

MANIFESTO: EARLY START LEARNING AND LIFE-LONG LEARNING MEET SUSTAINABLE RIPARIAN ZONE AND HUMAN WELL-BEING

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Riparian zones for multiple and sustainability benefits

As the world faces increasing environmental degradation and associated biodiversity loss as well as, climate change, riparian zone managers are challenged to address and mitigate pressures leading to riparian degradation as well as undertake restoration activities and conservation for their sustainable management. Increased intensification of agriculture, new settlements in the floodplains and hydroelectric power production are some examples of pressures that can degrade riparian zones and the health of associated watercourses. These activities or developments have been performed generally with the aim of improving conditions for humans. However, restoration activities envisaged by some key policy documents e.g., European Union Green Deal (EC, 2019) and riparian ecosystem conservation activities by some others e.g. Habitat Directive (EEA, may appear contradictory to development and can lead to tensions. **Early and life-long learning** is required to inform solutions that minimise tensions and achieve protection of the multiple benefits that functional riparian zones provide. Teachers and educators are at the front-line to help transfer the knowledge that can contribute to the understanding (CESI, 2018), critical thinking and skills set of students and professionals such as managers, planners and policy makers, to better inform behaviour, policy and actions for sustainability of natural systems such as riparian zones with benefits for human well-being.

The COST action Converges clearly recognised that a “knowledge co-creation triangle” engaging scientists, managers with stakeholders and policy-makers is required to enhance riparian zone management. Moreover, fostered knowledge transfer among all these groups and knowledge co-creation are envisaged. Thus, knowledge about riparian zone importance for nature and humans should reach all people, not just riparian zone experts. Since new knowledge about nature and ecosystem functioning is emerging daily, teachers and other educators have a central role to play in this knowledge transfer.

This manifesto is a call to action to help teachers and educators, provide adequate and effective information and training to enable protection and sustainable management of the environment including riparian zones. As it is impossible for managers to solve the many issues related to riparian zone management alone and immediately, interventions are suggested at different educational levels that could start tomorrow (short term) and help establish a sustainable approach for the future (long term). These insights are mostly based on experiences in higher education where riparian zone managers are educated. However, other education levels are equally important. As new knowledge is emerging daily, life-long learning related to the importance of the riparian zones and their management is also a key pillar of sustainability and human well-being.

A draft of this manifesto was discussed by educators from several European countries during the COST Converges action. The authors hope that their contribution will feed into policy making and education, to ensure that the described approaches will be applied and educators supported. This manifesto is an overview of the opinions and feedback shared by the participants and experts

involved. It is a result of this exercise and cannot be attributed to the opinion of a specific expert, organisation, or Member State.

The overall vision of the manifesto is for 'early and life-long learning'. The education framework requires a two pronged approach; 1. cultivating awareness and ecological understanding, and 2. professional training and life-long learning. It needs to encompass traditional education institutions but also a wide spectrum of learning opportunities for the public.

Riparian zones in contemporary education programmes: an overview

The Chapter is prepared based on the answers provided by 51 persons for 37 education programmes at third (university) levels in 17 European countries. Answers were provided through an e-questionnaire titled "Riparian systems: What is taught?" between 8 and 22 March 2022.

Degree programmes (e.g., bachelor (BSc), master science (MSc) and PhD) in higher or third-level institutes are the main means by which knowledge related to riparian zones and their management is transferred to managers and other professionals dealing with environmental management, planning, policy and research. However, sustainable management of riparian zones requires an interplay among policy-makers, scientists, managers and stakeholders which should help co-create knowledge (Urbanič et al. 2022).

Riparian zones are considered in several contemporary education programmes across Europe and in varied disciplines (natural science, engineering, planning, agriculture, forestry) or subjects (botany, instream ecology, vegetation ecology, hyporheic zones, water management, legislation, hydraulics and sediment transport, geomorphology). However, these programmes are usually not fully focused on riparian systems and therefore the subject is only considered and discussed in certain modules, e.g. geomorphology, ecology.

Education on riparian zones is undertaken in both lectures in the classroom as well as in the field. However, field experience and practical training relating to the management of riparian zones are only occasionally included. Additionally, it is not clear what type of riparian zone conditions are considered in the field work: natural or degraded. A range of degradation conditions needs to be considered for effective training in management and restoration approaches.

