

## **Environmental education**

PP Marini

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### INTRODUCTION

“Man meets Nature” project, sponsored as a W.G. by the European Club, was developed thanks to the cooperation between Cooperativa Atlantide, Romagna Acque S.p.A., Alpina Acque S.r.l., ITCOLD and the European Club.

The project was born from the experience acquired by Cooperativa Atlantide and Romagna Acque through the management of programs of environmental education for students of Italian schools and the technical expertise of Alpina Acque.

The program, performed at the Ridracoli dam, turned its attention to the problems of environmental compatibility of a civil engineering large work in a territory of an high naturalistic value.

The European Club project has as a main aim to address the attention to environmental and technological themes, putting in perspective environmental, technical and economic aspects with a language and a deepening interesting to university students from all Europe.

### THE SECOND YEAR PROJECT (2003)

Following the good results of the first course, the project has been proposed again for the year 2003.

The performance, as for the first course, enjoyed the effective cooperation of the different partners.

Specifically we would like to mention the technical and logistic support by Romagna Acque and Alpina Acque, and the cooperation of their experts, mainly Mr. P.P. Marini, and the promotion of the project by the Italian Committee with the European Club and Italian Universities.

The second year project presents some innovation with regard to the first:

- the participation of Italian students besides foreigners ones;
- in the program has been included a space for cultural exchange between the participants to illustrate and discuss the didactical programs in their different countries.

#### Participants:

from Norway:

1 Trine Indergård

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2 Sigrun Birkeland

from Italy:

3 Claudia Patrizia Ferrai

4 Isabella Botta

5 Sauro Manenti

from United Kingdom:

6 Richard Simmons

from Portugal :

7 João Fernandes

The Spanish participant, José Serrano, due to personal problems, cancelled his participation some days before his arrival.

### THE PROGRAMME

The programme was carried out in six days analysing different aspects: legal, technical, geologic, biologic, hydraulic and environmental in a general overview. It was accompanied by the visit of the adjacent territory, stressing the historic and cultural aspects of the coastal and artistic towns, focal point to understand the cultural and social importance and the interaction of the large works. Activities were performed from July the 20<sup>th</sup> to the 26<sup>th</sup>, 2003.

#### Sunday the 20<sup>th</sup>

Arrival and accommodation

#### Monday the 21<sup>st</sup>

Morning:

Didactic Centre of Capaccio

1. Program illustration

2. Introduction to the Romagna Water Supply System and the Ridracoli Dam  
Ridracoli reservoir

3. Electric boat excursion

Themes:

- Comments on chemical and physical characteristics of reservoirs.
- Taking of water samples for analysis.
- Comparative analysis of chemical and physical parameters in the last years.

Teacher: Eng. Farina (Romagna Acque)

Afternoon:

Bologna University, environmental sciences Faculty, Ravenna Center.

#### 4. Introduction to the Study of Environmental Impact and the European Normative.

Themes:

Environmental Impact analysis: principles and methods. EU norm 85/337 dated June 27<sup>th</sup>, 1985, and its acceptance by the European nations. Contexts of application with peculiar attention to the analysis performed on the Ridracoli reservoir.

Teacher: Prof. Bruzzi (Bologna University)

Tuesday the 22<sup>nd</sup>

Morning:

Ridracoli dam watershed

#### 5. Geology and geological safety

Themes:

- Introduction to the main rock typologies (sedimentary, metamorphic, etc.) and their transformation. Practical activity of rocks identification with comments on sedimentary ones.
- Problems of Ridracoli dam and reservoir; comments on geological safety of the dam ancillary structures; slope failures in the bordering area; analysis of a landslide and its stabilization design.

Teacher: Eng. Gianfranco Marchi (Bologna University)

Afternoon:

#### 6. Presentation of experiences in different countries

Themes:

- Short reports by the students on environmental and design problems for large hydraulic works in their countries, with comment by the Italian students.

Wednesday the 23<sup>rd</sup>

Morning:

Didactic Centre of Capaccio and visit to the Ridracoli dam crown.

#### 7. Environmental problems of regulated watercourses.

Themes:

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- General main features of watercourse, with particular reference to the Ridracoli reservoir watershed and to river Bidente. The concept of *river continuum*. Monitoring methods of watercourses.

Teacher: Prof. Paolo Salmoiraghi (Bologna University).

Afternoon:

Bacine brook (Ridracoli watershed)

8. Practical monitoring activity on Bacine brook

Themes:

- Practical EBI (Extended Biological Index) analysis of a regulated watercourse.

Teacher: Prof. Paolo Salmoiraghi (Bologna University).

