Education for Sustainable Development in the Mediterranean: with Emphasis on Water Education

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Recently, several initiatives have been conceived at a global level to foster education for sustainable development and, more specifically, everything related to water. One of them is the Mediterranean Strategy on Education for Sustainable Development (MSESD), approved by the Union for the Mediterranean (UfM) ministers in 2014. This initiative, of great importance in the geographical context both because of the immense vulnerability of our sea to water scarcity and climate change, has been included in different programmes. Sustainable development is a relatively recent phenomenon that features challenges that have not yet been overcome. It is believed that such problems cannot simply be managed with rapid technical solutions but must be considered in a set of educational, cultural, communication and also scientific aspects. To this end, the use of the tetrahedron configuration comprising the following four plans/objectives is proposed: personality development and fulfilment, professional skills for cooperation in decision-making and action, knowledge generation and management, and interaction with the citizenship/society. In an era characterised by post-truth policies, an education with a solid foundation becomes more necessary than ever.

Preamble: Recent Developments

The Mediterranean Strategy on ESD and its Action Plan

Some months ago (8-9 December 2016) a very successful Ministerial Conference was held in Nicosia (Cyprus) on the Action Plan for Education for Sustainable Development (ESD) in the Mediterranean organised by the Ministry of Education and Culture of Cyprus with the scientific support of the UNESCO Chair on Sustainable Development Management and Education in the Mediterranean/University of Athens and the technical support of the Mediterranean Education Initiative for Environment and Sustainability Network (MEdIES)[1] of the

1. http://www.medies.net/main1.asp

Environmental Education Project in El Nassr Area, Egypt (EU Neighbours South).

Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE).[2] The Action Plan is meant to facilitate the implementation of the Mediterranean Strategy on Education for Sustainable Development (MSESD),[3] which was approved by the Union for the Mediterranean Ministerial Meeting of Athens in 2014 in order to promote ESD in formal, non-formal and informal education in all member states.

The Action Plan includes key recommended activities, with indicative roadmap under each priority area of the MSESD; regional programmes/projects of an institutional/non-thematic nature; priority thematic issues for region-wide programmes; and indicators of progress and monitoring.[4]

The countries also agreed on the establishment of a Mediterranean Steering Committee, with representatives from Mediterranean countries and regional/international organisations (UNESCO, UN Environment/MAP, UNECE, UfM, LAS), which will be responsible for promoting and monitoring the implementation of the MSESD and its Action Plan in the region. Cyprus chairs the Committee, while MEdIES of MIO-ECSDE and the UNESCO Chair on SD Management and Education in

2. http://www.mio-ecsde.org/
3. http://ufmsecretariat.org/wp-content/uploads/2014/05/Mediterranean-Strategy-on-Education-for-sustainable-development-.pdf
4. http://www.esdmedcyprus.pi.ac.cy/files/zero_action_plan_for_esd_in_med_region.pdf

the Mediterranean of the University of Athens were asked to continue their role holding the Secretariat, also providing scientific expertise under the guidance of the Committee. The countries will appoint Focal Points within the Ministries of Education, which will meet again in Cyprus to review the progress on ESD in their countries. The meeting will be supported by the EU-funded programme SWIM and Horizon 2020 Support Mechanism[5] and by the Ministry of Education and Culture of Cyprus and will be held back-to-back with a Mediterranean Meeting of Members of Parliaments (Circle of Mediterranean Parliamentarians for Sustainable Development – COMPSUD),[6] the Circle of Mediterranean Journalists for Environment and Sustainable Development (COMJESD)[7] and Stakeholders for Sustainable Development (21-22 November 2017), in which the Focal Points will be invited to participate in a special joint session at the Parliament of the Republic of Cyprus.

