Conclusions and recommendations.

The scientific activities of INSINUME'2008 in Rabat demonstrated diverse interests. New trends are emerging to integrate the ecosystem concept with nuclear metrology. These trends underline the growing needs to face a wide-range of new challenges in the developing countries especially the impacts of environment and climate change. The sustainable management of natural resources in terms of tight collaboration between mining, environment, agriculture and the water sectors is an example where INSINUME can benefit from stronger coupling between the ecosystem concept and nuclear metrology. Both the ecosystem concept and nuclear metrology are mature sciences where research, and not only training, should be strongly supported.

Our understanding of the functioning and metabolism of ecosystems is still limited to temperate regions and there are great gaps in our knowledge on the ecosystems of arid and semi-arid regions. These issues are important for the developing countries where the impacts, e.g. on land-water resources, health and food-production and food-quality, of environment and climate change are expected to be huge. Better understanding of the changes in the environment and climate, and the involved processes, through using the eco-system concept and nuclear metrology along with other tools will allow us to assess the past, current and future impacts of the mentioned threats. The key issue here is to understand natural self-cleaning mechanisms in aquatic and land-water systems. Multi-disciplinary and transnational collaboration is imperative for understanding complex aquatic systems, e.g. river and coastal systems and the associated interactions with other environmental compartments, e.g. the atmosphere, lithosphere and hydrosphere, and the global climate system as well.

Strengthening the technical and human resources, structuring research and building field infra-structures in the developing countries are needed to achieve sustainable policies for using the natural resources. This involves finding proper instruments to couple research with education on the one hand, and research, the market and society needs on the other.

Many African countries have still low population and/or relatively high percentage of young people. Solutions are urgently needed to guide the young African population and prepare them for a better future. There are no better tools other than implementing sustainable science and technology solutions for facing the increasing threats from environment and climate change.

The INSINUME'2008 illustrated the emerging needs for using the ecosystem concept and radio-metrology to understand and assess the impacts of environment and climate change in the Nile Basin, for example. The Nile Basin provides excellent opportunities for coupled environment-climate studies especially what regards the protection of water and land-water resources. It can be used as model for managing complex ecosystems running across different climate zones. Another example is finding sustainable solutions for solving the diverse problems from NORM-industries. This is an area where Morocco can be a leading country in developing clean technologies for using phosphate-minerals without imposing negative impacts on the environment and where mining-industry, agriculture, eco-system and land-water resources can be more sustainable, economic and effective. The idea of developing sustainable, effective and clean technologies around the use of mineral resources has enormous advantages both economically and environmentally e.g. through turning industrial wastes into attractive and clean products.

Quality of Conferences. I am generally satisfied with the general quality of the conference. For example, a relatively high percentage of the participants took part in the last day of the conference. The facilities of the conference were good and allowed the speakers to deliver their talks without difficulties. The schedule of the Conference was strictly followed. The number of undelivered presentations was relatively low although the limited support given by external organisations expercially the IAEA. However, the Organising Committee allowed a number of young people to go over from poster to oral presentations which indeed was very positive and several persons appreciated this action. The acceptance of the Journal of Environmental Radioactivity to publish a high number of paper gives also an indication of the good quality of the conference. I can also say that I have participated in better and in worth conferences, so this Conference is definitly above the average on the international standards. One aspect here is the gender issue as reflected in the low percentage of female participation from the host country Morocco. The number of countries and international talks in this Conference was very high and I must say that this Conference reflects the high potential to conduct similar international conferences in Morocco. I would be willing to participate in organising other conferences within, e.g. Solar Energy; Global and Climate Change issues. However, this might need solid resources from international organisations.

Keynote lectures. The high density of these lectures did not allow using them in full extent, however the high number of these lectures enhanced the diversity of the Conference and high-lighted several central issues and related topics.

Scientific program. The scientific program was well-organised and focused on oral presentations. It was quite intensive and compact and left little time for poster presentations, questions and discussions.
The short time for oral contributions, which is a common feature in many other conferences, makes the educational value of the conference low and leave very little space for your people to participate in discussions and communications. An alternative would have been parallel sessions, limited number of oral presentations and expanded poster sessions. IAEA's talks took much space in the scientific programme and were weakly integrated in the programme.

Social program. The social program was without hesitation EXCELLENT and shows the real charm of Morocco as a growing focal point of cultural importance, however from my point of view it could have included other African features in order to underline its geographical location as well. It is clear that the Local Organising Committee devoted large efforts to please the guests and gain their satisfaction.

