity that will have a negative effect on people or the environment. Further distinction with regard to GE-related natural hazards can be made between geological (e.g. drought, floods, tsunamis, mass movement (landslides, avalanches), earthquakes and volcanic eruptions) and atmospheric hazards (e.g. climate change, storms and heat wave). It is important to understand that atmospheric hazards can trigger geological hazards, and vice versa.

Table 3.2: Top list of natural hazards in Europe, 1990-2010 (www.emdat.be)

	Country	Hazard	Date	Affected people[1)]
1.	Spain	Drought	Sep-1990	6.00
2.	France	Storm	Dec-1999	3.40
3.	Albania	Drought	1989	3.20
4.	Moldova	Flood	Nov-2000	2.60
5.	Ukraine	Flood	Jun-1995	1.70
6.	Russia	Drought	2003	1.00
7.	Lithuania	Storm	Jan-1993	0.78
8.	Russia	Flood	Sep-1994	0.77
9.	France	Storm	Feb-2010	0.50
10.	Albania	Storm	Jan-2005	0.40
	USSR	Earthquake	Apr-1991	0.25
	Italy	Volcano	Dec-1991	0.007
	Italy	Landslide	May-1998	0.004

amount in million people

With this in mind, one may recognize a trend in the development in time of the number of reported disasters caused by natural hazards in the past century (see Figure 3.5). Climate change has clearly led to an increase in the frequency and magnitude of extreme meteorological events. Furthermore, the growing vulnerability to disasters can partly be ascribed to an increasingly intensive land use, industrial development, urban expansion and infrastructure construction (ISDR, Global Trends Report, 2007).

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

To put the extent of a disaster caused by each of these natural hazards in perspective, Table 3.2 shows a top list of the largest disasters in the past 20 years in Europe. This shows that in Europe (just as in the rest of the world, see www.emdat.be), droughts and floods negatively affect the most people.

3.3.1 *INSPIRATION: European FP7 projects*

The European Commission funds many joint research initiatives on natural hazards in FP7. This research considers a robust and comprehensive framework that supports individual hazards and multi-hazards research and the integration of the risk-reduction chain. Climate change and its effects are also specifically addressed in the Europe 2020 Strategy.

The need to address disasters on a European level are manifold. Most obviously, disasters do not respect borders and may have a transnational dimension. And although EU Member States already have policies aimed at disaster prevention, actions on a European level can complement national actions and focus on areas where a common approach is more effective than separate national approaches, see (European Union, 2009). Some examples of relevant FP7 projects:

- **XEROCHORE (**http://www.feem-project.net/xerochore/**):**
- *An exercise to assess research needs and policy choices in areas of Drought;*
- **MICORE (**https://www.micore.eu/**)**: *Morphological impacts and coastal risks induced by extreme storm events;*
- **FLOODPROBE (**http://www.floodprobe.eu/**):** *Technologies for the cost-effective flood protection of the built environment;*
- **SAFELAND (**http://www.safeland-fp7.eu/**)**: *Living with landslide risk in Europe: Assessment, effects of global change, and risk management strategies*.

3.3.2 *Related ISSMGE activities*

ISSMGE has (re)established several TCs that address the challenges that natural hazards bring and show the impact that GE can have in solving their negative effects: TC201 (Geotechnical aspects of dykes and levees, shore protection and land reclamation), TC203 (Earthquake geotechnical engineering and associated problems), TC208 (Slope stability in engineering practice), TC209 (Offshore geotechnics), TC210 (Dams and embankments), TC303 (Coastal and river disaster mitigation and rehabilitation) and TC306 (Dealing with sea level changes and subsidence).

3.4 *RESOURCE EFFICIENCY*

Mankind depends on natural resources for survival. They underpin the functioning of the global economy and our quality of life. This includes raw materials such as fuels minerals and metals but also food, soil, water, air, biomass and ecosystems, see (European Union, 2011). However, the supply of resources is limited and our natural resource base is becoming exhausted. Growing global demand is increasing pressure on the environment, and competition for many resources is increasing. Logically, the need for improving the resource efficiency in Europe is part of the Europe 2020 Strategy.
Fresh water is a well-known example of a fundamental resource, the supply of which is limited. However, the depletion of a limited exhaustible fossil resource like phosphorus is much less known, but at least just as catastrophic. Its depletion threatens the long term nutrition of al humans (and plants and animals) in future, since this element is part of life supporting molecules in organisms.