Thursday the 24<sup>th</sup>

Morning:

Bologna University – Engineering Department

9. Visit to the laboratories of the engineering department.

Themes:

- Visit to the laboratories with practical demonstration: Science and material testing lab; Structural tests lab; geotechnical lab.

Teacher: Eng. Gianfranco Maltoni (Bologna University)

Afternoon:

Argenta (near Ferrara)

10. Visit to the reclamation Museum and Saiarino pumping station.

Themes:

- Characteristics of Romagna territory and water resources management.
- Visit to the Saiarino Museum; elements of the Museum are strictly integrated with the Saiarino pumping station, heart of the drainage system between Reno and Sillaro rivers, drainage system which comprises different networks of canals for high and low waters, various pumping stations, flood regulating reservoirs and many underpasses.

Teacher: an authorised guide for the works visit.

Friday the 25<sup>th</sup>

Morning

Casentinesi forests National Park

11. Ridracoli reservoir watershed. Journey inside the Park

Themes:

- The journey, which unwinds inside the Ridracoli reservoir watershed, from Passo della Calla to Poggio Scali, goes through the mixed woods of the Tuscan and Romagna Appennines, showing with the variation of the vegetational facies the interactive cohabitation between the man and the environment.
- The end of the journey, Poggio Scali, offers an excellent panoramic view of both slopes, the Tuscan and the Romagna offering positively the possibility to observe geological, hydrological and orographic characteristics proper of the territory.

Teacher: Official Guide from the Casentinesi Forests national Park.

Afternoon:

Capaccio didactical centre

12. Round table: comparison between the experiences in different countries.

Themes:

- Discussion on the different national experiences, following the presentation of the 22<sup>nd</sup> of July.

Participant: the students

Saturday the 26<sup>th</sup>

Leaving to Florence and hotel accommodation

Morning free

Afternoon:

13. Guided visit to the town.

Themes:

- The discovering of architectural magnificency from Ponte Vecchio to the old Oltrarno district, crossing Ponte alla Carraia and walking along Arno up to Ponte delle Grazie.

Teacher: Official Guide from Florence Town

Sunday the 27<sup>th</sup>

Transfer to the airport or railway station for final departure

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There follow the reports sent by two of the participants:

### 1. The ITCOLD Course on the Ridracoli Dam and its Environmental Aspects by Richard Simmons, Southampton University, UK

*Richard Simmons is a third year undergraduate student at Southampton University, studying for a Masters degree in Environmental Engineering. This year, BDS sponsored Richard by paying the fees for him to attend an environmental course on dams, run by ITCOLD, at the University of Bologna. Richard reports here on the course which used the Ridracoli Dam and its river basin as a case study for a series of lectures, laboratory experiments, and site visits.*

#### Introduction:

The Ridracoli Dam is located in Northern Italy, with Florence to the West and San Marino to the East. During the summer, I had the trip of a life time, flying out to Italy to learn about the workings the water supply system for Romagna region (North East region of Italy).

#### The Ridracoli Dam:

The Ridracoli Dam, serving the Romagna Water Supply System, lies on the River Bidente, in the upper reaches of the Tuscany-Romagna Apennines, in a wooded mountain setting of ravishing beauty. This impressive example of Italian engineering was completed in 1982, after 12 years of work, and a further 15 years of preliminary studies, designs and the formation of the leading player in the project - Consorzio Acque \ Romagna Acqua.

The arch-gravity dam stands 103.5m in height and measures 432m in length. The lake it has formed extends over an area of 1,035km<sup>2</sup>, while the reservoir has a capacity of 33 million m<sup>3</sup> of extremely pure, high quality water whose water characteristics are superior to the parameters laid down in EU standards. The Ridracoli Lake is in fact situated inside a National Park, in an area of outstanding natural beauty devoid of human settlements and production facilities.

A 10.5km long drainage channel supplies the lake with the water flowing into the Rio Bacine, Bidente di Campigna, Bidente di Celle and Fiumicello. A 7km power tunnel then takes the water from Ridracoli to the Hydroelectric power plant, the purification plant and the distribution network.

Situated a few kilometres downstream of the reservoir at Capaccio, where my accommodation was based, is the nerve centre controlling the dam and the water supply system. The control system is monitored 24 hours a day; its sophisticated recording and analysis equipment ensuring that the structure is absolutely safe at all times.

The complex at Capaccio includes the ENEL hydroelectric power plant, the water purification plant and the operations centre, the heart of the entire system. Conceived as a multipurpose structure, the operations centre houses the technical management of the dam and water supply system facilities, as well as a conference room, a teaching-briefing centre for schools and universities, and a fully furnished guest quarters.

#### The Hydroelectric Plant:

The water from Ridracoli flows through the power tunnel to the ENEL hydroelectric power plant, which exploiting the difference in height and head, transforms the motive force of the water into clean energy. The power plant therefore can generate at least 35 million Kwh per year.

