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Traditional Knowledge Role for Security and Mitigation of Water Conflicts

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Summary. Traditional Knowledge are ancient techniques and practices of a territory passed on through the generations and used for water harvesting, soil management, use and protection of natural areas, rural architecture and for organizing urban centers. They are the historical knowledge of humanity that allowed building architecture and landscapes with a universal value protected by UNESCO in the category of cultural landscapes. An appropriate use of natural resources such as water, soil and energy is made possible by using traditional knowledge that establishes the harmony of architecture with the environment, the symbiosis of the techniques of organisation of space with the traditions, the social habits, the spiritual values and the fusion between practical aspects and beauty.Today, traditional knowledge is in danger and its disappearance would not only cause the loss of people's capability to keep and pass on the artistic and natural heritage, but also of an extraordinary source of knowledge and cultural diversity from which appropriate innovative solutions can be derived today and in the future.UNESCO launched a global programme for an inventory assigned to IPOGEA – Research Centre on Traditional and Local Knowledge. The project gathers and protects historical knowledge and promotes and certifies innovative practices based on the modern re-proposal of tradition as well.

Keywords. Traditional knowledge - UNESCO - IPOGEA - Water conflict - Mitigation

Rôle du savoir traditionnel pour la sécurité et l'allégement des conflits d'eau

Résumé. *Les anciennes techniques et les pratiques adoptées depuis des générations et utilisées pour la collecte de l'eau, la gestion du sol, l'utilisation et la protection des zones naturelles, l'architecture rurale et l'urbanisation, relèvent du savoir traditionnel d'un territoire. Il s'agit d'un patrimoine historique de l'humanité qui a permis la réalisation d'une architecture et d'un paysage protégés par l'UNESCO pour leur valeur universelle, les classifiant comme des paysages culturels. Une utilisation appropriée des ressources naturelles telles que l'eau, le sol et l'énergie s'avère possible si l'on a recours au savoir traditionnel qui établit l'harmonie de l'architecture avec l'environnement, la symbiose des techniques d'organisation de l'espace avec les traditions, les coutumes sociales, les valeurs spirituelles et la fusion entre les aspects pratiques et la beauté. Aujourd'hui, le savoir traditionnel est en danger et sa disparition pourrait engendrer non seulement la perte des capacités des gens de garder et de transmettre le patrimoine naturel et artistique, mais aussi la perte d'une source extraordinaire de connaissance et de diversité culturelle qui peut être à la base de solutions innovatrices appropriées pour le présent et pour l'avenir. L'UNESCO a lancé un programme global pour un inventaire assigné à IPOGEA – Centre de Recherche pour le Savoir Traditionnel et Local. Le projet rassemble et protège les connaissances historiques et encourage et certifie les pratiques novatrices basées sur la proposition moderne de la tradition.*

Mots-clés. *Savoir traditionnel - UNESCO - IPOGEA - Conflit de l'eau - Allégement*

I - Water harvesting techniques in the Mediterranean Arid zones

Three sides of the Mediterranean Basin are connected with areas where humankind had to cope with dry land areas; its isles are completely lacking in underground or ground water where complex civilizations developed and even in its more northern areas it undergoes a changing and catastrophic environment. Therefore, most of traditional techniques relative to the water organization for water harvesting, conservation and diversion are widespread as well as the systems of slope protection and the creation of soil that have different characteristics according

to the environment. In southern Italy and in Spain there are also systems like for example underground drainage tunnels that are common in oasis towns, in North Africa and in the Eastern World that have been handed down by Islamic civilization or by more ancient civilizations.