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

According to (Rijnaarts, 2010), predictions indicate that depletion of easy recoverable phosphorus will be completed within decades to a century, if we continue to flush the quantities to soil and water through our sewers.
Resource efficiency means using the Earth's limited resources in a sustainable manner. Using resources more efficiently will be the key in making progress to deal with climate change. Furthermore, this increases resource security.

3.4.1 *INSPIRATION: Nile Basin*

Recently, I was involved in the set up of a FP7 proposal on water harvesting technologies in Africa. Although in the end the proposal proved not to be successful, it explicitly illustrated the impact that GE can have on society.
Africa's water resources are scattered throughout the continent. In the desert almost no water falls, while the western part of the continent near the equator receives as much as 4,000 millimeters annually. However, the greatest cause of Africa's lack of water perhaps is that the continent cannot effectively utilize its resources. Though approximately 4 trillion cubic meters of water is available every year, only about 4% of that is used (ThinkQuest 1999, A Global Challenge).

Figure 3.6: Revival of Roman catchment systems

Socio-economic development in the Nile Basin countries depend largely on the basin's water resources. In 1999 the Nile riparian countries took a historic step in establishing the Nile Basin Initiative (NBI, www.nilebasin.org). Based on a shared vision, the NBI provides an institutional

multi-national mechanism and a set up of policy guidelines to provide basin-wide cooperation on water resource management. The foreseen project would have been complementary to the NBI. It envisaged the introduction of new low-cost water harvesting technologies (using local experience and materials), and existing technologies proven elsewhere. For example, the revival of Roman interceptor systems for capturing rain runoff and infiltration (see Figure 3.6).

The need for a complementary project arises from the effects of climate change and global changes like population growth, migration, land use, et cetera. These will inevitably increase pressures on the natural resources of the Nile Basin. Its effects will have direct impact on water availability and traditional ways of water harvesting techniques as well as available quantities.

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

3.4.2 *Related ISSMGE activities*

ISSMGE has established TC215 (Environmental Geotechnics) to address part of the challenges that resource efficiently brings and show the impact that GE can have in solving its negative effects.

4 CONCLUSION

In this paper, the future position of GE is discussed through considering the relevance of four significant societal challenges for the GE profession: demographic ageing, urbanization, natural hazards and resource efficiency. It is demonstrated that the field of GE can have significant contributions to all four of these global challenges.

The future position of GE in Europe significantly depends on how the profession deals with the consequences of demographic ageing. Young people should be attracted, to be able to timely transfer the GE knowledge in which empirical laws still have significant influence on daily practice. While the European labour force is likely to decrease, the regional GE profession shall have to compete with other disciplines in attracting young people. Competition is tough.

Therefore, the GE profession (and ISSMGE) should have a proper focus on inspiring students and young professionals, by explaining to them the added value that GE has in many relevant societal challenges that the world has to face, now and in the future. That will require honest communication with regard to the uncertainties in the properties of our profession’s building material: soil. Subsequently, the involvement of young people shall lead to vivid commitment, which secures a bright future for GE.

Nowadays, convincing societies of the significance of a profession’s application asks for more than only producing scientific proof within one’s own discipline. This certainly applies to GE, which has to deal with relatively high degrees of uncertainty. The significance of the field of GE shall increase if interfaces with relevant scientific disciplines (e.g. mathematics, physics, chemistry) are further strengthened, and disciplines like ICT (e.g. knowledge management, serious gaming) and social sciences are further explored.

To conclude, the developments mentioned above highlight the importance of involving young geotechnicians. Recent and future generations have an inherent affinity with modern technologies and have already been trained to work on a multi-disciplinary level. Therefore, young professionals should have a more prominent role in present and future ISSMGE activities.

Future Position of Geotechnical Engineering – From the European Perspective (Continued)

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