The ministers in charge of Water of the Union for the Mediterranean (UfM) and other Heads of Delegations emphasised the unique features of the Mediterranean region, which makes it particularly vulnerable to water scarcity and climate change

It is notable that the MSESD and its Action Plan have already gained international recognition and support: (a) they have been integrated into the Mediterranean Strategy on Sustainable Development (2016-2025) of the Barcelona Convention-UN Environment/MAP (http://www.unep.org/unepmap/who-we-are/map); (b) the EU, under the SWIM and Horizon 2020 SM, supports its capacity-building activities at national level (e.g. in Algeria, Jordan, Palestine and Tunisia); (c) the UfM Secretariat included a report on the progress achieved on the MSESD and its Action Plan since 2014 in the agenda, the working documents and the conclusions/recommendations of the 1st meeting of the UfM Working Group on Environment and Climate Change (Barcelona, 14-15 March 2017); and (d) UNESCO acknowledged the importance of the Action Plan in the recent Review Forum for the Global Action Programme (GAP) on ESD (Ottawa, 6-8 March 2017) and expressed its intention to propose this example as an inspiration for similar regional ESD strategies in other regions.

The Water Agenda in the Mediterranean

Even more recently, on 27 April 2017, the ministers in charge of Water of the Union for the Mediterranean (UfM) and other Heads of Delegations attending the Malta Ministerial Meeting on Water agreed on a new Water Agenda for the region to further enhance regional cooperation on water. The ministers recalled the importance of the Paris Agreement, re-affirmed their commitment to the 2030 Agenda for Sustainable Development, and emphasised the unique features of the Mediterranean region, which makes it particularly vulnerable to water scarcity and climate change (http://ufmsecretariat.org/wp-content/uploads/2017/04/Ministerial-Declaration-on-Water_Union-for-the-Mediterranean.pdf).

The UfM Water Agenda is expected to provide a workable regional water policy framework that offers a means for substantial and measurable positive impact towards sustainable use and management of water resources in the region. It will also contribute to meeting the UN Sustainable Development Goals (SDGs)

5.http://www.swim-h2020.eu/
6. http://www.gwp.org/en/GWP-Mediterranean/WE-ACT/Country-Water-Partnerships/COMPSUD/
7. http://www.gwp.org/en/GWP-Mediterranean/WE-ACT/Country-Water-Partnerships/COMPSUD/

and targets, in particular SDG 6 on Water, and will facilitate the promotion of comprehensive plans and projects in UfM countries that are suffering from water scarcity, which in some cases is exacerbated by significant refugee and migrant influxes as well as by other emerging factors. The role of education and public awareness in promoting the Water Agenda in the Mediterranean was emphasised by many ministers and confirmed.

Education has a responsibility to be in gear with 21st century challenges and aspirations, and foster the right types of values and skills that will lead to sustainable and inclusive growth and peaceful living together

The aforementioned two ministerial meetings clearly place education, and in particular ESD, at the centre of the tools for addressing existing and emerging global and/or regional/Mediterranean challenges, such as water scarcity and water-related risks, which are also closely linked to climate change. Furthermore, they fine-tune the regional agendas to the global efforts for upgrading the role of education as a contributor to the building of a new vision of sustainable global development (UNESCO, 2015). Irina Bokova, Director General of UNESCO (2009-2017), has insisted that "...a fundamental change is needed in the way we think about education's role in global development, because it has a catalytic impact on the well-being of individuals and the future of our planet. Now, more than ever, education has a responsibility to be in gear with 21st century challenges and aspirations, and foster the right types of values and skills that will lead to sustainable and inclusive growth and peaceful living together."

In the present article, an attempt is made to present a summary of the background and key elements of ESD and its implementation through education systems and examine, as a case study, water and "water education" as an important but integral part of ESD. Obviously, the same or a similar approach could be followed for other "sectors" or "challenges", such as energy, material flows, waste, the oceans, etc., or more cross-cutting issues such as climate change.

Education for a New Era in the Mediterranean

Education and education institutions, as we know them today, have undergone in the Mediterranean and the entire world significant transformations throughout history. However, they still maintain two apparently divergent but coexisting characteristics: they are effective laboratories of new, innovative and sometimes revolutionary ideas, while simultaneously being custodians of tradition and quite often part of the so-called social, economic, cultural and eventually political "establishment". The co-existence of these two characteristics may act differently depending on the local conditions and circumstances: they may create serious, internal tensions, or may act as drivers of revitalisation/reorientation and synthesis necessary for progress, within and beyond the education sector.

