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Author manuscript

Rev Environ Health. Author manuscript; available in PMC 2019 May 22.

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Published in final edited form as:

Rev Environ Health. 2017 March 01; 32(1-2): 15–22. doi:10.1515/reveh-2016-0053.

Building multi-country collaboration on watershed management: lessons on linking environment and public health from the Western Balkans

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Abstract

Community-based watershed resilience programs that bridge public health and environmental outcomes often require cross-boundary, multi-country collaboration. The CRESSIDA project, led by the Regional Environmental Center for Central and Eastern Europe (REC) and supported by the US Environmental Protection Agency (EPA), forwards a resilience-focused approach for Western

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Conflict of interest: Authors state no conflict of interest. The views expressed in this document are solely those of the authors and do not necessarily reflect those of the Agency. EPA does not endorse any products or commercial services mentioned in this publication.

Informed consent: Informed consent is not applicable.

Ethical approval: The conducted research is not related to either human or animal use.

Balkan communities in the Drini and Drina river watersheds with the goal of safeguarding public health and the environment. The initial phases of this project give a contextualized example of how to advance resilience-driven environmental health goals in Western Balkan communities, and experience within the region has garnered several theme areas that require focus in order to promote a holistic watershed management program. In this paper, using CRESSIDA as a case study, we show (1) how watershed projects designed with resilience-driven environmental health goals can work in context, (2) provide data surrounding contextualized problems with resilience and suggest tools and strategies for the implementation of projects to address these problems, and (3) explore how cross-boundary foci are central to the success of these approaches in watersheds that comprise several countries.

Keywords

environment; public health; resilience; watershed; Western Balkans

Introduction

Organizations that focus on projects bridging environmental and public health problems through development programs often inform their approaches by forwarding resilience, or the ability of a system to ‘bounce back’ after a sizable perturbation (1) [e.g. Rockefeller Foundation’s 100 Resilient Cities (2)]. The Hyogo Framework for Action 2005–2015 recognized that risk from disaster is directly related to a cadre of vulnerabilities spanning social and environmental concerns and noted that programs must address these holistic factors in development projects (3). The project entitled “building local Community RESilience for Sustainable development in International watersheds such as the Drini and DrinA river watersheds” (CRESSIDA) (4), implemented by the Regional Environmental Center for Central and Eastern Europe (REC) and supported by the US Environmental Protection Agency (US EPA), forwards such a resilience-focused approach, which rests on sustainable watershed management approaches and a focus on cross-boundary communication and collaboration. In this paper, using CRESSIDA as a case study, we show (1) how watershed projects designed with resilience-driven environmental health goals can work in context, (2) provide data surrounding contextualized problems with resilience and suggest tools and strategies for the implementation of projects to address these problems, and (3) explore how cross-boundary foci are central to the success of these approaches in watersheds that comprise several countries.

Barriers to resilience in the Western Balkans

The political, economic, religious, social, ethnic, and cultural dynamics in the Western Balkans post-1990 paint a distinctive backdrop for resilience-based project planning (5). In addition to socio-political concerns, extreme weather events leading to catastrophic flooding in the Western Balkan countries over the past decade have stimulated considerable interest from donor countries in supporting climate change adaptation. The region has been demarcated as a notably vulnerable region (6, 7). Flood management/preparedness (8) within projects comprising broader watershed management approaches is a key area for

requested support (9). In this context, the preservation of ecosystem services that can reduce the velocity and volume of stormwater that can accumulate and cause flooding is paramount, especially where existing pollution problems can endanger communities after disaster events. Thus, the framework of adaptive community resilience is salient for efforts to enhance local and cross-boundary efforts to manage natural resources. Adaptive community resilience refers to actions that maximize the capacity of individuals or institutional, ecological, or social systems to function well during times of non-crisis and are adaptable in response to disasters, for both the short and long-term (10). Given the explicit relationship between natural disasters and public health, resilience has proven to be a useful conceptual bridge between environmental protection and human health (11). While enviro-health relationships form a critical pillar of environmental protection efforts, the links between environment and health are not always clearly understood by decision makers seeking to enhance well-being in their communities. There is a need for better ways to frame, explain, and illustrate how public health and overall wellbeing are supported by the environment (12). While “sustainable development” highlights that public health cannot be truly advanced in the long-term without safeguarding the environment (13), the interdependency between these systems may not always be evident, especially in emergency situations (14). “Systems thinking” (15) can be used to interrelate the mutual influences public health and the environment have on each other (16, 17). However, implementing programs that truly showcase a resilience-informed systems approach is complex, especially in cross-border watersheds.