The several water saving techniques used by the *Nabatean agriculture*, the condensation caves and pits, the stone arrangement for rainfall harvesting, the underground dams are not only widespread in the Negev desert but also in the whole Mediterranean area. In Petra (Jordan) they present their urban ecosystem synthesis but they can be also found in Tunisia, in Libya and in southern Italy and in particular in the isles thanks to the influence of prehistoric or widespread traditions imported by current exchanges. The techniques of *Andalusia agriculture* in Spain are widely represented because of the influence of the Islamic civilization. In the isle of Ibiza there is a similar irrigation practice called feixes designed according to an ingenious hydraulic organization. The fields are divided into long and narrow rectangular plots by means of a network of canals having the twofold function of draining the water in excess, thus collecting and saving it and of irrigating the fields during drought seasons. In fact, if these works were not carried out it would be a swampy area in some seasons and arid or flooded by seawater in other seasons. In this way, it is possible to carry out a self-regulating process which allows practicing intensive cultivations of both marshlands and arid lands. Open canals are about one-metre deep and flow at a lower level than the plots of land thus keeping them dry. The land excavated for building the canals is used to raise the level of the cultivated land. During hot seasons when the land undergoes high evaporation, the plots absorb the necessary quantity of moisture directly from the subsoil and from the walls of the canals by osmosis and capillarity. The process is then fostered by further underground canalisations excavated in the plots. These underground canals are built with porous stones and pine-tree branches covered with a layer of Posidonia algae collected along the coast. This method ensures the good running water pipings and at the same time it allows to obtain a certain level of permeability in order to give the land the quantity of water necessary to keep it humid. Therefore, the irrigation is carried out from the subsoil directly to the plant roots. This technique enables to save water that would be lost because of evaporation by using open irrigation methods.

Traditional techniques can be found not only on southern Mediterranean shores and in southern areas of Europe but also in northern France and even in the Swiss mountains, where specific geomorphologic conditions cause aridity. This situation depends on the position of the mountain slopes compared with the direction of the dominant winds, which release all their moisture as they rise up the sides. Once they have reached the top, they lash against the slopes below with high pressure dry wind currents that dissolve the clouds. This is the phenomenon of the foothill deserts that in Switzerland creates dry, arid conditions in the valleys. In the region of Valais and the province of Sion on the contrary there are green pastures and plentiful vineyards. The landscape is not the result of natural conditions, but rather of a skilful use of a traditional local technique called *bisse*. This consists of a series of channels made of wood or carved out of the rock, which extend up into the mountains as far as the sources of the brooks and the perennial glaciers, running for many kilometres. They slope very gently down the steep edges, remaining at a high altitude to convey the water along above the natural course of the bed river and use the force of gravity alone to irrigate distant valleys. Otherwise, they would completely lack water. This system is supported by social cohesion, by water boards and companies similar to those that manage Andalusian agriculture or the Saharan drainage tunnels. Just as in northern Africa and in Spain, this system generates a particular landscape where the location of the settlements is determined by the layout and the outlets of the bisses.

The most widespread system that can be defined as one of the typical features of the Mediterranean area is the terracing which can be found from the Middle East to Greece and from Italy to Portugal. Terracing associated with olive and wine growing actually contributes to shaping the landscape. The slopes and hills in the northern Mediterranean have stood up to erosion over time and their present shape is the result of that long-lasting titanic action. Along with the dry stone walls, the

stone barrows (specchie) and the tholos constructions (trulli), terracing is typical of the Apulian region in the south of Italy. Here, the terraced slopes of Amalfi and in the north of Italy, the Cinque Terre in Liguria, create fascinating and traditional urban ecosystems. In Sardinia and in the isle of Ibiza there are systems of fields surrounded by dry stone walls called *tanka*, which is a term deriving from an ancient Mediterranean toponym.

The majority of the ancient Mediterranean sites follow the layout of the terracing and the water systems network. These sites adopt the techniques of rainfall harvesting, protected vegetable gardens, the use of organic waste for the creation of humus, the methods of passive architecture and of climate control for food storage and for energy saving as well as the practices of recycling productive and food residues. The aesthetic qualities, the beauty of natural materials, the comfort of architecture and spaces, the organic relationship with the landscape that these ancient towns boast are especially due to the intrinsic qualities of traditional techniques and to the search for symbiosis and harmony intrinsic to local knowledge. The survival of the poor archaic societies of the whole Mediterranean areas depends on the accurate and economical management of natural resources. The close link between traditional farming techniques and settlements make the traditional historic centres a fundamental element for environmental safeguard. In the Mediterranean area, which is characterized by intensive historical settlements, each part of the environment is not only the result of natural process, but rather represents a cultural landscape where historical centres are the crystallization of knowledge appropriate to the correct environmental management and maintenance.

