

Holcim Awards for Sustainable Construction – European Winner
www.waterpoweramalfi.com

WATERPOWER

Renewal Strategy for the Mulini Valley
Amalfi & Scala

MAIN AUTHORS

LUIGI CENTOLA_CENTOLA & ASSOCIATI

profession_architect nationality_Italian country of residence_Italy
main author_ TERRITORIAL MASTERPLAN

MARIAGIOVANNA RITANO

profession_full professor university of Salerno nationality_Italian country of
residence_Italy main author_ GEOGRAPHICAL RESEARCH

AUTHORS

2

A+AA (ESP)

profession_architects nationality_Spanish country of residence_Spain
author_ RENEWABLE ENERGY PRODUCTION AND DISPLAY Ex Hydroelectric
Power Station

KING ROSELLI (ITA)

profession_architects nationality_Italian country of residence_Italy
author_ WATERWORKS WALKWAY Ex Aqueduct

LABICS (ITA)

profession_architects nationality_Italian country of residence_Italy
author_ CAR PARK – EXHIBITION SPACE – RIVER REMODELING

MARANO (ITA)

profession_architects nationality_Italian country of residence_Italy
author_ AUDIOVISUAL RESEARCH CENTER Ex Pansa Paper Mill

MIRALLES TAGLIABUE EMBT (ESP)

profession_architects nationality_Spanish Italian country of residence_
Spain author_ CHATEAUX RELAIS – POOL AND LEMON TERRACES
Ex De Luca Paper Mill

N! STUDIO (ITA)

profession_architects nationality_Italian country of residence_Italy
author_ LOCAL PRODUCT SHOP Ex Soap Factory

NEMESI (ITA)

profession_architects nationality_Italian country of residence_Italy
author_ WATERFALL HOME AND STUDIOS AND SLOW FOOD Ex Marino
Paper Mill

ROTO (USA)

profession_architects nationality_American country of residence_USA
author_ MEDITERRANEAN WATER SPA AND BATHS Ex Lucibello Confalone
Paper Mill

SUD' ARC-H (ITA)

profession_architects nationality_Italian country of residence_Italy
author_ HYDRAULIC MUSEUM AND PANORAMIC BAR Ex Mansi Hydroe-
lectric Power Station

TECLA (ITA)

profession_architects nationality_Italian country of residence_Italy
author_ CENTER FOR BIODIVERSITY – PALMHOUSE AND HOSTEL Ex Iron
Mill

UFO (UK)

profession_architects nationality_English country of residence_England
author_ YOUTH HOSTEL AND TERRACES-PAPER PRODUCTION
Ex Milano Paper Mill

TERESA AMODIO

profession_professor university of Salerno nationality_Italian country of
residence_Italy main author_ GEOGRAPHICAL RESEARCH

PROJECT DESCRIPTION – WATERPOWER

THE REGENERATION PROGRAMME TERRITORIAL MASTERPLAN AREA

3km x 1 km
HEIGHT ABOVE SEA-LEVEL
40–225 m
AREA RENOVATED HISTORICAL BUILDINGS
20.000 m²
ORIGINAL PAPER MILL CHANNELS SAVED
1,5 km
IRRIGATION CHANNELS RESTORED
5 km
PEDESTRIAN WALKWAYS SERVED BY W.P.E.
5 km
ACCESSIBLE PATHWAYS SERVED BY W.P.E.
1 km
WATER POWERED ELEVATORS (W.P.E.)
5 n°
LEMON GROVES SERVED BY W.P.F.
20 hectares
STONE WALLING SERVED BY W.P.F.
1,5 km
WATER POWERED FREIGHT (W.P.F.)
11 n°

THE PROJECTS

- 1 CENTER FOR BIODIVERSITY & HOSTEL
Ex Iron Mill
- 2 RENEWABLE ENERGY CENTER
Ex Hydroelectric Power Station
- 3 YOUTH HOSTEL AND NEW TERRACES
Ex Milano Paper Mill
- 4 WATERFALL HOME AND STUDIO
Ex Marino Paper Mill
- 5 WATERWORKS WALKWAY
Ex Aqueduct
- 6 MEDITERRANEAN WATER SPA & BATHS
Ex Lucibello Confalone Paper Mill
- 7 HYDRAULIC MUSEUM
Ex Mansi Hydroelectric Power Station
- 10 LOCAL PRODUCT SHOP
Ex Soap Factory
- 11 CAR PARK & RIVER REMODELING
New facilities
- 12 AUDIOVISUAL RESEARCH CENTER
Ex Pansa Paper Mill
- 13 CHATEAUX RELAIS & LEMON TERRACES
Ex De Luca Paper Mill

RENEWAL STRATEGY FOR THE MULINI VALLEY, AMALFI & SCALA

Set in the magnificent context of the steep valley of the torrent Canneto rising between Amalfi and Scala, this project aims to recover a terraced landscape and a system of pre-industrial water mills (mulini) currently in danger of collapse beyond repair.

From the early XIII century the paper mills, iron mills and later hydro-electric power stations exploited water power through ingenious systems of channels, tanks, level drops, funnels and water wheels (norie) to produce energy to make things.

The cultural origins are found in the history of the Marine Republic of Amalfi and the contacts throughout the Mediterranean with many different cultures: the Arabs for the water collection system and hydraulic machines, the Chinese for the hand made paper and the lemon tree. So the 14 historical buildings together with the original hydraulic space and the lemon terraces with the dry stone walls constitute a trans-continental heritage to be given back to the local community.

Waterpower is a regional regeneration strategy tackling a series of sensitive problems linked to the restoration, accessibility and reuse of these ancient structures in the landscape.