Topics. The topics of the conference illustrate the multidisciplinary nature of invloved sciences and the growing needs to reshape and extend the topics to the newly emerging needs especially what regards of use of radionuclides as spatio-temporal tracers within environmental and climate change studies Organisation.

The organisation of the Conference was primarily managed by the Local Committee and external persons could have contributed more in organisation. The idea of integrating the round-table with the closing session was very positive and allowed the conclusions and the recommendations coherent and solid. In the framework of the Conference scientific excursions to environmental sites were lacking, e.g. of relevance to phosphate mining/industry and major rivers in Morocco.

Additional observations. It is quite clear that there are huge needs for specific workshops and task-oriented activities to be carried out in Morocco, e.g. courses on the use radio-nuclides as spatio-temporal tracers and for dating purposes, also coordination and planning of scientific projection of multi-disciplinary and transnational nature.

CONFERENCE SUMMARY

Conference organisers asked me to present concluding remarks at the closing ceremony of this Conference. Let me stress at the beginning that it has been great pleasure for me to participate in this Conference.
A few observations gathered after discussions with conference participants:

- This was probably the biggest INSINUME conference with 110 participants from abroad and 120 participants from Morocco, representing 43 countries + IAEA + IUR.

- The Conference was well supported by the International Union of Radioecology as well as by the International Atomic Energy Commission (3 keynote speakers).

Let me summarise 10 hot topics discussed during the conference which have been of great interest for conference participants:

- A new approach in the protection of the total environment was in front of many subjects, specifically the ecosystem concept, which present a clear shift in radioecological research from the protection of humans only to the protection of the total environment.

- Management of environmental crises, also illustrated on the social and economic impacts of the Chernobyl accident, is of growing interest due to global economical developments having also global environmental aspects.

- *In situ* technologies, developed for both the terrestrial and aquatic environments have been well mastered and widely applied in environmental research, even in such exotic areas as viticulture.

- Emergency response plans, safety standards for radiation protection of the public and the environment, development of national and regional infrastructures and their integration into an European emergency system has been stressed as an important prerequisite for a wider public acceptance of nuclear energy.

- Radionuclide tracing of climate change and other environmental processes, including processes in humans, have been recognised as important topics for future development of radioecological research.

- Environmental impact of uranium mining, as well as of various NORM industries, has been minimalised if effective management has been in force to protect the environment against radionuclide contamination.

- Radionuclide transfer studies in the total environment, including modelling approaches, still require much more work to be done for their better understanding.

- New developments in radiochemical, radiometrics and mass spectrometry techniques, including analysis of microparticles, have opened doors for new research which was not possible before either because of lack of sensitivity or availability of suitable samples.

- Data quality management, development of reference materials and their utilisation in everyday laboratory work has been important pre-requisite for reporting meaningful results.

- Development of national and regional radionuclide databases and their availability via the Internet to the public is important not only for the internationalization of the radio ecological research but also for information of the public.

Recommendations

As this was an academic meeting we were not expected to collect any recommendations to governments or intergovernmental institutions. However, a few observations could be made:

- A shift from *in situ* technologies to general radioecology, including NORMs has been noticed during this Conference. As there are specific conferences on these topics, it would be appropriate to reserve in future more time in oral sector for *in situ* technologies and emergency response.

- Participants acknowledged inclusion of keynote lectures at the beginning of each session. Altogether 20 keynote lectures were presented, and all speakers except one delivered their lectures. The time reserved for the keynote speakers could be longer, at least 30 minutes.

- More time should be devoted to discussions – it is not acceptable if a session with 10 oral presentations was running without any discussion because of a lack of time. We should remember that symposia were invented by Greeks during Platoon era as discussion fora on chosen topics (actually the only difference should be that nowadays our women-colleagues are participating in symposia, what makes them even more interesting). A better balance between orals and posters will allow to devote more time for discussions. Otherwise it would be enough to exchange and discuss papers via email.

- In connection with renaissance of the nuclear energy, colleagues who are coming from universities should maximize their effort to bring more students at all levels (BSc., MSc., PhD.) to nuclear sciences.

- We should force our nuclear energy authorities, as control agencies of nuclear installations in each country, to disseminate information on radionuclide release rates, eg. from nuclear reactors, nuclear reprocessing facilities, etc., as well as on temporal and spatial distribution of radionuclides in the environment via Internet, with necessary accompanying explanation, e.g. on radionuclide levels, radon levels., etc. Such open public information would improve acceptance of nuclear energy by the public.

- The Conference was both scientifically and socially great success. We all thank Dr. El Mrabet and his team for their effort to prepare this Conference.