Sustainable Development (SD) (on which we will further elaborate) has been identified, almost from the beginning, in dual terms: as one of the greatest opportunities but also a major challenge for our societies and, of course, for our education system in the 21st century. The challenge is greater in the Mediterranean region because of old, accumulated and newly-emerging problems on many fronts.[8] SD

8. https://www.atkinson.cornell.edu/Assets/ACSF/docs/research/20140925-GWP-MED-PUBLICATION-ONLINE.pdf

apparently represents the eternal aspiration of human beings not simply to address their needs but also in "realising" their "dreams" for the present generation, while ensuring a good future for their descendants, if possible "forever and ever"!

Despite efforts at all levels and increasing awareness-raising among part of the population, unsustainable practices not only continue but in many cases are still increasing throughout the world and definitely in the Mediterranean region

It is not entirely surprising that our generation did not perform well in dealing with SD, because it was the first one ever to do so on an Earth holding more than 6 billion people and also the first one addressing the natural resources as "finite", and the carrying capacity of the system as "limited". This occurred in the time of one generation that had no proper preparation, education and "culture" for such dramatic change, while it has benefited from (if not been "spoiled" by) considerable improvement in public health, public services, communication and a large number of technological innovations. Therefore, despite efforts at all levels and increasing awareness-raising among part of the population, unsustainable practices not only continue but in many cases are still increasing throughout the world and definitely in the Mediterranean region, resulting in widening social, economic and environmental inequalities, increasing biodiversity loss and environmental degradation, expanding extreme poverty, misery, suffering and marginalisation of billions of people and limiting the quality of life, even within countries considered "prosperous". These phenomena, in turn, erode ethical values, the social fabric and the cultural capital, all of which are fundamental for SD and, if lost, are very difficult to restore or regenerate.

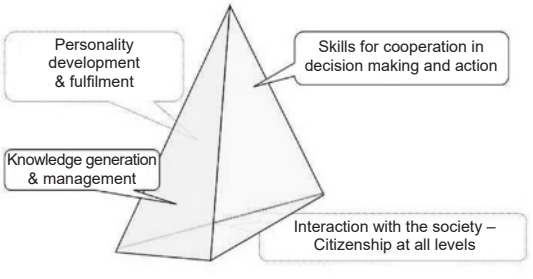
It has been repeatedly stated that our education systems are critical for approaching SD as they may equip learners with the knowledge, skills, attitudes and overall competences needed to re-orient, change and revisit consumption and production patterns, and symbols of success. This "change" may also include adapting, maintaining or restoring appropriate social behaviours, structures and practices of the past.

Schools and education institutions in general are, therefore, strategically positioned to address SD issues, options and challenges, as they are called to teach and prepare future generations of the general public and professionals, while producing and/or applying innovative, socially accountable and ethically responsible and appropriate research and technology.

Education for Sustainable Development: Employing "Tetrahedron" for Better Visualisation of Key Concepts

In Figure 1, we start introducing and using the "tetrahedron" configuration for the presentation and visualisation of a series of concepts, principles and even practices important for ESD and the key challenges related to water in the Mediterranean region. It is notable that the vast majority of molecules and crystals constituting the material world on which we depend have "tetrahedron" form structures:

Figure 1. The goals of education in addressing the new era



from water to carbon and many basic minerals. In a different publication we have explained the advantages of using these representations for introducing concepts in teaching/learning processes (Scoullos, 2017).

The "tetrahedron" represents the four major functions or rather "goals" of education of our days in order to provide learners with the necessary skills for good personal and professional lives. These are: personality development and fulfilment; professional skills for cooperation in decision-making and action; knowledge generation and management; and interaction with the society/citizenship at all levels. It is notable that these four goals directly respond to the four objectives of education/learning as a whole, as defined in the Delors Report (1996), namely "learning to learn", "learning to be", "learning to collaborate with others" and "learning to act", which formulate another important "tetrahedron" (see Figure 2).