The teaching approach is often interdisciplinary, at least in part. This is required if graduates are to address the complexity of riparian management for their multiple benefits. Although most aspects of riparian zone science appears to be well covered and well-integrated into the existing programmes, management principles are often just superficially covered. This may in part relate to the fact that the tuition is delivered by academics who may not have the practical experience of riparian zone management. Furthermore, policy and legislation related to riparian zones are only poorly covered in

most university programmes, which is in line with the lack of scientific research developing the social dimensions of riparian areas (Dufour et al. 2019). Generally, only policy and legislation relevant to the specific discipline or subject area are covered, e.g. Floods Directive in Engineering, Habitats Directive in Environmental Science, rather than the full suite of relevance to riparian zone management, e.g. water quality management, spatial planning, agricultural policy, energy policy and nature conservation policy.

Effective education for sustainable riparian zone management

Effective education requires skilled teachers to confidently teach riparian zone science and management, people interested in ‘early and life-long learning’ and interdisciplinary high-level education programmes that provide the basis for better informed riparian zone management.

Let’s start teaching about riparian zones in kindergarten

People's awareness about the relationship between the riparian zone conditions and human well-being needs to start at an early age and to be honed through the education system. The interventions listed below would significantly contribute to this goal:

1. Develop an education strategy with a clear vision on how to convey knowledge and promote awareness on riparian zones across education levels from kindergarten to university and beyond through life-long learning.
2. Adopt the ‘Early start learning’ principle. Students should start to learn about the riparian zone animal and plant life and their importance in kindergarten. Riparian zones could become the location of the outdoor classroom.
3. Incorporate knowledge on riparian zone importance and management including field experience in training programmes for teachers of primary to second-level students.
4. Use extracurricular activities to create awareness and knowledge of riparian zones, as the time available in the curriculum is often limited at all educational levels. For example debating and other such local activities could contribute to awareness generation and sourcing of information on riparian zones. These activities have proven to be of benefit for students, as they provide them with new insights into observed issues and options for problem-solving.
5. Support teachers with refresher training and adapted teaching materials (videos, books, leaflets, etc) to enable them to teach and inspire students about the importance of riparian zones and their benefits to human well-being.

Higher-level education: improving the basis for sustainable riparian zone management

Sustainably managed riparian zones for the multiple benefits that they can provide are crucial for human well-being. Education programmes related to riparian zones should cover riparian zone science, management principles and practices and all relevant legislation directly or indirectly related to riparian zone conditions. The following interventions would enhance training for riparian zones management:

1. Develop specific programmes or modules for riparian zone managers. We need professionals who have good knowledge about riparian zones and know where and how to seek and use new knowledge as it emerges.
2. Integrate field experience that covers varied riparian zone conditions (from near-natural to degraded) and varied riparian zone types (floodplain, valleys) into the various programmes.
3. Develop specific modules that provide insight into all relevant policies and legislation of relevance to riparian zones.
4. Develop flexible study programmes and modules that incorporate new emerging scientific, management and policy knowledge.
5. Ensure that the programme modules educate about the multiple riparian zone contributions and benefits (ecosystem services) to human well being including how to capitalise on those benefits and address trade-offs.
6. Better integrate the experience of managers into study programmes through their involvement in the design of programme curricula and also in the delivery of components related to riparian zone management in the classroom and field (e.g. site visits) to provide insight into real life challenges and examples of good practices.
7. Integrate riparian zone management case studies under the supervision of the riparian zone manager into the programme curriculum.
8. Invite riparian zone policy-makers and managers to talk with students and provide opportunities for work placements to foster hands-on learning as part of project centred education.

New knowledge is emerging daily

New knowledge will continue to emerge from research and the challenge is to ensure it is integrated into education programmes at second and third level. The following interventions would enhance new knowledge transfer to students:

1. Innovate within the curriculum by building in elements of critical thinking, e.g., European values, conflict resolution etc., as part of existing courses and activities. This will encourage students to seek up-to-date knowledge needed to address these issues.
2. Enrich the curriculum and teaching /pedagogical approaches with online tools (e.g. social media, live support, smart communication). A variety of online content regarding riparian zone management across Europe and beyond is available, and such counter narratives could be part of the curriculum, as input for discussion.
3. Direct students interested in participating in activities related to riparian zones to management organisations or NGOs that offer suitable opportunities to contribute to a case study (at home or abroad). The students will be exposed to real life challenges and seek the knowledge required to address them.
4. Integrate socio-economic and environmentally dynamic views on riparian zones into discussion on riparian zone management.. Share up to date management experiences and motivate students with examples of case studies that illustrate sustainable outcomes.

