Full Proposal CAMP Alatoo & UCA

Section 1: General Project Information

Project Title: *Kyrgyz Mountains Environmental Education and Citizen Science project (KMEECS) - Exploring an institutional network introducing citizen science in school curricula, enhancing applied environmental education and generating local-level environmental data*

Duration of Project: 24 months
Countries included in this project: Kyrgyz Republic
Regions included in this project: Asia
Research Themes: T1, T3, T4
Justification of Research Themes: This project addresses and links 3 of the OCSDNet research themes. Through its analysis of stakeholders it reviews a specific community of practice (T3) created through their interaction in piloting an environmental education and citizen science project. It further combines an analysis of motivations (or non-motivations) for involvement with innovative, participatory and open science (T1) with an investigation of positive and negative impacts (T4) for all actors in this multi-level and multi-stakeholder process, as well as non-involved individuals, groups or objects who might be positively or negatively influenced by this initiative.
Total Budget Cost (CAD): 79'360 CAD

Section 3: Proposed Study Information

Research Project Abstract

WORD LIMIT: 250.

Open and Collaborative Science for Development is a widely unknown, unused and untrusted approach in post-Soviet Central Asia, although it arguably offers opportunities to impact education, citizen awareness, policy and local governance for a more informed management of natural resources.

The Kyrgyz Mountains Environmental Education and Citizen Science (KMEECS) project combines citizen science on the community level, environmental research and curriculum-linked programming to foster awareness of and interaction with the local environment. At the same time it aims at generating locally relevant data on the environment in the mountains of Kyrgyzstan. The project proposes to pilot the introduction of low-cost environmental field courses (on water quality and/or climate monitoring) in schools in mountain communities of

Kyrgyzstan's Naryn province. Based on a citizen science approach, students will analyse and generate data on their local environment, which will be fed into a network of open environmental data.

The project will also analyse the stakeholders involved (or explicitly not involved) in implementing the pilot, their motivations, constraints, resources, interactions and how it has positively or negatively impacted them. This analysis will generate insights on how OCS principles are applied and governed in a multi-level and multi-stakeholder process with the aim to create localized environmental education resources for remote schools in Kyrgyzstan. Ultimately, the project will contribute to an increased awareness about local environmental challenges among students, teachers and key stakeholders, to an improved accessibility of local environmental data in a vulnerable high mountain environment and to an increased knowledge about OCSD, its benefits, constraints and applicability in a marginalised context in Central Asia.

Research Problem, Significance and Justification

WORD LIMIT: 1,000. Please provide a brief overview of relevant literature and highlight the knowledge gaps that this project will address. Indicate the size and scope of the problem, as well as how the problem relates to the purpose and goals of OCSDNet; broader national development priorities, and the research and capacity needs of the countries involved.

Representing two sectors intrinsically linked to the sustainable development of the country, education and the sustainable management of natural resources form part of the development priorities for the Kyrgyz Republic (UNECE, 2009; OECD, 2010). In its Action Plan until 2010 to the Agenda 21 approved by a Government Resolution, specific targets with respect to Education for Sustainable Development in Kyrgyzstan were set, among other to reorient 30 per cent of school educational curricula to environmental education by 2007 (UNECE, 2009). Yet, there is no evidence of attempts to reach this target. School enrolment rates and even more the quality of education in Kyrgyzstan have regressed considerably since the late 1990s, which is particularly dramatic in remote areas. Declining quality results mainly from the budgetary neglect, which led to depleted stocks of textbooks and other educational materials, to underpaid, under-trained and overburdened teachers, and to deterioration of school infrastructure (Mertaugh, 2004; UNICEF, 2008). Curricula that are overly theoretical allow hardly any scope for students to learn through practical and locally adapted teaching methods (UNICEF, 2008).

Citizen Science, the involvement of non-scientists into the planning and conduction of research, has often been named as a suitable tool for introducing applied field teaching into theoretical curricula, enhance student knowledge and involvement with their environment and at the same time contributing to the generation of scientific data (Gommermann & Monroe, 2012; Buytaert et al., 2014). Although participatory or citizen science is not a new phenomenon, the past decade has seen a rapid increase in the number of citizen science projects, particularly in North America and Europe, spanning diverse areas of interest and ranging from local to global (Silvertown, 2009; UK-EOF, 2011; Dickinson et al., 2010;

Bonney, Cooper, Dickinson et al., 2009; Nov, Arazy & Anderson, 2011; Bonney, Ballard, Jordan et al., 2009; Mackechnie, Maskell, Norton et al., 2011; Roy et. al., 2012). However, to date, very few citizen science projects are being implemented in developing countries.

