

**NATO Advanced Study Institute on**  
**Defence from Floods and Floodplain Management**  
**Budapest, Hungary, April 1994**

**Report to NRA by Dr John Gardiner**

**Summary**

The declared purpose of NATO ASIs is 'to promote the dissemination of scientific knowledge, to impart experience and to foster professional contacts.' This Budapest event, held at Vituki Institute, attracted senior figures from UNESCO, Europe, the USA and Japan, and clearly achieved the stated purpose of the ASI, providing most informative and stimulating lectures and discussion periods. The NRA derives many benefits from the event and from the further contacts made as a result of sharing experiences on the course.

The UK delegates were Chris Haggett and David Pellymouter (NRA Yorkshire and Northumbria Region), both from Flood Defence, Dr. Richard Hey (UEA) and myself (lecturer and one of the four organisers). We contributed greatly to the event, and provided three of the six videos shown. This ASI followed a similar event 'Coping with Floods' held in Sicily in 1992, to which I was an invited Lecturer, chairing a half-day session and giving two papers which introduced the theme of Floodplain Management.

There was much interest shown in the NRA's experience, technology, techniques and methodologies, particularly perhaps in flood forecasting and warning, the approach to sustainable development, integrated catchment and floodplain management (including source control in surface water management), and holistic project appraisal.

From the USA, the Assistant Administrator of FEMA, Dr. Frank Thomas and his colleagues from the Bureau of Reclamation, the US Army Corps of Engineers and the University of Massachusetts, showed a high degree of complementarity with the 'innovative edge' of Thames Region's approach to policy and strategy in these areas.

There was a high degree of interest from the audience in methods of obtaining consensus over decision-making. Using an Environmental Assessment framework for project development (as in the Lower Colne/MWEFAS and DWSC Floodplain Management Plan studies) seemed to gain a marked preference over multi-criterion analysis for environmental and social questions.

The 'Euroflood' Project was presented by Professor Correia from Lisbon; this team (Portugal, France, Germany and The Netherlands, co-ordinated by Prof. Penning-Rowse of Middlesex University's Flood Hazard Research Centre) also contributed to NRA's R&D Project 'Review of Best Practice in European Strategic Land Use Planning'. Both 'Floods Across Europe' and the NRA R&D Note will provide landmark documents and show that there is much 'Good/Best Practice' on mainland Europe of which the NRA should be aware.

This was a good opportunity for 'UK Ltd.' to be promoted, and those present made the most of it, without being overt salesmen. A great number of personal contacts were made or renewed, and it was clear that the less developed countries of Europe would welcome the UK at least as much as other developed countries such as The Netherlands (whose 'Public Servants' appear remarkably active from Portugal to Hungary and beyond), and Japan.

## **Recommendations**

Specific recommendations include the following:

1. Continue to seek Best Practice (institutionally, technically, etc) overseas. Recent R&D carried out by the NRA has underlined the value of looking abroad to find examples of Best Practice that it might be useful to import. The 1992 "Floodplain Management in the United States: An Assessment Report" summary gives much food for thought in this context. The Conclusions on p.65 see in the near future "a further broadening of the scope of ..... and tools".
2. Arrange follow-up seminars for further exchange of Best Practice and innovation between European countries such as The Netherlands, Sweden, Germany, Portugal etc. etc. which focus on issues such as:
  - implementation of sustainable development
  - production of catchment and/or floodplain management plans
  - use of GIS
  - source control
  - public perception
3. Investigate the issue and potential benefits of Source Control across all functions of the NRA, possibly as an R&D project following a scoping exercise involving recognised experts from the UK if not abroad.
4. Hungary is well positioned with Eastern Europe and has a solid reputation in the Water Resources (including Flood Defence) field. Vituki has a strong association with Halcrow and WRc, and Hungary has recently forged links with the UK at both personal and organisational levels. These links have value to both countries, and should be maintained and strengthened for the benefit of individuals, the NRA and UK Ltd.
5. Invite Dr. Frank Thomas, a very senior figure in FEMA and an excellent speaker to present the USA's experience in (Integrated) Floodplain Management (Rivers and Coastal), the use of GIS and GPS in automated (hazard) mapping, for Planning, Insurance and Emergency Planning and Management in general.
6. Invite Prof. Penning-Rowse to present the results of 'Euroflood' and hold a seminar on his publication 'Floods across Europe'.
7. Consider the brief given to NRA staff involved in overseas activities in terms of its potential for promoting UK Ltd.