As in the best Italian tradition, the preservation of the delicate balance between the area's natural beauty and the traces of man's intervention is achieved by an integrated approach in which the buildings are simply 'tessere' making up the mosaic of the landscape.

The buildings natural decline is simply 'crystallized' in time avoiding the necessity to fake a past glory. The innovation lies in the use of contemporary programs, technologies and materials driven by water power to boost a new life into the area avoiding the risk of museification. In this way history is not lived as a fossilized inheritance but a dynamic flux.

The Valley's hydropower, traditionally used in the production of Amalfi's famous handmade paper and lemon irrigation is reinterpreted by the introduction of contemporary systems to solve the problems of today: improve accessibility and generate energy.

For these reasons the territorial masterplan includes:

- a series of water-powered elevators that overcome the major level changes in order to make all the paper mills accessible,
- a series of water-powered cable freight cars for the lemon harvests and the maintenance of the dry stone walls of the terraces;
- a series of micro-turbines, installed at the major drops in altitude using the original channels to produce energy without transforming the landscape.

PROJECT DATA

4

project title

WATERPOWER

Renewal strategy for the Mulini Valley,

city

AMALFI & SCALA

country

ITALY

project type

TERRITORIAL MASTERPLAN

start of construction

2009_

client

PROVINCE OF SALERNO

1 QUANTUM CHANGE AND TRANSFERABILITY

5



SAVING A THOUSAND YEARS OF MEDITERRANEAN CULTURE

At the core of the Valley of the Mills regeneration programme is an ethical imperative – to bring to life an area of unique global natural and architectural importance which is slipping into a progressive, irreversible decline.

Waterpower has the potential to be a model for projects combining technology, environmental awareness and economic sustainability. By adopting a participatory model of environmental protection and tourism, Waterpower also provides a model for similar initiatives both in Italy and beyond.

The Valley of the Mills is a veritable environmental and cultural microcosm. The area, with its 20 hectares of lemon groves, 14 mills and kilometres of dry-stone walling, is the fruit of knowledge acquired through the centuries by navigators and tradesmen from the Marine Republic of Amalfi in their travels and conquests abroad.

Despite its now degraded condition, it still speaks of a proud past linked both to this marine tradition and the area's ample water supply. Today, the power and potential of water flows through the regeneration programme, shaping its strategic choices and projects.



WATER: THE VALLEY'S PAST AND FUTURE

Historians tell how, from the XII century onwards during numerous trips to China, Amalfi's citizens stole the secrets of producing precious handmade paper, made using old rags. Water that powered this production process – channelled in canals down the mountainsides, up to hundreds of metres in length, it flowed into tanks and gushed onto waterwheels, powering the paper-making machinery. The water was then returned to the river, to be used by the other workshops further down the valley and strict rules governed when water was allowed to be drawn. The paper-mills along the river were intentionally spaced out so that they would not interfere with each other. This process represents one of the earliest forms of water management, an example of collective use of resources and mutual respect for fellow man.

At the same time as they invented Amalfi paper, the people of Amalfi also discovered another Eastern import: the lemon tree. The area's mild climate, ample water supply and steep slopes led the farmers to carve out the famous terraced landscape near water sources. Almost a thousand years later, more than 700 hectares of pergolas produce some 16,000 tons of lemons per year. The lemon groves, and the fascinating irrigation system that nourishes them, remain key characteristics of Amalfi's landscape, culture and economy.

The UN has stated that Mediterranean countries should strive to protect their terraces as one of the most important agricultural systems. Terraces both preserve the landscape and work in intrinsic harmony with nature. Their dry stone walls protect from erosion and prevent dangerous landslides. But the high costs of maintaining and managing the lemon groves are threatening the system's survival. Some of the least accessible areas have been abandoned and the collapse of supporting walls and irrigation channels poses a serious threat to the stability of the slopes and the safety of local inhabitants.





A MAP OF INTERCONNECTED MATERIAL AND IMMATERIAL SYSTEMS

The splendid isolation of the Valley of the Mills is at once its weakness and its strength.

The area is only accessible on foot and the land's steep inclines means extra work and effort are needed to maintain farming techniques that can no longer compete with modern industrial production.

But the valley's remoteness is also its strength – it will attract only a non-seasonal, niche tourist, the kind of person who is passionate about local culture and nature and keen to preserve the area's character.

One of the most important elements of the Waterpower project is its attempt to interconnect and balance a web of material and immaterial networks. The programme aims to renovate the buildings, canals and terraces; employ sustainable tourism and renewable energy technologies, reintroducing water as a primary power source; protect the Canneto and the Mediterranean flora and fauna fed by its waters; increase the numbers of those able to enjoy and work in the valley and bolster local identity through an awareness of the area's history.

A cable and funicular transport system powered exclusively by solar and hydropower, for example, will improve access to the lemon groves. In addition, the renovation works on the existing architectural structures will fuse ancient and modern. Waterpower offers a sustainable way of tapping into the area's diverse networks.

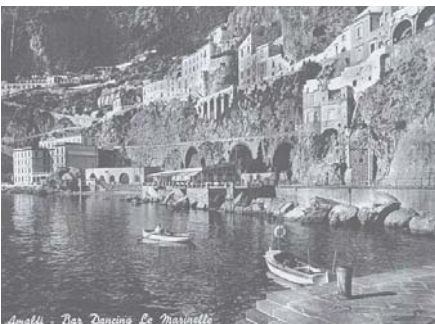
6

HYDROPOWER

The Valley's history has taught us a vital lesson from the past – water is a precious resource that must be used scarcely and handled ingeniously. Using water in this careful and sustainable manner will preserve the natural hydrology and also weave a thread linking current renovation work with Amalfi's glorious past.