Why Do We Need Water Education? What Kind of Water Education Do We Need? And What is its Relationship with ESD?

The first question is easily answered. Summarising the arguments, one could reply:

In order to achieve the much needed water security and address a number of related challenges, including protecting vulnerable water ecosystems, mitigating the impacts of water-related hazards such as floods and droughts, ensuring access and sanitation for all (remembering that many millions in the Mediterranean still lack proper access to safe water and sanitation) and managing water resources in an integrated and equitable manner.

Through water education we are able to:

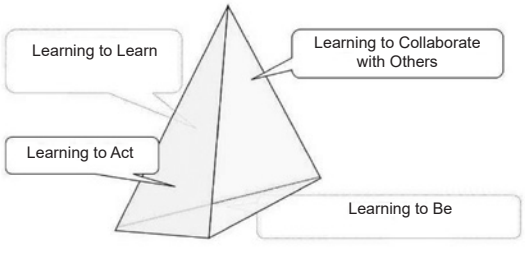
- build the rights for the non-represented (environment) and future generations;
- enhance the responsibility of individuals and societies to respond to demand management (water economy) and enhance the cost recovery policies;
- train people in dialogue, the basis for the consensus-building and participation processes needed for IWRM.

On the second question, the "kind" of education we need, one could argue that it should be an education that capitalises on the thesis that "water problems cannot be solved by quick technical solutions alone. Solutions to water problems require the consideration of cultural, educational, communication and scientific aspects…" (UNESCO IHP).

In other words, this education should recognise that water is critical for life.

- Against that, in primary and secondary education water is presented in a rather fragmentary way with little hands-on and connection to real life experiences; while in
- tertiary education water is traditionally dealt with in sectoral approaches largely in departments of civil or sanitary engineering, hydrology, agriculture, water/environmental chemistry, etc., with little, if any, inter-connectivity and limited interaction with ecological, socioeconomic and governance systems or cultural, aesthetic and other considerations. In vocational education most technicians dealing with water issues have a rather limited exposure to overall management and SD issues.

Figure 2. The four objectives of education according to the Delors Report



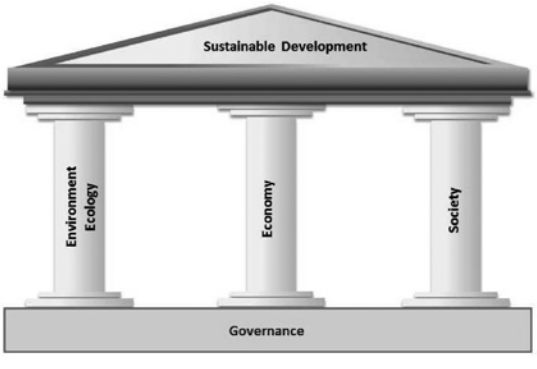
To effectively address the aforementioned problems, a new approach to water is needed, at all levels of education and training, by integrating SD principles and considering inter alia water security, IWRM and the entire water cycle (including natural and non-conventional water inputs). Therefore, water education is becoming an integral part of the ESD, employing its teaching/learning methodologies, also in accordance with the recommendations of the post UN Decade of ESD and the Global Action Programme of UNESCO (DESD/GAP UNESCO). This is the answer to the third question.

At this point, it may be useful to remind readers of the conceptual transition of SD from the "three pillar" approach and visualisation (Figure 3) to a "non-pillar" one represented by a tetrahedron (Figure 4). Water is fundamental within sustainable development and therefore needs to be properly reflected within ESD.

Sustainable water management should also follow the wide SD dynamics, in which appropriate water governance is a prerequisite for achieving SD.

It should also be remembered that education itself is a major tool for governance, and water education needs to duly recognise and explain the role of governance. In combining Figures 4 and 5, we obtain a "double" tetrahedron (and "hexahedron"), which represents the key contents/categories of ESD.

Figure 3. The "traditional" consideration of SD based on three pillars: Ecology, Economy and Society. Governance has been placed here as the prerequisite "foundation".