II - A Success Experience: Matera, Southern Italy

The Sassi of Matera represents a typical example of traditional use of water resources in the Mediterranean. The local knowledge system adopted is found in a wide set of situations ranging from the troglodyte dwellings of the Loire valley, in France, to Petra, in Jordan, to the towns carved out of the calcareous rock in Cappadocia, in Turkey, to the underground settlements of Matmata in Tunisia, to the villages along the canyons in Algeria and in Morocco up to Andalusia and Nabatean water farming techniques. The towns are built along the borders of deep valleys, the Gravine, that have a small water carrying capacity or do not have any. The settlements are not placed on the bottom of the canyon like one could expect if it were to provide water, but on the upper part, along the plateau and its steep slopes. In fact, the resources of the maze-like troglodyte dwellings of the Sassi of Matera and of the other stone towns of the Gravine are the rain and the dew that are harvested in drains and in cave-dwellings. (Laureano P. 1995) The time stratification of traditional knowledge according to the classification adopted for social groupings, hunter-gatherers, farmer-breeders, agropastoralists shows the progressive determination of a complex system of knowledge and appropriate use of resources until the creation of stone oasis and of the urban ecosystem.

1. Hunter-Gatherers (Water Harvesting in the Cave Dwellings by Dripping and Percolation

Human beings have settled the area from the Palaeolithic onwards, as evidenced by a number of stone findings in the Grotta dei Pipistrelli (The Cave of Bats) and by an intact skeleton of a hominoid found in a karst pit near Altamura which has been dated at about 250,000 years old. The Grotta dei Pipistrelli is a natural formation but its structure is made up of a passageway, the entrance of which gives out onto the slope and the other end of which emerges through a karst sink hole onto the plain and is a model for later artificial constructions

2. Farmer-Breeders (Rainwater Harvesting in Wells and Cisterns; Villages with Large Ditches to Drain the Soil and Harvest Water; Multipurpose System)

During the Neolithic age, a number of techniques were developed for digging in the calcareous highland and for harvesting water. Bell-shaped cisterns, huts and small canals were enclosed in deep ditches, forming circles and ellipses and were therefore called entrenched villages. It is nonetheless likely that the ditches were not used for defensive purposes, but rather they were used in Neolithic practices of animal husbandry and farming. An analysis of aerial photographs showing where vegetation grew more thickly also show drainage systems, that is used for water harvesting or humus collection, and the maze-like systems called *corral* that were necessary for agricultural and animal grazing. The recent excavation of the Neolithic complex of Casale del Dolce near Anagni underpins this hypothesis.

3. Agro-Pastoralists (Cave Excavation for Worshipping Purpose and for Intercepting Water; Pit Courtyards; Terracing for Soil Conservation and Plants; Dry Walls; Megalithic Monuments; Moisture Condensers; Barrows and Stone Arrangement)

The Age of Metals provided new tools which made it easier to excavate caves and pits. As the environment deteriorated, these caves became ever more attractive as human dwellings. In fact, the progressive loss of the vegetation cover left the surface villages without shelter, left the land unprotected, thus causing a shortage of wood for building and heating purposes. The climate ranged from freezing winters to broiling summers.

The absolute lack in water in the rivers or on the slope made it necessary to harvest meteoric water in underground cisterns. An increasing popular form of dwelling was the pit courtyard which had been developed during the Neolithic age subsequent to the development of excavation techniques where tunnels radiated out from a central shaft.

This dwelling model also arose in remote areas such as Matmata, in Tunisia and on the dry plains of China and was the origin of the courtyard dwelling used by the Sumerians, both in antiquity and during the Islamic era. An excavated house near the Neolithic site of Murgia Timone, across from the Sassi of Matera, proves just how effective this type of construction is. The house is rectangular in shape like the megaron of Crete and is divided into three spaces made up of two open rooms and a third underground room. The courtyard is used as a water reservoir, it is an open and sunny space, which is protected by its walls and which can be used for the preparation of the food. At the opposite end is a garden that is used for waste and as a compost heap, which has been carved out of the rock. The garden is absolutely necessary given the poor soil and the need to protect plants. The caves keep a constant temperature throughout the whole year and are ideal shelters for men and animals, for the storage of grains and water conservation.

It is interesting to remark that after the structure was discovered and freed of sediments, the underground part of the cistern soon filled up with water, even though there had been no rainfall.