Water power will run through the project, just as it runs through the valley's history:

- The entire Arab-inspired hydraulic system, with its canals, cisterns, wells, waterwheels and paper production equipment will be renovated;
- a series of ingenious hydraulic elevators will make access easy for those who have mobility problems;
- a series of funicular transport systems will transport the lemons and allow maintenance work to be carried out on the dry stone walling which girds the terraces;
- a complete energy generating network of hydraulic micro-turbines in the historical buildings will be installed, using both the restored cisterns and wells and making the most of altitude variations;
- the creation of a system to store excess hydropower using a hydrogen system that collects energy during periods of low consumption so it can be used when demand increases.



Hydraulic machinery: floating, pressure, variable weight, oscillating pistons
As part of the programme's general framework of self-sustainability and energy efficiency, Waterpower includes a series of water-powered elevators for visitors and a funicular system to transport the lemon harvest. These will be powered using water continuously available through the dense network of artificial channels and storage tanks.

Floating platform elevator

The floating platform elevator will be powered by renewable mechanical energy alone. It will take the shape of a tower which can fill with water, with a floating platform capable of lifting visitors.

The energy efficiency of this system is tied to the low frequency of its use, estimated at approximately one complete cycle (up and down) every half hour, a sufficient interval for storing up the necessary potential energy for the successive raising of the floating elevator cabin.

Pressure Elevator

Designed by engineer Leone Edoux for London's Crystal Palace in the mid nineteenth century, this elevator uses pressurised telescopic pipes to lift the cabin. The water can be pressurised either by placing a tank at the correct height, or by using a pump. It uses only small amounts of water, but, as the elevator shaft requires lubrication, it remains a closed system.

Variable weight elevator

This innovative system is based upon the variable balance between two opposing forces; the combined weight of the passengers, cabin and the water ballast is balanced by an equal one. The volume of fluid is varied during the elevator's movement so that it initially accelerates, then moves at a constant speed and finally slows down. Water entering and leaving the system is managed by specially controlled mechanical system.

The energy efficiency of this system is tied to the high frequency of its use, only modest amounts of water are required and these are returned to the river after use.

Funicular/cable freight

We have come up with two solutions to the challenges of transporting the lemon harvest and moving materials needed to maintain the dry-stone walls: the first is based on the same variable weight technique as the elevators, the second on a system powered by a specially designed hydraulic machine. Both systems will be used depending whether the area is terraced or steeply sloping. The cable system uses a weight which balances that of the cabin and its load, which can be varied using a water ballast. In the hydraulic machine an oscillating piston moves downwards when the tank is filled with enough water and upwards thanks to a balancing weight when water flows out of the tank.

HYDRAULICS MACHINES: PAST AND PRESENT

The Valley of the Mills will showcase working examples of sophisticated ancient technology inspired by the Arabs alongside the most modern functional hydraulic engineering systems. Waterpower will reinforce local people's sense of identity and continue an ancient tradition based on water – a means of dialogue and understanding between different peoples, religions and cultures – making Amalfi an even more unique place.



2 ETHICAL STANDARDS AND SOCIAL EQUITY



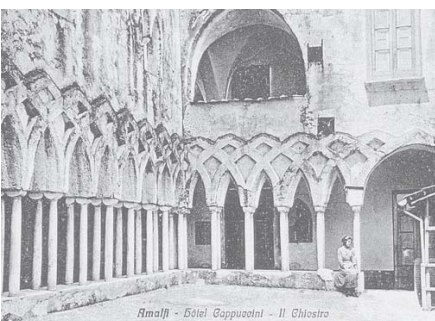
A COLLECTIVELY-DESIRED GRASSROOTS PROJECT

The Valley of the Mills regeneration programme came in to being as a public project mainly through the desire of the local inhabitants, professional academic communities to protect an area of immense architectural and natural area from disappearing. It was not motivated by a political decision from above or through a planning competition but as a local proposal. The beginnings came out of a research project started in 2003 carried out by the geography department of the University of Salerno and financed by the Ministry of Innovation, University and Research (MIUR). In early 2004, a group of urban planners and architects from Italy, Spain, America, developed the finding of the University interesting research in to a realizable project.

The research highlighted some 40 abandoned early industrial buildings over the Amalfi Coast. The Valley of the Mills concentrated many characteristics of the overall research in one place. Together with the intention of promoting Mediterranean culture and sustainable tourism the site contains the potential for a development strategy which can be applied to the all Amalfi Coast. In 2005 an exhibition and conference were organized and these were followed by public debates which took place between Salerno and Amalfi.

Local citizens and those who own the structures were actively involved in these discussions. The Province of Salerno, aware of the importance of sending a political message, signed an agreement with the University, setting up a Promotion Committee to regenerate the area. The Landmarks Commission of Salerno and Avellino, the Montana Community of the Amalfi peninsula; the municipalities of Amalfi and Scala; the Amalfi Cultural and Historical Centre; the Salerno Chamber of Commerce and Industry; Assocarta and Comieco all took part.

From the beginning the programme has actively involved all local institutional and political actors; as well as respected representatives from local academic and business communities and Italy's largest paper producers and recyclers.