## **Benefits to the NRA**

### **General**

1. Information and technology transfer between countries and individuals.
2. Extends and strengthens contacts between institutions and individuals.
3. Development of technical/professional awareness and monitoring in individuals.
4. Improved international relations at individual and organisation levels.
5. Cultural education for individuals.

## **Specific**

6. The NRA has learnt that European countries and the USA have developed strategies, policies and best practice which promote the water environment and flood defence interests in particular, such as the concepts of 'wise use' and 'best mix', powers over floodplain development and the use of source control techniques.
7. The NRA has had the opportunity to disseminate some of its own best practice and obtain feedback. For example, Hungary has few catchments but many areas which can be regarded as the equivalent of catchments, having recognisable 'boundaries', while CMPs hold good for co-operating countries within the catchment. CMPs also provide an approach which is valid for other defined areas of catchments.
8. The NRA's reputation has been enhanced with a multi-national audience of over 80 delegates chosen for their ability to absorb information and relay it for the benefit of their organisations and countries. Of the organisations represented, the NRA undoubtedly presented the highest and best profile at this ASI.

and from Chris Haggett.....

9. Conferences of this type allow NRA staff to gain an insight to the work and thinking of their NRA colleagues!! There is no forum for information transfer and debate within the Authority.
10. Increased awareness of the different approaches adopted by various nations to tackle common river catchment issues.
11. The importance of the multi-disciplinary approach to flood defence and floodplain management - gaining an insight into the varying points of view of professionals from different backgrounds.

## **Participants**

A final list of participants (over 80 in number) is attached.

## **Programme**

The final programme is attached; there were a series of demonstration sessions included (flood forecasting, expert system for flood management, GIS, chemistry labs. etc.).

## **Venue and Accommodation**

Vituki Institute provided good presentation facilities in their excellent auditorium, and a filling lunch. The Hotel Platanus, while not in its first youth, provided satisfactory facilities and transport arrangements worked well.

## **Social Arrangements**

There was not a great deal of 'free time' outside the programme, but most participants managed to attend cultural events and other aspects of Budapest night life. I attended all

programme sessions and had one evening 'out' in addition to the Study Trip, 1½ days with Dr. Néméth Miklós of the NWA and 1 day with Mr. Tóth Sandór from the Ministry (accounting for the other Saturday and 1½ Sundays).

### Contents of ASI - Part 1 Flood Defence

The opening sessions covered the basic subject area, with the particular issues of flood embankments (piping and overtopping), of which the Hungarians have particular expertise (with 4,220kms of embankments) and flood forecasting/warning. It was clear immediately that the size and other characteristics of the catchment demanded significant differences in approach - from data collection to methods of modelling and warning procedures. There was great interest in Chris Haggett's contribution (made from the floor).

The presentation from Toth, Ubell and Nagase underlined the importance of flood defence preparedness, monitoring and maintenance, especially where levees are involved. There is a wide debate in Hungary on environmental sensitivity in flood defence, including the issue of 'managed retreat' which would have the effect of removing summer dikes in some areas. The Netherlands have a team, headed by a senior technical manager (at my level, apparently), who pays very occasional visits to discuss issues with regional Managers/NWA/Ministry personnel, which is involved with floodplain restoration and water quality. Any UK personnel helping the evolution of 'catchment planning' (or the Hungarian equivalent) would need to collaborate with this team and to understand the political background and profile of river management in Hungary; this issue is not to be taken lightly.

Prof. Ganoulis gave a vivid description of urban flooding from saturated Karst hills; storage, even in the urban area, and safe routing seemed the best option. The introduction of sustainable development and how it might sponsor an holistic approach received a warm welcome, tinged with doubt for the more senior members present over the degree of subjectivity apparently involved (inherent?). However, the full range of the Conference had been exposed by the end of the second day and the discussion sessions were lively.

Rossi and Reitano gave the first of the papers focused on the use of expert systems and multi-criteria analysis. This is still favoured in some countries but is elsewhere being replaced either by the inclusion of 'fuzzy set theory' (to make it appear less threateningly number-based for multi-functional teams/public) or by (S)EA techniques applied to project development. The theme was developed by Prof. Miloradov and also by Prof. Nachtnebel (in the last 'expert lecture').

Monitoring, of physical structures during floods was comprehensively covered by Starosolszki, whose second paper dealt with the particular problem of ice control. Prof. Yevjevich, whose eminence in this field is underlined by scores of structural designs throughout the world, gave a comprehensive account of the technical approach to floodplain management, focused on the benefits and costs of flooding (excluding the other environmental, social and economic characteristics of these special areas). He was followed by Prof. Bruk of UNESCO, who demonstrated how far the influence of geomorphology and ecology has reached into the river 'engineering' tradition.