#### The Purification Plant:

Downstream of the ENEL power plant is the water purification plant which treats up to 250,000m<sup>3</sup> of water a day! The process is performed in various stages:

1. arrival of the raw water and flow regulation,
2. pre-chlorination,
3. clarifoculation,
4. filtration,
5. dis-infection with chlorine dioxide,
6. final storage.

The characteristics of the treated water fully comply with the strictest standards regarding the quality of water for human consumption. The chemical laboratory performs the necessary process controls and analyses samples of water taken systematically from the purification plant and the municipality delivery points.

#### Remote Operation and Control:

The Romagna Water Supply System Operations Centre also houses the remote operation and control facility, a modern system for the real-time monitoring of the dam, the purification plant and the entire distribution network. A sophisticated complex of optic fibre cables and computers ensures that the

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monitoring centre receives data around the clock on the water collection, treatment and distribution processes, from every point in the various structures. Specifically, the basic quality parameters of the water are closely controlled right up to delivery to the municipal tanks.

### Activities whilst in Italy:

The most impressive activities were when we had guided tours around, on and inside the Ridracoli dam. The photos that accompany this article really don't do the dam justice. The sight of the massive dam in-between two huge hills, with the vast lake in the background is something I will never forget. It was amazing. Walking on the dam and along the surrounding hills was great, it gave a true reflection of the success of the introduction of the dam into the natural landscape, and the environmental benefits created. When inside the dam, reality really hit home how huge the dam really was. It was 37m thick! There were many levels inside the dam where instruments were monitoring any movement of the dam, and were accessible through a maze of tunnels. Then a boat trip on the lake showed the upstream environment and the views of the dam from behind. You really had to be there to witness the tremendous feat of engineering on such a large scale.

To complement the trips to the Ridracoli dam, there were also many lectures and visits to other sites that helped to explain the bigger picture behind the success of the water supply system. Some lectures were held at the Capaccio lecture theatres, and the other lectures were taught at the University of Bologna.

The first lecture discussed environmental impacts from dams and to the globe in general. We looked into many areas of human intervention to the environment and major factors why this occurs. We covered areas such as 'poor environment = poor health', the 'Greenhouse Effect' and 'Photochemical SMOG' to name but a few. All topics were discussed within the group, where possible changes and solutions were suggested from everyone. It was interesting to hear from the different students (of which there were four nationalities; British, Italian, Portuguese and Norwegian), as their experiences and ideas differed slightly from person to person. However, a common opinion was shared throughout the group that certain areas of the environment were in a bleak state!

The second lecture was focused on geological aspects and geological safety. The Professor touched on topics such as 'Landslide types', 'Rock classification' and 'Rock fall analysis'. This was backed up by a visit to the dam's surrounding environment where examples of rock types were shown to the group, and

bedding planes of the hills were analysed, and the reasons behind angles of dip were discussed.

The third and final lecture was split into two main parts, both focusing on 'Environmental problems of water Eco-systems'. The morning consisted of lectures on topics like 'Methods of summarising Eco-systems', 'Minimum Vital Discharge (MVD) from a dam to support the downstream Eco-systems' and 'Dam impacts on Eco-systems'. In the afternoon, we had a practical session downstream of the dam, sampling the water and investigating what insects were present. The range of insects, present in the water samples, were identified from charts, and from this, information about the conditions of the river could be deduced.

My final thoughts on the trip:

I feel that the trip to Italy was a real benefit for me in many ways. I gained first hand experience of the workings of not only a dam, but the whole water system process, which included so many elements that I was personally not aware of. I have taken a fantastic opportunity to experience the working atmosphere and style of a foreign country, and also interact with students from a variety of backgrounds, with their individual methods of thinking and from different ways of life to myself. I would like to thank the BDS for their sponsorship for the trip, and to encourage them to keep on providing this wonderful experience to students for years to come.