A MODEL OF GOVERNANCE

Waterpower has achieved international recognition and was awarded first prize in the European Holcim Awards, generating a high level of interest from within both the academic and cultural communities. As of today unsolicited contributions include research on irrigation systems and hydraulic machinery in Mediterranean culture from the Italian National Research Council (CNR); the project has also received contributions on the care of the coastal terraces - which receive ten million euro in financing from the Italian state - from NGO Italia Nostra; the Consortium for the Promotion of Amalfi Coast Lemons (CO VA L), which brings together and represents more than 1,500 local farmers and companies from the area. From the political sphere, the Province of Salerno is funding a series of reports and in-depth consultations.

The initial proposals made by geographers, town planners and architects have been refined thanks to contributions from hydraulic engineers, renewable energy experts, landscape experts environmentalists, botanists and



geologists.

At the same time, a team of economists and experts in administrative law are working towards a strategy to create a public-private management structure through an Urban Regeneration Company which will hold the funds for the implementation of the masterplan.

The Sichelgaita Foundation has recently made available a large sum which will be used to present the programme to the Campania Region and thus gain access to significant funding sources to carry out the public part of the project, which will form part of the Regional Working Programme (POR) 2007-2113.

Many private groups have expressed an interest in constructing and running the accommodation facilities, especially those from the health and well-being sectors. With the highest levels of transparency and following the public procedures of Italian law, the Urban Regeneration Company will have the task of choosing the private partners able to best ensure the works are carried out according to the guidelines.

But, above all Waterpower is dedicated to the citizens of Amalfi and Scala, to those who remember the techniques, work and sheer effort involved in the production and transport of the paper, to those who will learn its long history through the stories of today's papermakers and those who are simply passionate about the material.

Everyone will be able to become involved and participate in a collective enterprise that brings new meaning and value to local traditions. Young people currently forced either to move away or live on the fringes of society will find new interests and opportunities in their very own land and be able not only to continue this story but also to bring it alive once more.

ETHICAL STANDARDS: SOCIAL ACCOUNTABILITY AND THE GLOBAL COMPACT

As well as being a programme that is widely backed by local people, Waterpower will also bolster the local economy whilst maintaining the quality of the cultural and environmental context and promoting a culture of social responsibility.

The entire planning, building and management processes of the renovation programme will meet the standards required under legislation SA 8000 (Social Accountability). The programme will adhere to aims of fair management of human resources, of transparency and respect for ethical and social principles. We will encourage businesses involved in the process to seek ethical certification.

Moreover, we will try to choose materials and products from businesses with an ethical code of practice, thus encouraging the certification of business enterprises within the project area. To ensure respect for human rights and labour issues, Waterpower has taken on board the ten principles of the Global Compact, norms of social and ethical responsibility for businesses, proposed by UN Secretary-General Kofi Annan in 1999. Our objective is to promote transparency and political correctness, as well as protecting the environment.

The general principles to promote environmental responsibility and the development of environmentally-friendly technologies are part of each individual project as well as the overall framework of the programme.

THE POTENTIAL AND LIMITS OF DEVELOPMENT

The renovation of the abandoned papermills represents a rare opportunity to extend the functional area of the Amalfi Coast, which has, for years, been subject to rigorous legislation limiting all coastal building development. In gaining more than 20,000 m² of land dotted with vast architectural structures, Waterpower will be able to return a unique heritage to the community, boosting economic development and creating new job opportunities.

To date we have calculated that some 500 long-term jobs will be created, 300 additional beds and the potential to attract about 1,000 daily visitors. It



is difficult to estimate the influx of people but there is no doubt that it will represent a formidable number throughout the entire course of the year, not just during the seasonal summer period when the coast is flooded with tourists.

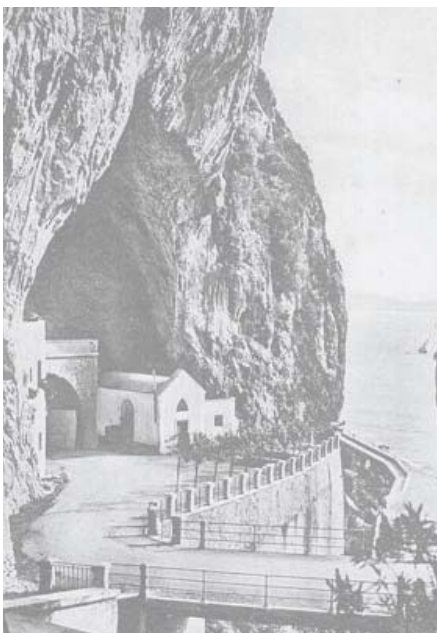
During the building phase more than 150 people will find work linked to construction and hospitality companies for a period of at least ten years.

From the earliest phases of the masterplan and its development through individual projects, the university and administrators have sought to find solutions within the constrictions and opportunities offered by the area.

This approach, which might be seen as limiting the programme's ambitions, is actually a strategic choice to avoid the resolution of problems through a single act and, at the same time, the need to impose limits on the use of the Valley to preserve its character and landscape.

In order to achieve the best results from such a co-ordinated programme we have focused on a series of varied interventions and diverse projects which, together, create a rich and varied whole and whose success exceeds the sum of its parts.

10



3 ECOLOGICAL QUALITY AND ENERGY CONSERVATION

ENERGY INDEPENDENCE THROUGH RENEWABLE ENERGY SOURCES AND ZERO EMISSIONS

Respect for the environment is at the centre of the energy design in the Valley of the Mills regeneration programme. Following traditional practice, we propose the use of technology exclusively run on local renewable energy sources, primarily generated by the waters of the Canneto torrent and solar power. In this way the valley obtains total self-sufficiency, fulfilling its annual energy requirements while respecting the environment. It also eliminates the use of fossil fuels which, apart from polluting, are also not locally available resources.