Therefore, the system started working again using capillary infiltration and condensation. Even the barrows of the Bronze Age took their shape from water harvesting practices, both functionally and ritually. The barrows consisted of a double circle through which ran a corridor with a room excavated down the centre. What is interesting to notice is that these structures were introduced along the excavation of the archaic Neolithic walls, which had been abandoned when the buildings were constructed but which can be still used as moisture diversion systems.

What has been found in Matera is quite similar to prehistoric structures made up of barrows and underground rooms in the Sahara desert. Actually, these are solar tombs made up of concentric

circles around the barrow. They could also be ancient methods for the collection of moisture and dew and could belong to cults devoted to the practice of water harvesting.

Similar interpretations could be made of the dry stone structures spread throughout the dry lands of Apulia where stone mounds harvest the night dew thus replenishing the soil with moisture. Indeed, the roots of centuries-old olive trees all point to the low walls that are a staple of the farmland. The walls, the barrows, the trulli and the mounds of calcareous rock called *specchie* are all structures of water condensation and conservation. These structures carry out their tasks during the day and at night. In the broiling sun, the wind carries traces of moisture which seeps into the interstices of the stone mounds, whose internal temperature is lower than the outside temperature because it is not exposed to the sun and because it has an underground chamber. The decrease in temperature causes the condensation of drops that fall into the cavity. That same water accumulates and provides further moisture and coolness by amplifying the efficiency of the condensation chamber. Overnight, the process is reversed and condensation occurs externally so that dew settles on the surface; the dew slides into the interstices and is harvested in the underground chamber.

4. Stone Oases (Canyon and Gravina Settlement: Vertical Integration of the Systems; Terracing, Realization of Ecosystems; Dwellings Built in Traditional Materials for Energy Saving, Water Harvesting and Recycling

By developing the original prehistoric techniques, an adapted habitat system that uses the combination of different water production techniques: catchment, distillation and condensation are carried out in the Sassi of Matera. During the torrential rainfalls, the terracing and the water collection systems protect the slopes from erosion and gravity pulls the water down towards the cisterns in the caves. During dry spells, the dug out caves suck out the moisture in the air at night: the moisture condenses in the final underground cistern, which is always full even if it is not connected to outside canals or ducts. The result is a multitude of underground storeys topped by long tunnels leading downward underground. Their slope allows the sun's rays to penetrate down to the bottom when heat is most necessary. In winter, the sun's rays are more oblique and can penetrate the underground areas. During the warm season, when the sun is at its zenith, it shines only on the entrance to the underground caves, which thus remain fresh and humid.

We know of up to ten storeys of caves one atop the other, with dozens of bell-shaped cisterns all connected to each other by means of canals and water filter systems. Like in the Sahara oasis the system of local knowledge enables, in a situation without water resources, to realize good living conditions thanks to the appropriate use of techniques and to their perfect interaction with the environment.

5. Urban Ecosystem

The Medieval monasticism contributed to this archaic texture. The hermitages, the parish churches, the farmhouses that are located in checkpoints of hydraulic works represent the poles of the urban growth process. The two main drainage systems called "grabiglioni" that provide tillable land and humus by sewage collection are surrounded by two urban sections called Sasso Caveoso and Sasso Barisano.

In the middle there is the Civita, the fortified acropolis that represents the ancient shelter in case of danger where the Cathedral was built. Along the boundaries of the highland where there are the large cisterns and the ditches, the cave silos for grain storage and the craftsmen's workshops.

The vertical structure of the town allows the use of gravity for water distribution and protects from wind blowing on the plateau. Matera boasts hundreds of rock-hewn churches painted with

beautiful Byzantine frescoes or built on the plateau and bearing monumental facades carved out of the tufa according to the architectural style of the period of construction: medieval, classic or baroque. However, the maze of small streets, stairs and underground passageways continues to follow the ancient hydraulic structure. Therefore, it is still possible to understand the urban layout of the Sassi of Matera by starting from the original matrix of the underground spaces, the cisterns and the terraced gardens as well as from that system of traditional knowledge that allowed a concentrated use of resources without depleting them.

6. Collapse and Rebirth

During the 1950's The Sassi of Matera were closed due to their neglected condition, and 20,000 inhabitants were moved to other neighbourhoods. The abandoned houses became property of the state and a wall was erected to prevent them from being occupied. The Sassi of Matera were transformed into a ghost town, the greatest troglodyte centre in the whole of Europe was completely abandoned. The dwellings were neither occupied nor ventilated leading to a rapid degradation. The churches carved from the rock and decorated with beautiful medieval frescoes soon crumbled away as a result of theft and pillage.