Similarly, the combination of Citizen Science and education is not new in scientific literature, but to date it has not been researched extensively in countries of the global south and even less in high altitude and remote rural areas of Central Asia.

Although environmental analyses abound for Central Asia in general, there is almost no data available at the local level or that differentiates between ecosystems and altitude levels within the highly diverse Central Asian ecological landscape. Additionally, in order to confront a poor understanding of environmental challenges and awareness of opportunities for change, it is instrumental to introduce locally embedded environmental education to the young generation who will prove primarily responsible for coping with and adapting to a rapidly changing environment (Gareeva & Maselli, 2008; Schuler et al., 2004; Mestre et al., 2013; UNDP, 2006). During the World Summit on Sustainable Development held in Johannesburg in 2002, the idea was expressed that the lack of education and the low level of knowledge within the population on issues of sustainable development is possibly a reason for existing problems in environmental, social and economic spheres (CAREC, 2007).

While analyses on climate change conclude that Central Asia is exposed to one of the highest rates of adverse effects of climate change (Christensen et al., 2007; Bizikova, Hove, Parry et al. 2011), additional challenges have arisen due to decades of mismanagement of natural resources. This includes the overgrazing of pastures, inefficient water and energy management, degradation of soils due to unsustainable agricultural practices, uncontrolled mining, loss of biodiversity and increasing conflicts over natural resources (Gareeva & Maselli, 2008; Schuler et al., 2004; Mestre et al., 2013; UNDP, 2006). Over half of the Kyrgyz Republic's GDP is derived from climate and weather-sensitive activities, making the country highly vulnerable to adverse impacts of climate change and in particular decreased water supply, increase in frequency and intensity of extreme weather events and threats to ecosystems, livelihoods and health of the local populations (World Bank, 2011). Understanding and observing these dynamics is therefore instrumental to supporting Kyrgyzstan's adaptation strategies (Buytaert et al., 2014).

This project will attempt to generate local-level data for understanding changing environmental dynamics through the observation of phenology and/or water monitoring. Phenology is the study of the timing of recurring plant and animal life cycle events and how these are influenced by seasonal and interannual variations in climate (Leith, 1974). Recently, there has been a significantly increased interest in phenology, primarily since phenology variables are some of the most sensitive data to climate conditions, and due to shifts in the timing of different phenological phases in plants, insects, birds and amphibians connected to climate change (Ruml & Vulić, 2005; Menzel, 2003; Menzel & Fabian, 1999; Sparks et al., 2000; Penuelas et al., 2002). Phenology has been used broadly in citizen science initiatives combining data collection and education, such as in the Project BudBurst in the US or in the GLOBE project operating worldwide. Similarly, citizen scientists (sometimes including children) have participated in water monitoring and quality assessment (Buytaert et. al., 2014; GLOBE, 2005), as it is planned in Kyrgyzstan through this project.

Within the KMEECS project, the stakeholder network involved in the process of testing a curriculum for schools involving students as citizen scientists for environmental monitoring will be thoroughly analysed. A multi-stakeholder participatory process for developing and testing a citizen-science based curriculum in rural areas of Naryn, Kyrgyzstan is likely to involve several degrees of participation (Arnstein, 1969), and different degrees of activity and passivity (Pretty, 1995) for different stakeholders. In analysing the stakeholder network involving and being impacted by KMEECS, this research project will contribute to a better understanding of the dynamics governing participation, motivations, relationships, impacts and barriers to Open and Collaborative Science in Development from the perspective of a remote mountain context.

Research Questions and Objectives

WORD LIMIT: 500. Outline your project's central research question(s), sub-questions, and objectives. There must be congruency between the questions, objectives, research design and methods. You should highlight how the study's questions and objectives will contribute to the research themes of the OCSDNet.