The estimated energy requirement is between 150 and 200kW. This can be met through the renovation of an abandoned hydraulic pressure water pipe system (generating around 30kW) and new hydraulic micro-turbines (generating about 7kW).

Some 105kW will also be generated by solar photovoltaic panels connected to the electrical grid with a contract to swap the energy generated on-site. An estimated 105,000kWh/year of electrical energy will be generated by the solar photovoltaic panels and about 205,000kWh/year through hydroelectric power. An estimated total of at least 300,000 kWh/year of electrical energy will be generated.

The use of solar panels for heating will also save some 30,000 kWh and this energy will be used to heat the buildings and provide hot water. The use of energy from renewable sources saves more than 70 Tpe/year (tons of petrol equivalent), avoids emitting pollutants into the atmosphere and reduces carbon dioxide levels and their related climate change effects (the greenhouse effect) equivalent to more than 210 tons of Co2 per year. This will also contribute to the reduction in noxious emissions required under the Kyoto Agreement.

Solar energy production will take place mainly during the middle of the day whilst hydropower generated by the constant flow of water, will be produced continuously. In the case of the solar photovoltaic energy, being connected to the energy grid and the legislation on the exchange of energy means it can be considered virtual energy generation, with energy consumed at different times from when it is produced (averaged out on an annual basis).

Exchanging hydroelectric energy in this way is not yet allowed under current legislation so the energy generated by this method will be used both onsite and to power an innovative, experimental system to convert it into hydrogen. Using water electrolysis, the temporary excess electrical energy – some 80,000 kWh – will be used to make hydrogen which will be collected in specially designed containers. A low-potency fuel cell (20kW) can convert the accumulated hydrogen into electrical energy (about 35,000 kW) and heat (co-generation) when needed.

ENVIRONMENTAL MANAGEMENT OF THE TRANSFORMATION PROCESS

The Valley of the Mills regeneration programme aims to allow the valley to achieve energy self-sufficiency through the use of renewable energy sources and zero emissions.





It also aims to experiment with the new planning techniques promoting economic activity and the conservation of the natural world. But the programme's ultimate objective is to become a pathfinder for environmental policy in the region.

The project adheres to EU regulations on environmental management (Eco-Management and Audit Scheme, Reg. CE n.761/2001) and adopt best practices which aim to:

- maintain: the hydro and hydro-geological balances; the beauty of the landscape; the flora and fauna; forest and plant ecosystems; geological characteristics;
- create real integration between man and his natural environment through the application of innovative environmental management and regeneration techniques;
- and develop education, training and research activities as well as compatible leisure activities.

EMAS standards are being applied during all phases of the regeneration project and in the management of the activities within the valley. The accommodation facilities, Roto (6), Miralles Tagliabue (13), Nemesi (4), Ufo (3), Tecla (1), also meet EU defined standards of ecological tourism (Legislation 1980/2000 ECOLABEL).

Environmental management has formed an integral part of the programme from its earliest stages through a series of activities which will allow control over the entire planning, design and implementation process as well as the management of the area.

Before the programme plan was drawn up a complete analysis of the territorial context of the Valley was carried out by the geographers of the Salerno University to be published shortly.

Environmental and landscape analysis and evaluations were carried out in the area to determine the key local, organisational and morphological bases for the works.

Divided into two sequential phases, these analyses led the working group to draw up evaluation criteria. The evaluation examined firstly the existence of biophysical characteristics and then any environmental or natural constraints.

Putting together both these analyses led to the definition of key project criteria which aim specifically to:

- Identify local, organisational and morphological conditions;
- Identify and measure their relative environmental impact;
- Draw up a systematic framework of environmental requirements which must be met in order to ensure optimal sustainability levels.

All of the accommodation facilities (refuge, youth hostel, Mediterranean spa and chateaux relais) will meet precise environmental standards as required by the European Community's Ecolabel legislation (EC legislation 1980/2000).

Adoption of best environmental practice in the management of these facilities will allow the area to obtain the status of European ecological quality, awarded to the most environmentally-friendly facilities, and the recognition that, throughout its entire life cycle, the facilities will have minimal environmental impact.

All analysis was developed following the methodological and practical guidelines for Preliminary Environmental Analysis as set out in EC legislation 761/2001 EMAS.



THE LIFE CYCLE APPROACH TO BUILDING DESIGN

From the outset, there has been a particular focus on the eco-efficiency and sustainability of the restoration and renovation of each individual structure and its surrounding spaces. For example in the Miralles Tagliabue (13) restoration of the De Luca paper Mill, considerable care has been taken in integrating restored lemon terraces with the renovated mill and the new water

course and machinery to give a naturally controlled microclimate.

The renovations have been planned to ensure full environmental compatibility throughout the entire life cycle of the individual structures and landscape as in the Sud'Arc-h (7) scheme for the Water Museum. An up-to-date knowledge of experimental techniques in this field also means we are able to follow current scientific protocols and codes of practice as in the A+aa (2) project for the Renewable Energy Laboratory.

Common to all the projects is the observation of the US LEED procedure (Leadership in Energy and Environmental Design), pioneered by the US Green Building Council. Each project conforms to the Reference Package for New Construction and Major Renovation with the aim of meeting the procedure's specific environmental requirements and making the projects eligible for a certificate of energy efficiency and environmental quality.