Rossi and Reitano returned to give a detailed account of an approach to flood insurance based on flood contours and measured flood risk. There was concern over the socio-economic aspects implied in making such information public. Andras Szosi-Nagy closed the first week with a review of hydrological analysis for breaching embankments.

Miklós Néméth, learning about the Hungarian politics (the national election took place the next Sunday) and the technical, environmental, social and political issues in river management. We visited Lake Balaton and watched the huge eel-traps being emptied at the outfall.

The second week continued the various themes, with the introduction of input from the USA on the evolution of national policies on coastal hazards (Rutherford Platt), Floodplain Management (Frank Thomas) and the Mississippi/Missouri floods of 1993. The social and legal issues were brought into focus in these excellent presentations; Frank Thomas especially exhibiting his immense knowledge and deep understanding. The videos, including Chris Haggett's on flood monitoring, forecasting and warning in London, were well received by a reduced audience of about 30.

The contributions from Portugal on floodplain management reflected their contact with our UK experience through Middlesex University and personal communications over some years. The second paper showed some of the results of the first phase of Euroflood, with which the NRA has been associated through the R&D Project on Best Practice in Land Use Planning, Flood Defence and the Environment. The Euroflood results will be of interest to the NRA, and feature in my Recommendations accordingly.

Dutch and Austrian approaches to floodplain management were presented, again from functional viewpoints and with the use of multi-criteria analysis (Austria). Herr Nachtabel admitted (privately) that more recent developments had introduced fuzzy set theory to improve the flexibility of the approach, and (publicly) that it was not appropriate for public participation. My suggestion that an independent figure, possibly a foreigner, could help to resolve his particular 'zugzwang' was welcomed as an innovation of clear merit; several others commented on the potential value of this option, and I was able to confirm my positive experience in this area.

During the Banquet I sat with Prof. Erik Plate of the University of Karlsruhe, Jan Leentvaar of The Netherlands and the new Hungarian assistant Secretary of State for Water, Dr. Hójjós. Jan, like myself, is part of one of the teams competing for the pilot Hortobagy-Berettyo Catchment Plan.

#### **Delegates' presentations.**

Of particular interest to the NRA may be Harry Dotson's 'Risk-Based Analysis of Flood Reduction Measures', which focused on calculation of freeboard through risk analysis. I shall be writing to him on this in due course in order to make further recommendations.

#### **Review of the ASI as a Course**

Although the length of the ASI allowed subjects to be thoroughly discussed, there were a few issues, such as:

1. Some delegates and lecturers were concerned at the time spent away from the office, although it was generally acknowledged that this was more than compensated by the opportunity for involvement in the cultural and social aspects of the host country, and secondly to get to know several individuals from many different countries (and about their technical, political etc. interests).

of the host country, and secondly to get to know several individuals from many different countries (and about their technical, political etc. interests).

2. Not all lecturers were able to stay for the whole period, which caused minor problems of continuity and some frustration over disruption of the group's social and technical development. The short speech of appreciation given by a Dutch delegate at the end of the ASI made a point of giving special thanks to those lecturers who had stayed throughout (about 75%) to answer student enquiries.
3. The programme, though long, was also very full and more free time could have been given - several students missed the video afternoon because it was the only practicable time to 'shop' in Budapest. However, the half-hour discussion periods should be retained, together with the demonstrations, video sessions and the opportunity for students to make presentations. The main lecturers' programme could have been tightened in terms of numbers, to provide a free afternoon.

### Conclusions

Assuming that the NATO ASIs in Sicily and Budapest are typical, it is clear that this form of information exchange is effective, efficient, and gives the NRA good value for money both corporately and to individual staff. For lecturers, it can be a surprisingly busy but rewarding event; new ideas attract many questions and spark conversations outside the lecture room more than inside.

It is quite disturbing to hear how far the UK appears to be slipping behind many other countries in the field of 'Source Control', ie surface water management at or near the point of rainfall. This strong impression was reinforced at the subsequent Standing Conference on Source Control at Coventry, 6-7 June, attended by a number of NRA staff including Lindsay Pickles. The NRA should have a clear view of this issue, which promises to benefit all functions of the NRA but has no current NRA Sponsor, possibly because of its cross-functional nature.

It was interesting to note the activities of the Dutch, who appear to be actively using staff associated with government organisations to pioneer contacts and contracts in Hungary; though I may on occasion to have appeared to be competing on behalf of UK Ltd., it would have been solely as a natural reaction. I feel it would do no harm if NRA staff were given the opportunity if not some material support to promote the interest of the UK in a positive way.