A Few Key Elements of Water Education and Capacity-Building

Based on the ESD context, water education needs to correspond to all aspects of SD, the environmental, economic and societal aspects of water issues. It should also serve as an "entry point" to address multiple global sustainability challenges and opportunities.

Universality: Water education applies to everyone. Even if water priorities vary from country to country, every individual needs to be equipped with the relevant basic knowledge, skills, values and behaviours to deal with water in a sustainable way.

Multi-levelled, multi-targeted and lifelong: Water education should make use of all education channels to effectively deliver its "water messages", including the formal, non-formal and informal learning channels as well as vocational training.

Multi-disciplinary and holistic: Water education should avoid traditional "exclusive" sectoral approaches that deal with the other aspects of water only "marginally". Transdisciplinary and multi-disciplinary models are necessary. At university level water education should be expanded beyond natural sciences and engineering and embrace all disciplines, including humanities, law and art, among others.

Furthermore, it should be interlinked with up-to-date and state-of-the art science and engineering, especially when dealing with misconceptions and prejudice (e.g. grey/waste water). Water education need not reinvent the wheel. Worldwide, there are many good examples and initiatives that are carried out and could be used, replicated and advanced.

Figure 4. Transition from the pillar to non-pillar concept of SD: SD as a "tetrahedron" based on governance, an important part of which is education (see Figure 5)

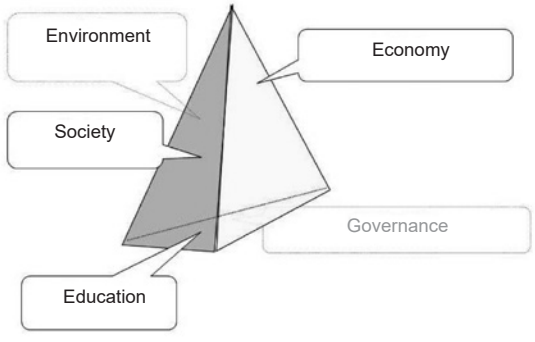


Figure 5. The elements of governance could be analysed and represented as follows, again by using the tetrahedron

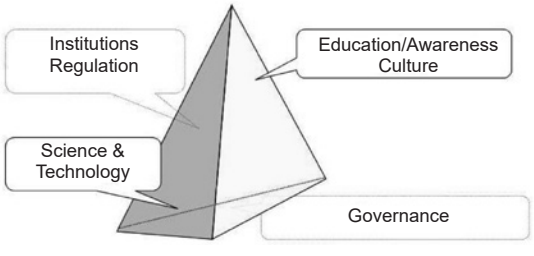
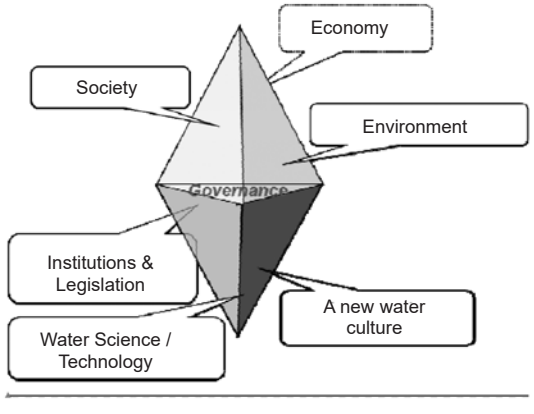


Figure 6.Water-related ESD content as a "hexahedron"



Water education within ESD should follow the objectives for achieving sustainable water management that have recently been "summarised" by UNESCO in support of the implementation of the relevant Sustainable Development Goals (SDGs) and SDG 6 in particular, as follows: "Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all."

The responding specific learning objectives are in the cognitive, socio-emotional and behavioural domains. The cognitive domain comprises knowledge and thinking skills necessary to better understand SD, SDGs and the challenges in achieving them. The socio-emotional domain includes social skills that enable learners to collaborate, negotiate and communicate in order to promote SDGs as well as self-reflection skills, values, attitudes and motivations that enable learners to develop themselves. The behavioural domain describes action competences. It is notable that additionally, for each SDG, indicative topics and pedagogical approaches have recently been outlined by UNESCO (2017).