ECOLOGICAL EFFICIENCY OF BUILDING COMPONENTS AND MATERIALS

The use of the buildings' structure and original shell and the recycling of all materials found on site in the restoration will ensure the historic buildings' life cycle is guaranteed. The historical framework of the area and its original context are retained, less waste is produced and the impact of the renovation linked to production and transport of materials is kept to a minimum. Materials to be used were chosen primarily for their ease and availability of access, the speed and simplicity with which they can be assembled and their 'reversibility', i. e. the possibility of dismantling the additional structures at the end of their life cycle.

The building programme will adopt reversible renovation techniques in buildings of historic value in order to be able to improve the structures without altering the nature of the area. The project life cycle is estimated to be in the region of a century.

Specifically, renovation work will include:

- structures made of recycled steel produced by low emissions production methods and low energy consumption as in King Roselli(5) Waterworks Walkway;
- wood certified by the Forest Stewardship Council (FSC). The FSC certifies wood products originating from responsibly managed forests which meet stringent environmental, social and economic standards as in Tecla (1) Bio-diversity Center;
- locally quarried or recycled stone which will lower transport costs and boost the local economy as in Labics (11) underground car park;
- stratified security glass made from completely recycled materials which will save not only the material resources needed in its production but also in energy used (melting glass uses less energy) as in Nemesi (4) Waterfall Home and Studio for Artists;
- recycled aluminium which, as it does not involve the process of extracting bauxite, uses 95% less energy in its production as in N! Studio (10) Local Product Shop.



ENVIRONMENTAL WATER MANAGEMENT

Rainfall water from rooftops as well as open land will be managed through a system of water capture, filter and collection. This water will be used for a variety of compatible uses (irrigating green spaces, technological uses and supplying the fire extinguisher network). There will also be a water collection and distribution in a dual network which feeds both the interior and exterior of the renovated buildings.

Similar capture, filter and collection systems are also being set up for the water produced by the four buildings in the upper part of the Valley which have no mains water supply Tecla (1), A+aa (2), Ufo (3), Nemesi (4). This water will be added to external water tanks where it will undergo a simplified filtration process and be able to be reused.

4 ECONOMIC PERFORMANCE AND COMPATIBILITY

14



From the legal and financial viewpoint the Waterpower scheme involves both private and public investors in a complex development regional programme.

Public investment is limited to 30% of the total (approx 100 million euro) and funds the restoration of the area's hydraulic system, the 6 small public buildings, the creation of access infrastructures including new hydraulic elevators and cable freight system and electricity generation. The characteristics common to this investment is the recuperation of the inestimable historic value of the site that of itself has little commercial interest.

The private investors are made up of the current 9 mill owners and outside companies interested in the commercial, parking and hotel development in the area.

70% of investment funds will be met by the private sector which will cover the renovation of the three main buildings (4,5,13) which will be used as accommodation facilities and the construction of the car park (11).

The governance and implementation of the various planned projects must, on the one hand, fulfil public needs and sustainably develop the area and, on the other, guarantee the economic viability and success of the works carried out.

The following analysis examines the various legal frameworks and financial structures suited to the efficient and shared implementation of the master-plan throughout its various phases.



THE URBAN REGENERATION COMPANY (URC)

(SOCIETÀ DI TRASFORMAZIONE URBANA) AS MANAGEMENT TOOL

An Urban Regeneration Company (URC) is the most appropriate legal structure for the integrated management of the Waterpower project. URC were introduced into the Italian legal system in 1997 under Law no. 127. After several modifications, the URC found its final form in article 44 of Law no. 166 in 2002.

In summary, Urban Regeneration Companies were created to allow the planning, implementation and management of regeneration projects within existing urban regulations.

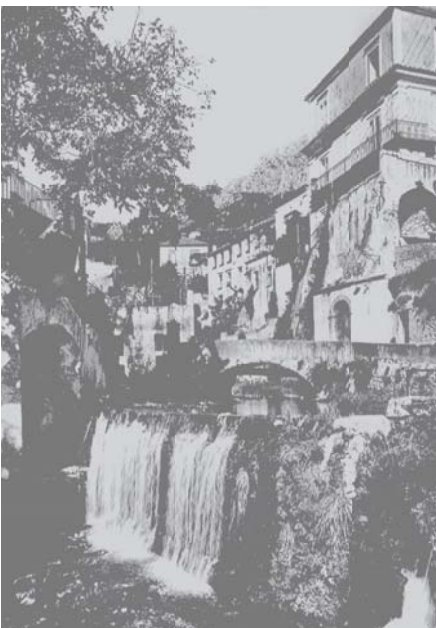
The URC, a public-private enterprise operates on both the area as a whole and the buildings present within that area. It also has the power, within limits, to modify planning regulations to the benefit of public interest.

In other words, the URC can be used for urban projects to transform and develop an area merging the advantages of the public and the speed of the private..

This distinctive function of the URC allows potential investors and individuals to take an initial and early role in project choices that will shape how the programme is implemented.

The URC plays a central role in the management of the project in that it:

- enables the full and active involvement of the private sector in all planning, implementation and supply phases;
- guarantees transparency and competition in the management of contracts which, as specified under relevant law, will be awarded on the basis of ten-



ders, ensuring that funds are rationally invested;

- ensures value for money for the public sector by minimising both immediate infrastructure and subsequent management costs;
- spreads the risk between the private and public shareholders, the URC is therefore the best vehicle to absorb and manage the project's results;
- guarantees total flexibility in terms of ownership, whilst contractually binding the project's aims and methods;
- allows for the active involvement of those who currently own property within the project area, either through direct involvement in the social context or through the creation of contracts guaranteeing a fair distribution of resources and profits;
- ensures flexible management which will meet the current and future needs of users (with the aim of customer satisfaction).

