OPENING ADDRESS

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Ladies and gentlemen,
In the holy books of all world religions water is described as a source of life, for although water can often be a carrier of diseases and death, there would be no life on earth without it. Groundwater is one of the most important sources of water supply, for human life as well as vegetation and animals. The quality of groundwater is therefore of the utmost importance.

Groundwater is generally considered to be a safer source of drinking water than surface water. But groundwater can be contaminated by bacteria and has often caused epidemics, sometimes with a high death toll. Some thirty years ago, an examination of 1,400 private wells in rural areas in the Netherlands showed that nearly 50% were contaminated by bacteria. It is obvious that protection areas around groundwater pumping stations were originally intended to prevent the contamination of groundwater by bacteria.

Since the industrial revolution in the 19th century, chemical pollution, although not directly identified as such, has become equally serious, and the fact that it could affect the quality of groundwater was not recognized until very recently, as the human senses cannot easily detect groundwater pollution and the means of identifying the chemical substances and detecting relatively low levels of pollution in groundwater were limited.
In addition there was a lack of familiarity with the health risks of most pollutants and their behaviour in the soil.

Until some ten years ago data on groundwater quality were scarcely available except on the 'macro-compounds'. Since macro-compounds may also be naturally present in groundwater, even in very high concentrations, pollution, especially if it were of a diffuse nature, could not easily be identified. Ignorance of local hydrogeological conditions frequently caused a wrong choice of location for monitoring wells, producing over-optimistic and even wrong conclusions. A recent evaluation of data on groundwater quality led to the conclusion that groundwater quality is gradually deteriorating.

Today, soil and groundwater pollution are widely recognized as a major environmental problem. The first indications of the magnitude of the problem of the contamination of groundwaters in the Netherlands, especially by organic micropollutants, were obtained in 1977. That year several cases of trichloroethylene contamination of groundwaters destined for drinking water were discovered by the National Institute for Water Supply. Subsequently a more systematic investigation of groundwaters used for public water supply revealed a limited number of other severe cases of pollution with organohalogen compounds. In one case a pumping station was temporarily closed down. At other pumping stations organohalogens were detected in low concentrations. More recent data indicate a wide distribution of organohalogen compounds in the soil and in the upper strata of groundwater. Organohalogens have been detected in 90% of the water samples examined by the Dutch national groundwater quality monitoring network; in 16% of cases even in concentrations higher than 1 microgramme per liter. Studies commissioned by my ministry also indicated relatively high concentrations of volatile aromatics like benzene, toluene and xylenes in percolate and groundwaters surrounding household waste disposal sites.

Most of you will have heard of one of the worst cases of soil and groundwater pollution in this country. The name of the unfortunate village has become a catchword: Lekkerkerk. The Lekkerkerk affair has drawn a lot of public attention to soil and groundwater pollution in the Netherlands. Chemical wastes had been dumped in ditches, to prepare the land for a building site. The wastes penetrated the shallow groundwaters and in some cases plastic pipes used for drinking water supplies. It also created a foul smell under the floors of a number of houses, and even in the houses themselves. A recent national survey in this country localised more than 4,000 sites where soil and groundwater may already be polluted by hazardous wastes. Many of these sites are situated in the catchment areas of groundwater pumping stations for public water supply and they include disposal sites for household wastes, potentially hazardous wastes, hazardous waste dumps and contaminated industrial and transshipment areas. Accidental spills can also cause problems. The cost of purification of the most severe cases, at some 350 sites, is estimated at half a billion dollars.

One must realize that, owing to their generally very low flow-velocities groundwaters once contaminated will often remain so for many generations. Moreover, it is often difficult to trace and to eliminate contaminated groundwater from local polluting sources. Thus even after a local site has been cleaned up, polluted groundwater from the site can still continue to influence the quality of groundwater at a water supply station for a very long period.
Installing a monitoring network without solid knowledge of local hydrogeological conditions and location of disposal sites cannot guarantee a timely warning system. At the same time, ignorance of the complex behaviour and character of many chemicals

hampers detection and proper removal of the compounds from groundwater. Predicting the long-term effects of pollution also poses problems.

The great abundance of sites with potentially hazardous waste in the Netherlands, demands that priorities be set for purification. It is a matter of great urgency that criteria for these priorities should be worked out and a great deal of time will be needed for research. The development of quick field-survey systems would seem useful in this context.
Government directives are necessary to further protect soil and groundwater against pollution and to clean up existing sites containing hazardous waste or contaminated waters. After legislation has been passed in the Netherlands on the quality of air, surface water and noise the next great step towards environmental control will be legislation on soil and groundwater quality.
National legislation on the handling of solid and hazardous wastes is already in force, and a new 'Soil and Groundwater Protection Bill' has been submitted to Parliament, which, when into forced will give national directives concerning the protection of soil and groundwater against pollution, including purification in severe cases.
This bill comprises the whole subject of soil and groundwater protection. The passing of the bill through Parliament will therefore take some time. The purification of the most severe cases of soil pollution cannot wait that long. The Government shall therefore submit within a few weeks an emergency 'Soil Purification Bill' to Parliament. This bill provides rules and means for the planning and execution of a purification programme at short term. The most severe cases of soil pollution are those threatening public health or the supply of groundwater. It is expected that these can be solved under this purification programme within the next three or four years. The intention is to start the purification of the fifteen most urgent cases this year.

On the international level, the Council of the European Community has recently issued Directives on pollution caused by certain dangerous substances discharged into groundwater, which limit the disposal of many hazardous substances in soil and groundwater.

The efforts and activities of the United Nations, the World Health Organisation, the Organisation for Economic Cooperation and Development (OECD), the European Community and the work of many governmental organisations and international scientific bodies such as the International Association of Hydrogeologists and the International Association of Hydrological Sciences are also worthy of note. With regard to problems of special interest to developing countries I would also mention the activities within the framework of the 'International Decade on Water Supply and Sanitation', otherwise known as the U.N. Water Decade, which started in 1980. The purpose of the decade is

to ensure a proper water supply and sanitary facilities for everyone throughout the world. The Netherlands government has promised to contribute and the involvement of the National Institute for Water Supply in water supply projects in developing countries will therefore increase. The International Reference Centre for Community Water Supply also carries out valuable work in this field.

Obviously much research is still necessary on many aspects of groundwater pollution. There is a far greater need than before for skilled scientists in the field of groundwater pollution, for well-equipped laboratories and field survey services and for people to apply research results. Personal exchanges of information in an international atmosphere are considered essential to success. To ensure that research efforts achieve their objectives, close cooperation and contacts must be promoted between researchers and those who apply the results.
This international symposium should offer an appropriate platform by stimulating the exchange of information and facilitating personal contacts.

Considering the many fundamental questions we are all facing, I am eager to hear the recommendations which will be presented during the closing session of this symposium by Prof. L. Huisman. They may be helpful in the process of improving existing policies or developing new ones. Looking ahead, I sincerely hope this symposium will contribute to an improvement in the quality of groundwater and will lead to a situation in which groundwater can retain its qualification as a source of high-quality drinking water.

I hereby declare this international symposium on the quality of groundwater open and wish you a very successful meeting.