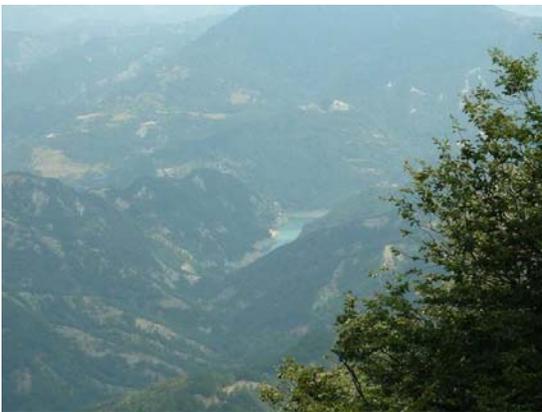
PHOTOGRAPHS



Dam basin, dam, lake and hills



Dam showing curvature from boat



Lake and dam situated in National Park



Settlement & treatment tanks & control centre



Angle of dip of surrounding land



‘Geological safety’ barriers to catch falling debris

## 2. Second report by Richard Simmons

### ICOLD European Club Project 2003 - MEN MEETS NATURE - Italy 2003

#### Introduction:

I was sponsored by the British society ‘British Dam Society’ to attend a course in Italy where I would be able to witness a dam first hand. This included series of trips to the dams, with tours inside and outside the dam. Then there were a programme of lectures arranged where environmental aspects and issues were discussed. Also trips to Bologna University were arranged and where tours around the laboratories were made. There were also trips to pumping stations and other local attractions, such as the National Park overlooking the dam. To round off the week, a weekend was spent in Florence seeing the ‘bella’ sights of Italy.

#### Own Impressions, organization, transport, stay:

I had a fantastic weekend, so my own impression of the week would be a very well run, very well organised event. There was always adequate transport provided, the hotel was really nice and the food was excellent (bounno?). The lectures were structured, however I think maybe a bit general in material covered. However I think this is because I had been taught most of the topics already covered, so maybe a quick questionnaire to all the students before we arrive might be an idea to gauge the level of the students, therefore the lectures can be designed for them in mind.

#### Focal point of the course:

For me, it was the dam visit and the tour inside the dam. I thought this was excellent and really breathe taking. I had never seen a dam before in my life

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(only on TV etc.) and so to see such a huge dam, and to tour inside it and around it was for me just amazing. I felt seeing the dam made me visualise the rest of the week in context with the dam. It was really good and a priceless experience.

Final report / conclusions:

I have many great memories from a fantastic week. I feel I have learnt many things from my week studying the dam and its environmental issues related to dams. It was a very well coordinated week, with a nice workload to work throughout the week. It was also great to mix with people from different countries and learn about their countries and methods of work. I feel this was an invaluable experience to me as a person as long as being good from an academic value.

3. Report by Isabella Botta:

The motivation for which I wanted to participate at the ICOLD European project "When men meet nature", was because I'm very interested on the topic of dam. I think that this occasion gave me the opportunity to improve my knowledge about impacts and benefits due to the construction of a reservoir. I believe that the organisation was good, because all the teachers were very gentle and helped us to understand all the problems concerning dams and their environmental problems.

The mean of transport was good, despite of the conditioned air. Then Elena has been very gentle and available for every our wish. The Capaccio hostel was very comfortable and the staying in Firenze was wonderful for every point of view.

The focal point of the course was to understand all problems concerning dams: slope stability, environmental impacts, biological life in the river downstream the dam, the nature. I think that was good to see concretely dams and water problems of Ridracoli dam. The more exiting moment was when we enter in the dam , even the temperature was very cold.

I think that it has been a good experience for me because I had the opportunity to meet foreing students and for undertand their point of view. Then I could improve my English.

It has been a wonderful and useful week.  
Thank you so much.  
Isabella Botta

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## CONCLUSIONS

On balance the result of the initiative has been for sure positive, mainly from the cultural point of view.

The participants demonstrated interest and enthusiasm in following the proposed activities, particularly appreciating the practical activities and the work visits performed utilizing their active participation.

The themes discussed were, for the students, reason for appropriate analysis and deepening to integrate the university course followed.

Moreover has been appreciated the alternation between theoretical lessons and practical activities on the field.

Also significantly interesting has been the comparison and discussion between the participants on the experiences in different countries, which consented to stress not only the cultural homogeneity aspects but also the existing differences in various realities.

Participants requested also the possibility to insert, during the stay, more amusement moments like short periods on the seaside.

In our opinion the course success is due also to the various opportunities offered by the locality.

The easy access and visit to the Ridracoli dam, included in an area of high naturalistic and scenic quality, joined by the availability and cooperation of Romagna Acque experts and managers, allowed the realisation of a course where the experiences on the field were one of the most valid.

## PERSPECTIVES FOR A FUTURE DEVELOPMENT

After the first two experimental years, we think there are the possibility and the requisites for a greater qualification of the course.

To reach this aim should be necessary to develop the following points:

- lengthen the course to two weeks
- increase the cooperation with the Bologna University (namely with the department of Environmental Sciences) which could allow to reward the participants with formative credits accepted by all European universities
- increase the cooperation of the European Club in order to facilitate participation
- find economic resources (contributions, sponsors etc.) to lessen the costs for the participants

To this aim Romagna Acque and Alpina will cooperate in presenting a new program for the year 2004, and confirm their availability to help in organising similar courses in other European countries, as for the initial Terms of Reference.