CRESSIDA project

The CRESSIDA project aims to understand existing development foci, to provide support for improving development, to adapt EPA and other science-based tools for use at the community level, to facilitate and encourage multi-stakeholder collaboration for development, and to ensure that local communities are engaged and represented in community policies. It is spearheaded by the REC, an international organization with a mission to assist in addressing environmental issues by promoting cooperation among governments, nongovernmental organizations, businesses and other environmental stakeholders, and by supporting the free exchange of information and public participation in environmental decision making. The REC was established in 1990 by the United States, the European Commission and Hungary, and today, is legally based on a charter with over 30 signatories. Headquartered in Szentendre, Hungary, the organization relies on a network of offices and experts in Central and Eastern Europe and beyond. The CRESSIDA project is just one of REC’s many aims for environmental resilience in the Western Balkan region. The beneficiaries of the CRESSIDA project are 18 communities¹ located along the Drini and Drina River Watersheds, encompassing six countries in the Western Balkans: Albania, Kosovo, and the Republic of Macedonia along the Drini; and Montenegro, Bosnia and Herzegovina, and Serbia along the Drina. The Drini River starts at the confluence of two headwaters, the Black Drin flowing from the Republic of Macedonia/Albania and the White

¹“Communities” here refers to municipalities, which are administrative units that comprise a small city, town, or collection of villages. Communities generally have a mayor and a city council. With the exception of a few, CRESSIDA communities are generally < 50,000 inhabitants. The municipalities were chosen by the REC. Community representatives generally work within the mayor’s office.

Drin flowing from Kosovo. The Drini then flows through northern Albania and into the Adriatic Sea. The Drina River flows from Montenegro and northward along the border of Bosnia and Herzegovina and Serbia into the Sava River (see Figure 1).

CRESSIDA's objectives comprise a series of steps to forward sustainable community resilience, several of which focus on the need to organize cross-boundary water management to improve public health and wellbeing (4). It leverages cooperation amongst governments, NGOs, businesses, and other environmental stakeholders. The project specifically supports the need for flood preparedness and pollution mitigation, both of which require multi-sector capabilities in Western Balkan regions (18). As of now, several funded resilience-focused efforts in South Eastern Europe are constrained to urban centers (2, 19). CRESSIDA experiences fill a gap by focusing efforts in small municipalities in the region, comprising several that are situated on headwaters and streams that feed into the flood-prone Drini and Drina rivers. The importance of the health and vitality of the Drini and Drina river watersheds cannot be overstated. The rivers offer economic development opportunities (20–22), energy (21–25), strong tourism draws (20, 26, 27), drinking water (28, 29), agriculture and forestry (21, 30, 31), cultural heritage (26) and transportation (31). However, several overarching pollution and management problems that endanger critical water resources in the region pose problems for long-term resilience and preparedness in the area.

CRESSIDA workshop

As part of a workshop for CRESSIDA communities,² we conducted several activities to garner local perspectives on watershed problems. Representatives from 18 participant communities reported several resource management and infrastructure challenges. Issues with wastewater, waste management, lack of sanitary landfills, urban and industrial development, pesticide and chemical use, and natural disasters are paramount in the region, with most communities coming to a consensus on these major issues in the region with varying degrees of difficulty on each issue reported in their home communities (see Table 1). Existing research supports these reports, with scholars noting problems with water quality/nutrient management and wastewater (28, 32–35), chemical and heavy metal pollution (36–39), and flooding (40); however, most studies do not cover the entire region, but rather focus on individual countries/water bodies.