**Scientific and *Social* Programme of  
NATO Advanced Study Institute  
on  
Defence from Floods and Floodplain Management**

Budapest, Hungary April 26 - May 6, 1994

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**Monday, 25 April 1994, Arrival of lecturers and participants**

16:00-19:00 Registration in Hotel Platanus

**Tuesday, 26 April**

8:00 Transfer by coach (Platanus - VITUKI)

8:30 Registration in VITUKI

9:30 Opening Ceremony

10:00 Break

**PART I Flood Defence**

10:30 **A.SZÖLLŐSI-NAGY**  
Forecast Applications for Defenses from Floods

11:15 Discussion

11:45 Coffee Break

12:00 **S.BRUK**  
River Training and Defense from Floods

12:45 Discussions

13:15 Lunch

14:00 **Károly UBELL**  
Planning Protective Measures against Seepage through Levees and Dikes

14:45 Discussion

15:15 Coffee Break

15:45 **Vujica YEVJEVICH**  
Operation of Water Resources Systems for Efficient Defense from Floods

16:30 Discussion

17:00 Transfer by coach (VITUKI - Platanus)

19:00 *Icebreaker in Hotel Platanus*

Chair  
Yejevich

Chair  
JLg

**Wednesday, 27 April**

- 9:00**            **Transfer by coach (Platanus - VITUKI)**
- 9:30**            **Sándor TÓTH**  
Organization and Preparations for Flood Defence Activities in Hungary
- 10:15**           **Discussion**
- 10:45**           **Coffee Break**
- 11:15**           **Károly UBELL**  
Protecting Levees against Pipings and Overtopping
- 12:00**           **Discussion**
- 12:30**           **Michio NAGASE**  
The Concept of Seepage Failure and Causative Conditions
- 13:15**           **Lunch**
- 14:00**           **Jacques GANOULIS**  
Defense from Floods in Karst Areas, on the examples of Greece
- 14:45**           **Discussion**
- 15:15**           **Coffee Break**
- 15:45**           **John GARDINER**  
Developing Flood Defence as a Sustainable Hazard Alleviation Measure
- 16:30**           **Discussion**
- 17:00**           **Transfer by coach (VITUKI - Platanus)**

**Thursday, 28 April**

- 9:00**            **Transfer by coach (Platanus - VITUKI)**
- 9:30**            **G. ROSSI and B. REITANO**  
Modeling Tools for Flood Plain Management
- 10:15**           **Discussion**
- 10:45**           **Coffee Break**
- 11:15**           **Ödön STAROSOLSZKY**  
Flood Monitoring
- 12:00**           **Discussion**



- 12:30**      **K.MAMIYA**  
Full Scale Experimental Study of Rain and River Water into Dike and Effect of Drain
- 13:15**      **Lunch**
- 14:00**      **Milorad MILORADOV**  
Application of Expert Systems (ES) in Defence from Floods and in Floodplain Management
- 14:45**      **Discussion**
- 15:15**      **Coffee Break**
- 15:45**      **Ödön STAROSOLSZKY**  
Ice and Flood
- 16:30**      **Discussion**
- 17:00**      **Transfer by coach (VITUKI - Platanus)**

## **PART II Floodplain Management**

- Friday, 29 April,**
- 9:00**      **Transfer by coach (Platanus - VITUKI)**
- 9:30**      **Vujica YEVJEVICH**  
Operation of Flood Affecting Structures and for Optimal Floodplain Management
- 10:15**      **Discussion**
- 10:45**      **Coffee Break**
- 11:15**      **S. BRUK**  
River Channel Adjustment to Floodplain Management
- 12:00**      **Discussions**
- 12:30**      **Tamás ZABÓ**  
Exploration and Stability Calculation Method for Subsoil Failure of Flood Levees (Contribution)
- 13:00**      **Lunch**
- 14:00**      **G.ROSSI and B. REITANO**  
Economic Evaluation of Flood insurance Programs
- 14:45**      **Discussion**
- 15:15**      **Coffee Break**

**15:45**      **A.SZÖLLŐSI-NAGY**  
Operation of Flood Release Basins

**16:30**      **Discussion**

**17:00**      **Transfer by coach (VITUKI - Platanus)**

**Saturday 30 April**                      **Study trip to River Tisza**

Departure: 8:00 Hotel Platanus

Arrival: 18:00

**Sunday, 1 May**      **Free**

**Monday, 2 May**

**9:00**      **Transfer by coach (Platanus - VITUKI)**

**9:30**      **Sándor TÓTH**  
Flood Risk Mapping with Special Regards to the Vulnerability of the Separate  
Floodplain Basins