In 1986, largely thanks to the motivation of individuals involved in cultural activities, the Italian Government allocated 100 billion liras to restore the Sassi and undertake the work necessary to improve its sanitary conditions and urbanization, and to encourage private individuals to take up residence there. All the state properties were entrusted to the Mayor of Matera, responsible for financing the project.

The turning point in the management of the Sassi came about with their inscription in 1993 as an UNESCO World Heritage Site. Matera became a destination for both national and international tourists and the individual requests to return and live in the Sassi multiplied. The Mayor of Matera equipped the Sassi with a network of water systems, drains, gas, electricity and telecommunications whose cables were buried in underground trenches so not to disturb their architectural qualities or landscape. Around 3,000 people now live in the typical cave-homes, half-built, half hallowed out.

7. The restoration of traditional systems of water collection

The Sassi of Matera illustrates the natural resource management capabilities (water, sun and energy) that were once perfectly employed but are so often neglected today.

The international debate on urban development makes this problem current and relevant. It is necessary to maximize the potential of a town at a local level to assure its harmonious and sustainable development. It is for this reason that the Ministry of the Environment chose Matera as an urban rehabilitation model within the framework of the Rio Conference and the United States Convention to Combat Desertification (UNCCD), in its directives and action plans.

The very encouraging experiment in Matera could be adopted in other urban centers such as the inland region of Lucania and the dwelling systems of the Gravine (canyons). Indeed, these sites offer similar architectural and environmental characteristics but have not benefited from similar renovation. Above all, this experiment is an exceptional example for those countries situated on the southern Mediterranean Sea. In these countries, the progress of modernization often destroys traditional methods of managing space and threatens the ecological equilibrium of the whole region. Only by demonstrating the success of rich industrialized countries, like Italy, to restore traditional systems can countries that are less industrialized, be persuaded to do the same.

III - Ancient water techniques for security and sustainable future

Using traditional knowledge does not mean to reapply directly the techniques of the past, but rather to understand the logic of this model of knowledge. It allowed societies, in the past, to manage ecosystems in balance, to carry out outstanding technical, artistic and architectonic work which are universally admired and has always been able to renew and adapt itself. Traditional knowledge is a dynamic system able to incorporate innovation subjected to the test of the long term and thus achieves local and environmental sustainability.

The TKWB promotes traditional knowledge as advanced innovative knowledge appropriate to elaborate a new technological paradigm based on the progressive values of tradition: the capability of enhancing a society's internal resources and managing them at a local level; the versatility and the interpenetration of technical, ethical and aesthetic values; the production not *per se* but for the long-term benefit of the community. Activities are based on the principle according to which each has to enable another one without leaving behind waste; energy use is based on cycles in constant renewal; the purpose, including economic interest, is to protect the ecosystems, the cultural complexity and diversity and all living beings. The project aims to prefigure a new model of development and a technological dimension connected with historical memory.

Traditional knowledge consists of practical (instrumental) and normative knowledge concerning the ecological, socio-economic and cultural environment.

Traditional knowledge originates from people and is transmitted to people by recognizable and experienced actors. It is systemic (inter-sectorial and holistic), experimental (empirical and practical), handed down from generation to generation and culturally enhanced. Such a kind of knowledge supports diversity and enhances and reproduces local resources (*Science and Technology Committee, UNCCD*).

Traditional knowledge is to be considered as part of an extensive system which hands down and accumulates shared knowledge whose proficiency and evolution is appreciable over long and very long periods.

The functioning principle of the traditional systems is based on a strong cohesion between society, culture and the economy. Their efficacy depends on the interaction between several factors which should be carefully considered: aesthetic and ethical values complete the interaction between environmental, productive, technological and social aspects.

Traditional techniques, therefore, cannot be reduced to a list of mere isolated technical solutions able to solve a specific problem. To catch the full meaning and importance of traditional techniques they must be always highly contextualised, not only into the local environmental situation, but to a precise historical moment and the complex social construction which originated them.

The understanding of the logic of traditional techniques' use and of their success in terms of environmental sustainability and efficacy over long periods is fundamental not only to safeguard a vast cultural heritage but as a new paradigm on which the modern re-proposition of traditional techniques must be founded.