CRESSIDA's work connects these concerns across state boundaries and shows them to be systemic issues in the Western Balkan region. While CRESSIDA communities have different local environmental and social histories (e.g. the particular effects of post-communist legacies, population shifts/urbanization, and the pervasiveness of environmental pollution vary) (41), the myriad environmental health challenges represented in Table 1 have translated to shared watershed problems across the region. There are differing levels of infrastructure and levels of expert knowledge found in communities (e.g. some communities

²The CRESSIDA workshops were designed in-line with other programs such as the Sustainable Development Academy where participants network and learn about strategies to promote local and regional solutions for sustainability. In particular, the workshop focused on tools that could enable participants to initiate and implement projects; facilitate dialogue, experience exchange and cooperation among participants; raise awareness for environmental protection by drawing attention to long-term consequences of decisions that favor short-term economic benefit. The workshop itself was led by an expert facilitator and included translation services for all communities. Please see <http://sdacademy.rec.org/> for more information.

have wastewater treatment infrastructure, but many do not). Furthermore, some communities lack financial and other resources while others do not. Communities reported a major focus on protecting the region's public health through stewardship of water resources.

Communities are currently at varying stages of readiness and resilience planning, although most feel unprepared for flooding and other natural disasters. Communities feel unable to use or implement early warning systems, and little ability to access and use GIS and other datasets. There are widespread concerns about disaster planning, especially when it comes to protecting water infrastructure and major water and sanitation resources (such as drinking water). Naturally, within this, there is a growing need to think about waterborne exposures holistically, not only the exposure event but also the social and environmental context of exposures. Table 1 shows the major topics elicited through the workshop and attendant resource management and infrastructure challenges related to these theme areas.

Tools and techniques for improving watershed resilience planning

In response to challenges reported in the region, we used collaborative, multi-stakeholder approaches to address resilience and preparedness in the region. The two techniques, Proper Functioning Condition (PFC) assessment and participatory mapping, were chosen to respond to the shared environmental problems identified by the participants while also building understanding of how local action can contribute to watershed wide solutions. Mapping was utilized to encourage participants to think beyond their local experience, better appreciate the impacts of different impairments at the regional scale and to visualize the linkages across the watershed. The PFC field exercise was designed to build understanding of ecosystem function and the benefits of healthy streams while also emphasizing that improvement even in small, potentially more manageable streams, contributes to the greater goals for the entire system. Both techniques were very well reviewed by program participants (review scores for both techniques post-workshop were 3.7/4). These techniques were used to kickstart thinking for pilot projects aimed at addressing resilience and watershed management in the region, attentive to overarching issue(s) as represented in Table 1. Over 50 stakeholders – comprising local environmental NGOs and local governmental representatives from all 18 communities – participated in both the PFC assessment and participatory mapping exercises.

PFC assessment

Appreciating the many services that riparian (or water's edge) ecosystems in smaller upstream areas provide [e.g. recreation, water supply, and economic value, see Prichard (42)] proper functioning condition assessment (PFC) focuses on characterizing the ecological functioning health of these areas. Riparian areas (43) serve as an indicator for the balance of the entire system, and assist in flood prevention – if they are healthy. PFC is a process for visually assessing the ability of the ecosystem to withstand events and protect the health of the watershed through the use of an interdisciplinary checklist (42, 44). If the riparian area is not functioning properly, it is likely that chemical and biological processes impacting human and environmental health will also be impaired (45, 46). Engaging workshop participants in PFC encouraged an attention to the ways in which small-scale, local protections for rivers and streams can impact and protect larger watersheds, and

encouraged participants to implement small-scale changes in their communities to begin to ameliorate watershed-wide concerns (see Figure 2).

Participatory mapping

The participatory mapping exercise asked communities to think about issues and assets in their areas and to map these by country in small groups, and then by watershed in large groups. Participatory mapping techniques allow participants to iteratively draw point source pollution and other water problems, as well as assets like infrastructure in spatial format (either on paper, as we did for this workshop (see Figure 3), or using computer-based programs, such as GIS). It is useful in disaster risk reduction (47), in understanding social values and experiences related to water use [e.g. (48, 49)], and in community-based appraisals (50). The results of the technique are the communication of grounded experience and concerns in communities and more detailed information about local awareness. The participatory mapping session for CRESSIDA solidified issues already brought to light earlier on in the project and additionally identified other areas of concern. This also worked as a team-building exercise for cross-boundary management, encouraging communities to share issues, assets, abilities, and strategies with one another, and served as a key brainstorming activity for cross-boundary project formulation.