However, new knowledge transfer is only feasible when teachers are supported through post-graduation education opportunities to gain new knowledge on riparian zones and emerging online tools. Here again, this requires 'life-long learning'. The following interventions would improve the knowledge and skills of teachers to confidently teach riparian zone science and management.

5. Invest in training of teachers at all levels with the support of governments and EU funds. Programmes training of teachers with input from different regions and disciplines would enable sharing of approaches and improve interdisciplinary knowledge transfer.
6. Provide opportunities for teachers at all education levels to receive new knowledge and training in relation to riparian zone science, management and legislation. Teachers must be instructed in management principles and approaches to ensure that students receive information that is appropriate and up to date. Furthermore, they should be equipped with varied examples to facilitate discussion and knowledge exchange among students. There are a variety of approaches that can be adopted from workshops and seminars to dedicated continuous professional development modules.
7. Offer post-graduate programmes for those who want to upgrade skills and change to careers dealing with sustainable environmental management.
8. Build teacher-networks. Teachers can help each other (across disciplines and regions) through discussion and sharing of experiences and approaches.

[Active learning and teaching tools offer several opportunities](#)

Traditional lecture-driven approaches need to be enhanced by “active learning” approaches (Yannier et al. 2021), e.g. interactive technologies and other strategies to engage learners and deepen understanding. Interventions listed below widen teaching approaches:

1. Discover online: the current generation of students are very active online. A wide range of valuable online content, platforms and tools are available that can be combined with traditional teaching to reinforce learning. However, as a teacher it is useful to be aware of the different online platforms that students engage in and the content they are confronted with. Teachers need to instruct students in how to deal with online content so that they can identify what is supported by science – especially in social media.
2. Diversify teaching approaches using expanded possibilities given by online tools and platforms, combined with traditional classes. This will also enhance knowledge exchange by virtual networking and even classes from regions far from the place where the teaching is originally delivered.
3. Use testimonials of former university level students: former students can be of great value when they engage with classes and provide information on how they use knowledge that was gained during their studies. Their life stories, both online and offline, can have a significant impact on the students and can also be a good opportunity to open up dialogue about real life management challenges and the application of scientific knowledge.
4. Management organisations and NGOs that focus on riparian zone management can be important partners because of their experiences and expertise. Working together with these organisations, in- and outside the curriculum, can provide real life experience of the knowledge and skills required to manage riparian zones and can offer job opportunities to students and recent graduates.

New teaching tools provide several opportunities, however, educators also need to be aware of and address the following challenges:

5. Careers relating to technologies and development are often more attractive to students than those dealing with conserved environments including riparian zones.
6. Due to extensive riparian zone degradation and lack of effective management in many parts of the world there are reducing opportunities for students to learn what constitutes a healthy, functioning riparian zone and to gain real life experience of good management practices. Experience gained in one region cannot be transposed to another region with different climatic etc. conditions.
7. As information and communication technologies know (almost) no borders, it is expected that technological progress may lead to further degradation of the riparian zones primarily because of urbanisation, agricultural expansion, and increase in economic value of land.

8. Enabling students and others to distinguish scientifically-supported and useful from false information.
9. Capitalising on digital technologies to foster the critical thinking that is needed to address effective protection and sustainable management of riparian zones.

Concluding Comments

Raising awareness of the importance of riparian zones at all levels of society is required, without which efforts to change policy and practice are unlikely to achieve the level of change required for their protection and sustainable management. In addition, our education programmes must firstly incorporate the interdisciplinary knowledge required by professionals to manage riparian zones for the many benefits they can provide to nature and society. However, they must also be flexible and innovative to ensure that new knowledge and approaches are integrated in a timely manner. Thus, this manifesto is promoting 'early and life-long' vision to address these challenges.

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