As a matter of fact, using traditional knowledge today means to re-interpret the logic as innovative advanced knowledge and to elaborate models of technological development based on the added values of tradition: the versatility and the interpenetration of technical, ethical and aesthetic values; the production not *per se* but for the good of the community and based on the principle according to which each activity has to start up another one without waste; energy use based on cycles in constant renewal; the protection of ecosystems and of cultural and biological diversity as the fundamental principle of the economic and productive processes.

These values allowed societies, in the past, to manage ecosystems in balance, to carry out technical, artistic and architectonic works universally accepted. Traditional knowledge is a dynamic system able to incorporate innovation subjected to the test of the long term and the local and environmental sustainability.

1. Innovative use of ancient water techniques in agriculture

Prehistoric traditional techniques, which were used to build the Italian agricultural landscape, are today re-proposed in agriculture as the best practices to replenish soils, save water and combat hydrogeological instability and desertification.

The technique of the *drainage ditches* spread in the Apulia district of Daunia 6,000 years ago when Neolithic communities built more than 3,000 villages surrounded by trenches in the shape of a crescent. The ditches met environmental needs by draining water and drying some areas to be tilled during the humid season and by working as drinking troughs for cattle, humus collection and water reserves during dry season.

After this practice has been replaced by mechanized agriculture, today these places are suffering terrible inundations in winter and extreme drought in summer. On the Ethiopian highlands, on the slopes of the Rift Valley ridges, there are many villages where multipurpose ditches systems are still used to store and manage water resources, gather sewage and produce fertilizers.

The *atmospheric water condensed* inside caves or mounds of stones and the dry limestone walls are used by all the ancient societies in arid areas. Today, authentic *aerial wells*, *atmospheric condensers* producing water from vapour, are used in the desert. They produce water from atmospheric moisture according to the principles and resources of very ancient techniques.

The practice of setting *cistern-jars* full of water or calcareous masses close to the plants to provide irrigation is today re-proposed with innovative techniques which enable to overcome constraints in ancient systems through modern drop irrigation. These traditional innovative techniques are used, for example, during the processes of reforestation of arid areas, thus allowing each single shrub to be supplied with the quantity of water it needs during the phases of growing as long as the plant will get independent vegetative power. Within the framework of this family of techniques a big company elaborated an enzymatically degradable product called *dry water* which, set into the soil close to the roots, progressively transforms into the necessary water supply.

The *drainage tunnels* are underground tunnels spread over arid areas since 3,000 years and which are still working today in the Sahara Desert, in China and in Iran to supply the oases with water resources. They allow absorbing the right quantity of water for the replenishment of the environment itself. This solution could be re-proposed, also in Italy, as an alternative to the excavation of wells which lower the groundwater and deeply perforate the soil, thus causing pollution and the salinisation on the surface.

In the Sahara Desert, people are experimenting the use of techniques to relieve the hard excavation work by introducing small machines planned for the purpose. This innovative category includes the whole of *mechanical adapted tools* which range from mini-tractors for the excavation of lunettes for water harvesting to new machines for sustainable agriculture.

The re-proposition in this field of ancient techniques enables to get important successes to combat erosion and soil degradation. In southern Italy there is successful experimentation with practices such as the *grassing* and *sowing on "hard soil"*. The first consists in making the grass grow under the orchards and in the olive groves, thus it forms a protective cover to avoid ploughing which causes erosion. The second consists in sowing wheat over unploughed soils. This technique enables to protect soils, to reduce costs and to have better results than by ploughing. This practice is most advantageous during drought periods because ears of wheat grow less high and need a lesser quantity of water and chemical fertilizers.