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Through the aforementioned pedagogical approaches and ESD, it is hoped that the new generations will be able to more efficiently face a number of global challenges related to water, all of which are of high complexity since they can be seen both as "root causes"

and as "results" of the "anthropocene" – the era that started when human activities became significant with a global impact on Earth's ecosystem and geology (Waters et al., 2016). ESD is supposed to provide the necessary element for breaking the vicious circle (Figure 7). To do this, ESD should help build a new global vision and comprehensively address the complexity, uncertainty and inertia that inhibit effective governance and threaten security at all levels (see, for example, the "nexus of water, energy, food and ecosystem security", yet another tetrahedron given in Figure 8; Scoullos and Brouma, 2014).

Figure 7. The vicious circle of global challenges

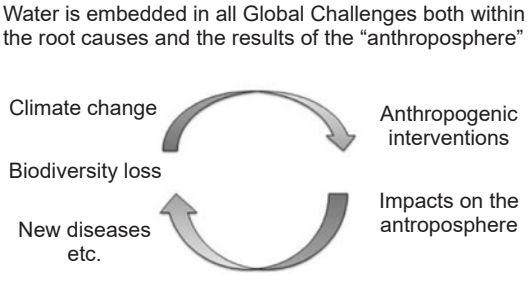
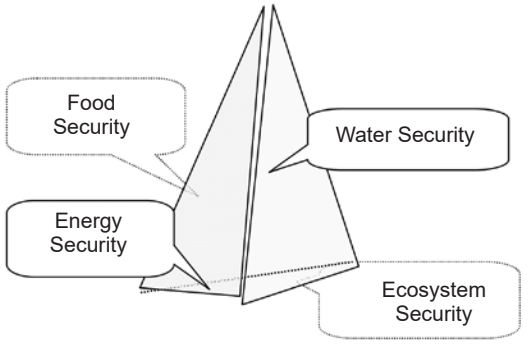


Figure 8. Nexus of water, energy, food and ecosystem security, yet another tetrahedron



Shaping Appropriate Institutions for Water Education within ESD

In an era frequently characterised by "post-truth" policies when for all our factual questions on water and beyond there seems to be a "Google-search answer", the role of education and education institutions, from primary schools to universities, needs to become even more clear, critical, value-led and (depending on the education level) diversified. As has become obvious from the above discussion, the water education/ESD approaches need to be integrative, transformative and envision change (Scoullos, 2015) (UNECE). Educators at all levels are called on to build competences, inspire courage and develop leadership skills in students; in other words, they are called on to sharpen the mind and strengthen the "heart and guts", particularly of the younger generations.

Experience has shown that successful examples are usually the result of rather long-lasting processes that have been developed in various ways, and steps made either in sequence or simultaneously

An education institution that delivers good water education within the framework of ESD should not be understood as a "prototype" to be faithfully replicated by others. Experience has shown that successful examples are usually the result of rather long-lasting processes that have been developed in various ways, and steps made either in sequence or simultaneously. Historically, progress has quite often been achieved by responding to "external" drivers: deriving, for example, from water scarcity or climate change. In some cases, "new" systems were introduced as an internal reaction/evolution to provide alternatives to "education crises" while in other cases progress was the result of the introduction and/or "integration" of a variety of new topics in updated curricula. Many of the new sub-

jects are of an interdisciplinary nature. Many changes were the result of combinations of all the above in a dynamically evolving transformation process, fuelled by increasing awareness of professors and students about the limitations of traditional disciplinary courses and the need to penetrate effectively into the science/policy, interface, enhancing the meaningful interaction with the social (economic and cultural) environment and economic actors at various levels (from local to international).