The URC organizes and manages the fundraising both from public (Eu, National, Regional) and private sources (project financing, direct investment, stockmarkets). Subsequently is responsible for the project design development and realization, finally ensures a business-orientated management of the built project in the public interest.

PROJECT FINANCING

In the current economic climate it is strategic to use innovative forms of financing for the planning and implementation of development projects, especially considering the necessary and complicated collaboration between the public and private sectors.

The sustainability of local development projects indeed depends on various factors which, when integrated, each contribute to rendering the works both efficient and durable. In recent years Project Financing has become increasingly popular as a means of structuring public works projects with shared management.

The main characteristic of Project Financing is its ability to separate the ownership and the management of the works carried out as well as attracting funding based on the technical and economic viability of the project rather than the fundraising capacity of independent investors.

THE ADVANTAGES OF PF UNDER URC MANAGEMENT FOR THE WATERPOWER PROGRAMME:

The main advantages of Project Financing for Waterpower can be summed up as follows:

- the project will be evaluated primarily (but not exclusively) on its income generating capacity;
- cash flow linked to the management of the project will form the main source for capital repayment;
- the management of the works (and the actual works themselves) will be carried out mainly by private investors based upon procedures agreed with those promoting the project (public companies) ensuring both an ordered management of the project and the generation of cash flows;
- the participation of the public administration permits the URC a simplification of the regional planning procedures.

NATIONAL AND EUROPEAN FUNDING CHANNELS

At the national level, the financial instrument best suited to the Waterpower project is the Campania Regional Working Programme (Programma Operativo della Regione Campania (P.O.R.).

The programme seeks to fulfill the following requirements which make it suitable for co-financing the project:

Measure 4.12 - (Projects to improve rural villages and to protect and safeguard rural heritage) - will be mainly used to all the intervention related to the lemon groves;

Measure 4.14 (Projects to encourage tourism and local crafts) - will be mainly used to restore the buildings with cultural programmes;

Measure 1.9 (The regeneration, development and promotion of historical, social, archaeological, natural, and ethnographical heritage and of historic areas of protected areas and regional and national parks) – will be mainly used to restore the 1,5km of historical channels and realize all the elements of the hydraulic system.



Among the European-level investments available, the European Investment Bank (EIB) offers financing to which the Waterpower project is suited, namely:

1. Increasing the competitiveness of European industry and of small and medium-sized firms; setting up trans-European networks (transport, telecoms and energy); improving the information technology sector; safeguarding the natural and urban environment and improving public health and education;
2. Benefiting poorer regions;
3. Attracting other forms of direct investment.

The European Initiative Programmes (EIP) of the European Regional Development Fund (ERDF) are a further important source of financial backing. Among the various programmes, which include (Equal, Urban, Leader and Interreg), the key programme is the Interreg which aims to strengthen economic and social cohesion in the European Union, promote cross-border and inter-regional co-operation and sustainable development in the area. The Interreg Programme IIB has funding available as part of the Archimed Initiative whose aims include the development of Italian regions classified as Category One. These regions include Campania, Basilicata, Puglia, Calabria and Sicily.

Among others the initiative covers the integrated and careful management of cultural, environmental and natural heritage and the promotion of sustainable tourism.



FINANCIAL DISTRIBUTION AND COMPATIBILITY

Continued funding across the entire cycle of the project will be guaranteed by the integration of diverse funding sources. Planning will enable a staggered, ordered access to diverse funding sources in order to guarantee financial viability throughout all the phases outlined in the master plan.

The different nature of the private and public funding sources, and the various aims and control mechanisms which characterise the distribution of national and European funding, will ensure the resources complement one another, increasing the efficiency of the processes involved.

Waterpower has income generating potential, the resolve to establish a model for local sustainable development and an ability to meet EU competitiveness objectives: each of these factors, both individually and combined, will form the basis for sourcing funding and will ensure the programme has a positive impact on the area.

5 CONTEXTUAL RESPONSE AND AESTHETIC IMPACT

17



NATURAL EVOLUTION

For over a thousand years, the main buildings in Amalfi and Scala have undergone dramatic transformations as time passed and the lives and livelihoods of people developed. The valley's workshops, originally built as water-powered mills to crush olives, grind wheat or make textiles, were gradually transformed from the XII century into paper-mills. These structures have demonstrated their flexibility over the course of the time. The people of Amalfi have tried to maintain the structures' original characteristics, including the use of waterpower. This tradition is continued in the regeneration programme.

A balanced integration of public and private involvement will continue this combination of innovation and tradition, ensuring that the region's culture is preserved and its local economy boosted.

Private projects will focus on providing hospitality and accommodation in buildings whose structural state, accessibility and size allow an economic return. The complete renovation of these structures meets the current demands of tourism – which should fulfil ecological, ethical and historical criteria. These remain the guiding principles behind the entire project. The refuge(1), hostel(3), mediterranean spa(5) and the chateaux relais (13) guarantee about 300 new beds and will allow visitors, and local residents alike to enjoy a whole range of daily activities – from health and wellbeing to relaxation, meetings and eating out.

Public finance will fund access infrastructure and buildings and intervention to prevent the further degradation of buildings and land that cannot be renovated. Although these areas will not have a precise function, they will form the architectural framework for the many activities of local associations and consortiums who produce paper, cultivate lemons and manage tourism and cultural heritage sites.