2. Innovative use of ancient water techniques in urban settlement and architecture

Several innovative techniques coming from tradition are being experimented in urban fields. The building of most of the ancient centres followed the layout of the terracing and the water systems network. As a matter of fact, the rainwater harvesting techniques, the areas with the walled gardens, the use of organic remains for the production of humus, the passive architecture methods and climate control for food conservation and for energy saving and the practices of recycling production and food residues have been integrated and perpetuated in the very structure of the ancient centres. This category includes all innovative techniques in the *photovoltaic*, *sun warming*, *water catchment*, *composting* and *waste recycling* fields. In some advanced contexts e.g. in Tokyo, a number of industries are now proposing by law the *roofed-garden* technique in new houses where the vegetable covering on the terraced of the modern buildings, which brings to mind the hanging-gardens in Babylonia. This keeps optimal climatic conditions inside the houses, harvests water and become an area for entertainment and contemplation. The micro-solutions for city quarters and houses represent a large innovative sector in the waste recycling field. Several *mini-compost machines* to be placed inside the gardens or in common areas of the quarters have been realized to directly absorb organic waste and supply the gardens with humus. A *water compost machine* is a device set beneath the toilet bowl, which directly transforms waste into compost. *Biomass mini-reactors* which transform waste into kitchen gases as well as greater plants for heating the whole house have been also realized. Also small and large-scale solutions for sewage water have been found. In Germany, modern houses have been equipped with a *vertical marsh*, a device which reproduces the processes of water decantation and filtration still existing naturally in marshlands. The process is reproduced along the wall of the building in glass interspaces where sewage waters seep into, infiltrate and constantly recycle themselves by gravity. In Calcutta, an innovative traditional technique used on a very large scale solved the serious problem of used waters. Sewage waters, traditionally re-used in rice-fields, are today turned into a resource for irrigating and fertilising rice fields by using proper innovative *systems of sewage waters filtration and sterilization*.

A very large series of *products*, *materials* and know-how necessary to a high-quality *architecture* form a further innovative sector. The aesthetic components that we appreciate in ancient towns, the beauty of the natural materials, the comfort of the buildings and spaces, the organic relationship with the landscape are due to the intrinsic qualities of the traditional techniques and to the search for the symbiosis and the harmony embedded in the local practices. In this field, experiences of firms re-proposing market materials and processes derived from tradition, such as lime, natural clay and pozzolana, both for rehabilitation and new constructions are now largely spread.

3. Production and landscape

Local knowledge is a propulsory and economic factor in different production sectors. Situations in which tradition persists, and its role in society and economy is consolidated and stabilised, can be proved specifically in the more technologically advanced countries and sectors. The values of tradition, manufacturing practices and the craftsmen's skills are the basis on which is founded the great added value of productions of enormous economic importance for many modern countries.

In particular the *typical food production* such as oil, cheese and wine safeguards both the aesthetic and environmental quality of the landscape, since the old production systems are possible thanks to the maintenance of traditional techniques of soil management. In this same field, the growing dissemination of organically controlled agricultural productions and meats shows even more interest in traditional techniques of husbandry and breeding.

These considerations are true even in other sectors ranging from *quality articles* and *haute coûture* to real estate and the building market. The most refined production houses are proud to list the traditional techniques they use in their manufacturing methods and the success of so many companies is actually due to the capacity to incorporate tradition into their processes or to be located in traditional environments or historical town centres.

In the regions of Valais in Switzerland, in the Loire Valley in France and in Tuscany in Italy, the maintenance of traditional techniques in agriculture has ensured the stability of high quality landscapes. The major difficulties and burdens due to the use of more expensive labour techniques can be overcome thanks to the great value of the product that can be obtained with these techniques, and in these cases, the wines.

In Valais, the water catchment systems from the sources of springs and from glaciers which, through little surface canals called *bisse*, allow mountain slopes to be irrigated by gravity on a higher level than the stream's natural course. A similar technique is today re-proposed in Tibet with innovative methods to *protect glaciers* which are in danger because of global warming. In the Loire Valley, the traditional technique of the *cave-dwellings* and of the excavation of subterranean caves is maintained in order to preserve each single metre of surface area, precious for high-quality wine production and, in order to organise wine cellars with a perfect microclimate for the production of that product. In Tuscany, wine production provides the economic resources necessary to preserve from destructive transformations one of the most wonderful agrarian landscapes, consolidated and affirmed over the centuries.

Thus, it is wrong to consider traditional knowledge as marginal compared to the great economic and technological processes under way. Even from a quantitative point of view, their use still supports most of humankind which is distributed throughout the less industrialized countries. Paradoxically, in these places where traditional techniques are still used in a massive way, these are considered by the modernist thought as a phenomenon of backwardedness, whereas, in advanced countries, they create an image of desirability and provide added value.