Many of the above considerations are summarised and embedded in what is frequently referred to as the Whole Institute Approach (WIA), depicted again by employing the tetrahedron (Figure 9), which allows for the combination, according to needs, of different "degrees" of the following:

1. Content and message for water in the curriculum. This concerns elements from many disciplines such as the balanced approach of the content of SD: scientific knowledge of water including economy-society-environment and the ways/tools to address them: institutions; innovation/science and technology; education/culture; and developing competences of students in a balanced way in order to acquire and use the needed knowledge but also learn to experiment and adopt critical attitudes towards all important aspects of water, throughout production and consumption and the needed management approaches.

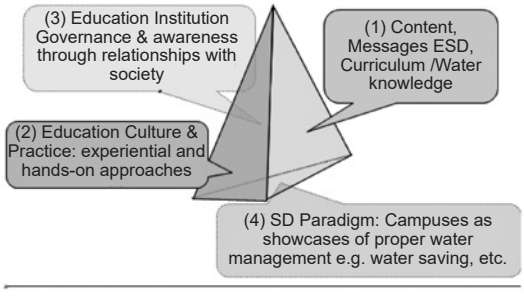
2. Education culture and practice methodology. This concerns elements such as competences in cooperating with other disciplines by placing the right questions and by envisioning what one discipline could expect from the others; the variety in education techniques and methods (experiential, student-centred and participatory teaching learning); research and experimentation as part of the education paradigm of the education institutions themselves; and the wider water education culture that normally makes up ESD principles and methods.

3. Governance, internal processes and external relationships with society. This makes the institution a "showcase" of the needed change. It concerns elements, such as the composition and operation of the education community, which touch upon the democratic processes, accountability and transparency; the operation/administration and leadership model; internal quality criteria; and the effective opening of the education institution to society and the interactions with local community and culture.

Through this function, the involvement of local society, municipalities and other stakeholders could be enhanced (a) by addressing local/regional water-related challenges in an integrated way and (b) by encouraging and assisting local authorities, enterprises, etc., to develop appropriate ESD courses/training/capacity-building and awareness activities on appropriate aspects of water management.

4. The applied water/SD "showcase". This concerns elements such as the economy of water, its "reuse" and rainwater harvesting; water management in the "green" spaces, gardens and food production, etc. The most important is the effort to obtain the maximum possible results within the existing infrastructure and feasible administrative conditions.

Figure 9. The Whole Institute Approach (WIA): an entry point for good water education



Concluding Remarks

The development of ESD, through the MSESD and its Action Plan and the new mobilisation of the countries of the Mediterranean region on water as well as the various programmes and projects supported by various donors, such as the Horizon 2020 initiative and the UfM/EU-funded programme SWIM and Horizon 2020 SM (a project to contribute to sustainable use of water and marine depollution), present a set of new opportunities for the development of water education in the Mediterranean, as an integral part of ESD. It is notable that within the Action Plan for ESD a series of themes are directly connected to water (see Table 1).

Table 1

Mediterranean-specific themes for the Action Plan include:

- Water
- Gender
- Solid waste (particularly litter in aquatic environments)
- Climate change
- Water safety and risks, water-energy-food-ecosystems-health nexus
- Capacity-building and vocational training in water management
- Enhancement of links between formal and non-formal education, especially in the Southern Mediterranean countries after recent political developments
- Networking
- The refugee crisis in the Mediterranean
- Whole Institute Approach
- Higher education curricula and open data handling

Many examples of excellent water education/ESD initiatives exist in the region and some of the most prominent, such as the following, have been jointly developed by MEdIES/MIO-ECSDE and GWP-Med, with support from private (e.g. Mission Water) and public (e.g. Government of Malta) sources:

- Alter Aqua project on Non-Conventional Water Resources (for non-formal and vocational training)
- Hydria project on water wisdom of the past, around the Mediterranean (non-formal and informal learning)
- Malta Water Conservation Awareness Centre

What is badly needed is capitalising on what has been achieved and ensuring continued, even modest, funding for regional Mediterranean and national actors to safeguard the progress, promote and, if needed, "re-connect" the thread of the relevant ESD and water education as the most effective cost-efficient tool for the sustainable future of our region.

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