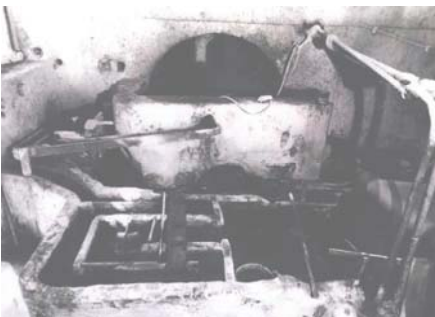
NEW WATER SYSTEMS

INTEGRATION OF NATURE, ARCHITECTURE AND ENGINEERING

The renovation of the Canneto's hydraulic system, the valley's ancient paper-mills is not merely a moral imperative, demanded of us by Amalfi's history, but also a means of using waterpower to introduce new technology into the valley. A study of the Canneto's water system and channels has showed that this new activity will not damage the river. Water use will be co-ordinated and alternated, just as was once the case in the valley.

A few examples give a sense of the many and varied ways water are used by the architects:

– Water is used to control the atmosphere in greenhouse in the former iron-mill which will become a Mediterranean biodiversity centre by Tecla (1), housing some rare plant species. Water is collected in a flat tank on the roof and channelled through pipes running down the edge of the building, flow across the two main walls, made of glass, and collect in various pools at the base of the building before being returned into the Canneto. The small metal museum will house some active examples of ancient water-powered machinery used to make metal before the industrial revolution.



– Following the wishes of the last owner, Nicola Milano, descended from an historic family of paper-makers, the Milano paper-mill, which will also house a young people's hostel designed by Ufo (3), will make paper once more. The channel, cistern, well and the machinery present in the building will all work again. Outside, a series of new spaces will be created, replacing the abandoned terraces. Water will flow from this area into the cistern which fills the tanks in the paper workshops, powering the machines which can be used by young people and schoolchildren.

– In the former aqueduct, which will be transformed into a water walkway by King Roselli (5), people will be able to watch the complete process of water being transformed into energy. At the end of its journey within the building the water will flow onto the next one, in this case the the Lucibello-Confalone former paper-mill, the new Mediterranean spa by Roto(6). Inside the mill, visitors will be able to travel in the variable weight elevator, with its cabin of double-layered glass. The journey, of more than 20 metres in height, will link the building to the public walkway. People in the elevator will actually be able to see and feel the effects of water flowing in and out of the machine as it ascends and descends.

– In the ex soap factory which will become an area selling locally products, rebuilt by N!Studio(10), visitors will be able to watch the principles of a pressure elevator in action. The elevator will represent modern needs reinterpreted on an ancient site.

– The stone car-park designed by Labics (11) will be built by restoring one of the terraces and the perimeter wall. We will be able to gain access to a long channel that fed the former Pansa (12) and De Luca (13) paper-mills which will be able to power their waterwheels again. A sheet of transparent polymer inserted in the new wall of the car-park will show the floating platform elevator which will take people up 12.5m to reach the public walkway through the lemon groves.

In the renovation of De Luca paper-mill by Miralles Tagliabue (13), which will become the future chateaux relais, the large abandoned waterwheel, positioned in a partially cleared area will become the building's fulcrum, powered by water from the rebuilt channel. The falling water will become the centrepiece and theme of the surrounding gardens which will express the movement, sound and spray of one of the oldest pieces of equipment found in the Valley of the Mills.



CONSERVATION AND INNOVATION - ARCHITECTURAL OPTIONS

Our renovation work will respect the historical structures and we will only intervene on a building after having made it structurally sound. New interventions will contrast with their historical backdrop using materials that are 'reversible' so that, having completed their natural function, they can be removed or substituted.

Depending on the state of the building to be renovated, we will use a number of techniques ranging from traditional methods to the use of composite materials, resins and steel to reinforce the existing structures. The main materials will be wood, glass, iron, copper and steel.

In a few lucky cases, where a wall has partially crumbled leaving a gap(7), for example, we will fill it with a glass box to allow a glimpse of the valley. Metal will replace sections of damaged rooftops and will serve to signal areas such as the entrance way to a building (5). Empty spaces between existing walls will be filled with solar panels where original tiles are no longer available (2). The reinforcing steel structures will also support the new hydraulic systems and be used to create new spaces(5). For example, a series of deep wells of light will be created along the river to create a suggestive atmosphere, the floor will be carefully paved to extend public space(13) and, finally, new terraces and sloping ramps will allow access to the various levels of buildings(3).

Newer structures such as the car-park (11) will be completely integrated with the perimeter wall which runs along the edge of the existing terraces. It

will also provide the opportunity to reveal hidden sections of the river. In the one building that has to be completely built from scratch(10), the characteristic nets protecting the lemon groves will be replaced by a metal pergola which will protect and shade the open space.



SPREADING THE WORD ABOUT WATER

Waterpower's main aim is that everyone who visits the valley, or even hears about the project, will be able to spread the message about the importance of using natural resources carefully and sustainably. Water has become a key and precious resource – its shortage causes desertification and can even spark wars.

The techniques that will be used to generate energy and activities – micro-turbines, floating technology, pressure systems and the ingenious uses of variable weights and ballasts – are a counterpoint to the large-scale dams and other interventions which all too often radically and negatively transform man's natural environment.

We trust that whoever physically walks through the valley, surrounded by the scent of the lemon groves and the sound of water, will understand and spread the ethical and political message about the correct and careful use of this resource.

We hope that even those who will not be able to actually visit the Valley of the Mills may come in contact with it via the internet or in books and be inspired by its unusual and somewhat romantic use of water. These methods show the power and potential of water through techniques that date from thousands of years ago. From Al Jazari's Compendium of Ingenious Mechanical Devices, published in 1250, via the hydraulic machines of Leonardo da Vinci, we hope that the leap to our water powered systems is not too far.