**10:15**      **Discussion**

**10:30**      **Coffee Break**

**11:00**      **Jacques GANOULIS**  
Use of Karst Water Resources Systems for Floodplain Defense and Management

**11:45**      **Discussion**

**12:00**      **Rutherford H. PLATT**  
The Evolution of U.S. National Policies on Coastal Hazards

**12:45**      **Discussion**

**13:15**      **Lunch**

**14:00**      **John GARDINER**  
The Role of Floodplain Management Planning in Changing Flood Impacts

**14:45**      **Discussion**

**15:15**      **Coffee Break**

**15:45**      **Frank THOMAS**  
Basic Principles of Floodplain Management

- 16:30 Discussion  
17:00 Transfer by coach (VITUKI - Platanus)

**Tuesday, 3 May**

- 9:00 Transfer by coach (Platanus - VITUKI)  
9:20 Introduction by video: The Mississippi Flood of 1993  
9:40 Rutherford H. PLATT  
The Mississippi River Basin: Crucible of National Flood Policies  
10:15 Harry W. DOTSON  
Missouri River Reservoir System Impact on the Great Flood of 1993  
10:45 Discussion  
11:15 Coffee Break  
11:45 Milorad MILORADOV and Z. ČUKIĆ  
Planning and Management of Floodplain Rehabilitation - Using GIS Technology Tools  
12:30 Discussions  
13:00 Lunch  
14:00 Video Session  
Recent Flash Flood Events in France  
15:30 Coffee Break  
15:45 Quantity and Quality Control through the Use of Dynamic Separation  
Discussion  
17:00 Transfer by coach (VITUKI - Platanus)

**Wednesday, 4 May**

- 9:00 Transfer by coach (Platanus - VITUKI)  
9:30 Francisco CORREIA and Joao ROCHA  
Floodplain Management on Intermediate size Catchments  
10:15 Discussion  
10:30 Coffee Break  
11:00 Frank THOMAS  
United States Experience with Floodplain Management

- 11:45 Discussion
- 12:15 VITUKI Demo Session upon request  
(see enrollment list at registration desk)
- 13:00 Lunch

### PART III Ecology, Quality, Social Aspects

- Chair  
-JLc
- 14:00 Francisco CORREIA  
Public Perception of Flood Risk and Flood Defense Policies
- 14:45 Discussion
- 15:15 VITUKI Demo Session upon request  
(see enrollment list at registration desk)
- 17:00 Transfer by coach (VITUKI - Platanus)

#### Thursday, 5 May

- 9:00 Transfer by coach (Platanus - VITUKI)
- 9:30 Jan LEENTVAAR  
Water Quality and Floodplain Management
- 10:15 Discussion
- 10:30 Coffee Break
- 11:00 H.P.NACHTNEBEL  
Ecology in Floodplain Management
- 11:45 Discussion
- 12:15 VITUKI Demo Session upon request  
(see enrollment list at registration desk)
- 13:00 Lunch
- 14:00 Jan LEENTVAAR  
Floodplain Management in Low-Land Areas, including Ecology, Recreation and  
Protection of Environment
- 14:45 Discussion
- 15:15 Coffee Break
- 15:45 H.P.NACHTNEBEL  
Environmentally and Socially Sound Floodplain Management

- 16:30 Discussion
- 17:00 Transfer by coach (VITUKI - Platanus)
- 18:40 Transfer by coach (Platanus - Hotel Gellért)
- 19:00 *Banquet in Hotel Gellért Söröző*

**Friday, 6 May, Morning - Short presentations by participants**

- 9:00 Transfer by coach (Platanus - VITUKI)
- 9:30 **László GODA**  
Dimensioning of Dam-Reservoirs for Flood Protection Purposes
- Mircea SELARESCU and Madalin MIHAILOVICI**  
Aspects regarding designing and dimensioning of the top lateral storages used for the flood waves mitigation
- Harry W. DOTSON**  
Case Study: Risk-Based Analysis of Flood Reduction Measures
- 10:15 Discussion
- 10:45 Coffee Break
- 11:00 **Richard HEY**  
Flood Defence: Engineering and the Environment
- Hide Motonaga**  
Flood Control Methodology in Urbanized Areas
- László Iritz**  
Effects of Forest Drainage on Extreme Floods
- Antal J. GÁLAI**  
Hydrological Modelling of Flood Control Reservoirs
- 12:00 Discussion
- 12:15 VITUKI Demo Session upon request  
(see enrollment list at registration desk)
- 13:00 Lunch
- 14:00 Closing Ceremony
- 15:00 Transfer by coach (VITUKI - Platanus)

**Saturday, 7 May 1994 Departures**