The combination of these two techniques afforded participants and project managers with visual as well as experimental understandings of barriers to resilience in Western Balkan watersheds. An additional benefit of these activities was that it proved to be a successful forum for garnering input from less outspoken stakeholders, thus broadening stakeholder ownership and buy-in of the products of the exercises. The combination of increased understanding of small-scale issues utilizing PFC, and large-scale, cross-boundary concerns using participatory mapping, produced solid returns in the community-led formation of multi-country resilience-based watershed protection project plans that are currently ongoing (4). The techniques afforded a multifaceted view of environmental pollution and watershed concerns in the region. Beyond this, the approaches encouraged discussion of socio-political factors that influence environmental management throughout the region. As a product of the workshop, participants discussed issues such as political dynamics, funding concerns and mechanisms, the efficacy of legal frameworks for the environment, upstream vs. downstream responsibilities within the watershed, issues of land and water ownership, and post-war perspectives on environmental resources. This list is not exhaustive, it is meant to exemplify some key areas of conversation that were raised within the space of the workshop as a whole, and which were aided by the techniques above. We expect these themes will be resonant with (if not exactly the same as) issues in other regions, and thus that these techniques may be useful for other similar projects, both for understanding environmental realities as well as exploring socio-political factors influencing environmental management.

Discussion and next steps

Communities in CRESSIDA are well aware that upstream issues cause downstream problems, and that while country boundaries may demarcate policy and law, the river unites them in a common goal of restoration and resilience. Water challenges that communities

face require a multisystems approach and solutions must draw on several different areas of expertise. In addition, a cross-boundary approach to identification, management, and mitigation of pollution problems is paramount. As well, there is a need to bridge scientific data and tool needs with social information in support of management of these systems as true social-ecological systems. Watershed management approaches in the Western Balkans require better and more on-the-ground geological and hydrological information, better mapping techniques, improved water quality information, and greater ethnographic and social understanding. Some scholars are already looking at finding ways to model water issues in data scarce regions within Western Balkan Watersheds [e.g. (51, 52)]. Perhaps the key underlying principle to enhance community resilience, especially in regions like the Balkans, is the need to organize cross-boundary management of natural resources. Cooperation amongst governments, NGOs, businesses, and other environmental stakeholders at the local and regional level can support climate preparedness by mobilizing efficient responses to hazards. The CRESSIDA project supports the need to pursue cross-boundary management and mitigation efforts, but also highlights the importance of community-driven research; stakeholders actively participate in the formulation of the problem and offer solutions that reflect the sociological and cultural context of the region. A cross-boundary focus is particularly relevant in the context of CRESSIDA because streams and rivers so often form the physical boundaries which visually separate the different communities and countries within the Western Balkans in a way that other shared environmental flows such as air quality or the carbon cycle do not. The ubiquity of the rivers in the region contribute to a shared experience but also a common vision of what a more sustainable and resilient future could be. We are further looking at crowdsourcing and citizen science techniques to fill data gaps and engage community members in scientific processes. We hope that these approaches, alongside a resilience-informed scientific programmatic approach, ensure decision makers will have better information upon which to base decisions, and that communities have improved resources with which to seek other grants and communicate their environmental experience. What has emerged with clarity from this work is that programs imbued with resilience-based foci and that rest on community-engaged, culturally relevant solutions are poised to ensure long-term benefit for communities.

Acknowledgments

Research funding: This article was developed under Assistance Agreement No.'s 83544001 and 83588701 awarded by the U.S. Environmental Protection Agency to the Regional Environmental Center for Central and Eastern Europe and the American Association for the Advancement of Science. It has not been formally reviewed by EPA.

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Figure 1:
Map of Western Balkan watersheds and CRESSIDA communities (Capital Cities are noted in Yellow for Reference).

Figure 2:
PFC assessment workshop at REC Hungary.

Figure 3:
Participatory mapping CRESSIDA workshop at REC Hungary.

Table 1:

Challenges to resilient river watershed management in the Western Balkans.

Topic	Resource management challenge	Infrastructure challenge
Water resources	River sediment excavation	Lack of wastewater treatment
	Upstream mining discharges	Upkeep of irrigation canals
	Soil erosion	
Solid waste	Waste management	Lack of sanitary landfills
	Recycling	Illegal dumpsites
		Lack of treatment facilities
Land use	Illegal deforestation and logging	Active urban and industrial development near river banks and lack of buffer zones
Chemicals	Pesticides and chemical runoff	
	Lack of database for pollutants	
Climate and floods	Floods	Lack of early warning system
	Drought	