What we recognize as tradition is not a static and immutable condition but a dynamic system which evolved by making innovative aspects so much an integral part of it that sometimes becomes difficult to interpret. For instance, nowadays, everyone considers the Mediterranean traditional space as one which cannot be separated from olive and tomato cultivation; however, both of them were introduced: the olive in ancient times and the tomato after the 16th century. It is commonly thought that American native peoples are associated with the use of horses. However, the latter arrived on the continent only after the Europeans' arrival. American nomadic people used them immediately and, during the period of colonisation of the American Far West, the horse was already an indissoluble component of the local tradition.

Medieval historical houses persisted in Europe thanks to the fact that this architecture was restored and adapted, with the hygienic facilities required for modern life. The more this is done with respect for tradition and authenticity, the more it requires advanced innovative and appropriate capacities and creates added value as well as economic effects.

The same consideration is true for entire historical centres and rural landscapes which are doomed to perish and be abandoned when they are unable to incorporate the innovations they need in order to function. In Liguria where in the Cinque Terre region there is one of the largest systems of *terraced slopes* in the Mediterranean, this traditional practice that protects the soils, catches and channels the waters, has been perpetuated through innovative agricultural mechanization. Agricultural work on terraces is hard due to tiring transport systems which are operational only on foot. Traditionally there were techniques of transport by means of sledges drawn up the hill by ropes. Already at the beginning of the century these were substituted with mechanical funicular systems on rails. The same technique is re-proposed today with appropriate *monorail* systems that enable the ascent of the slope without disturbing the landscape or the ecosystem.

In Botswana, the *motswelo* is a traditional form of cooperative and bank, which usually gathers together between 15 and 20 people who join the group voluntarily and bring what they can provide: money, produce of the land or work. Thanks to this ancient system it is possible to save money, to obtain interest-free loans and funds to start important activities. For instance, it is possible to organize the production and the sale of traditional beer, the cultivation of new lands or the restoration of villages. Production and trade are considered as the equivalent of money deposits. All the profits are given, in turn, to the members of the motswelo who use them to fund one of their activities or other social needs such as feasts, marriages or the purchase of a house. These practices are today reproduced by the experience of *Ethical Banks* and micro-loans which are an innovative means to recover traditional social habits.

In Burkina Faso *zai* is a particular traditional technique able to regenerate highly degraded soils. The soil is dug with holes that fill up with water in the humid season and are used as dump-sites for rubbish and manure in the dry season. This practice attracts termites that digest rubbish, thus its absorption by the plants' roots. Furthermore, the tunnels dug by the termites increase the soil's porosity. Seeds are then sown in the holes, giving very high crop yields. Innovative practices which promote original forms of symbiosis between humankind and animals or micro-organisms are today re-proposed to rehabilitate degraded soils or soils made suitable for human living in extreme areas. In the Balearic Islands, *feixes* are a traditional system of agricultural organization according to which the plant roots are irrigated directly from underground without wasting water. The tilled fields are separated by superficial drainage channels into which water flows. From these a network of channels made of porous materials and covered with a layer of seaweed branches out under the cultivations. Thus, channels release the quantity of water to the tilled soil according to seasonal and climatic needs. The technique is re-proposed in hydroponic cultivations and for planning space stations.

4. The competitiveness of the past

Thus, we must speak about an on-going construction of tradition. To guarantee its future does not mean to reduce or inhibit capacities of innovation, though this idea has been undergone over time to critiques and biases and weakened by the lack of communication and exchange of successful experiences as well. With emigration and the dramatic transfer from traditional habitats into new urban agglomerations, the rapid abandonment of the agricultural sector by large segments of the population and with the superficial suggestion of the absolute superiority of modern technology, the process of conservation and dissemination of knowledge is interrupted and lost. On the contrary, the good welfare conditions of people favour social cohesion, confidence within cultural identity and enable the safeguarding of traditional systems through the guarantee of a high remuneration of the work necessary to maintain them. It explains the apparent paradox of those rich countries which were able to maintain high levels of traditional techniques, and succeeded in paying for the necessary efforts with a great increase in product value. Thus, we can state that tradition is a feature of 'successful modernity', capable of getting benefits and values from it. To re-propose tradition by resuming its historical relationship with people's innovative and creative power is decisive to safeguard landscape and realize security and sustainable futures.