The overall goal of the study is to pilot the KMEECS project and to provide a thorough analysis of all involved stakeholders (embedded in their institutional setting) and their interests in adopting OCS approaches. The learning outcomes reached through the project will also be mapped.

Main objectives:

1. Generate locally relevant environmental data on high mountain socio-ecological systems using a citizen science approach, involving students and teachers in pilot schools of Naryn, Kyrgyzstan.
2. Contribute to improving environmental education and awareness about the local environment in rural schools.
3. Improve the access to knowledge and environmental information in marginalized mountain regions of Kyrgyzstan.
4. Reflect, analyse and document the implementation process with a particular focus on the stakeholders, their roles, motivations, interactions, impacts and learning outcomes.
5. Promote innovative, participatory and open research principles in Kyrgyzstan.

Research questions:

What are the obstacles to the introduction of a citizen science approach to generate data about the local environment in mountain communities of Kyrgyzstan as a new method of environmental education in schools?

- Who are the (expected and unexpected) stakeholders involved in and (positively or negatively) influenced by the introduction of a practical environmental education curriculum based on citizen science in remote mountain schools and how do they relate to each other?

- What are the barriers to identifying and collecting relevant and locally useful environmental data through citizen science in rural schools?
- How did the implemented project impact the learning outcomes of the involved stakeholders? In particular, to which extent did the participating children and teachers improve their ecological knowledge on the covered topics?

The objectives and research questions will reflect on three OCSDNet themes, interlinking them through the analysis of stakeholders. First of all, insights will be generated on theme 3 by analysing the institutional context, interactions and communities of practice formed through the project. Derived from this analysis, reflections on the linkages to theme 1 and 4 will be investigated by focusing on the motivations (and non-motivations) of the identified stakeholders, as well as on how each of the stakeholders was positively and/or negatively impacted by the project.

Upon completion of this project, there are further questions which form a basis for continuing the initiated open and collaborative science processes in the communities and to explore further research questions, such as “How can the environmental knowledge gained among school children contribute to social learning processes within the community? How can such processes lead to increased environmental awareness and action within a community? Does collaboration and the variety of actors involved in social learning increase the innovation and involvement in addressing local ecological challenges?”.

Further, an analysis of the robustness and usability of the data produced through citizen science at schools should be conducted when a critical amount of data has been collected and processed, which will be the case after the 2 years of this project. Additional funding for continuing research and activities will be sought during the implementation of the KMEECS project.

Stakeholders

WORD LIMIT: 250. Identify and briefly describe your project's stakeholders. How will your project respond to their needs and interests?

Since it is one of the aims of the project to investigate, define and analyse the stakeholders involved (including unexpected stakeholders) and their respective motivations, it is not possible to provide a conclusive identification of the involved stakeholders at this point. However, the list of stakeholders will include (but not be restricted to):

1. Community actors (school children, teachers, local decision makers and active citizens)
2. Kyrgyz non-governmental organisations
3. Kyrgyz universities
4. Kyrgyz government agencies
5. Local and international consultants and partner organizations

The project addresses school children in the age group 10-14 years in remote mountain areas as well as their teachers as primary potential beneficiaries. Ten schools and their

science teachers will be selected for piloting the project in Kyrgyzstan's Naryn province, which is characterized by remoteness, livestock-based livelihoods, high altitude ranging from 1500 to 6000m, low infrastructure development, as well as the highest poverty incidence in the country. The teachers will be the main stakeholders who will be trained and equipped for using citizen science during their lessons, so the focus will lie on them. The school children, the teachers and key community members will also be involved as the main contributors of localized knowledge during the participatory curriculum development process. On the other end there will be national-level key stakeholders involved in the participatory curriculum development process, such as environmental NGOs and partner organizations, education specialists from Governmental agencies (including the governmental working group on environmental education and the Kyrgyz Academy of Education) and universities.

Research Design & Methods

WORD LIMIT: 1,000. In this section, applicants should clearly indicate and justify the proposed study design. You should discuss how you intend to collect the data that you will need to achieve the study's objectives and answer the project's research questions. You should clearly outline how each data collection activity will contribute to the study objectives.

This research will be conducted as a case study and employs a participatory action research framework combined with a stakeholder analysis. It will be based on the principles of cognitive justice.

Participatory action research (PAR) will be used to develop reflective accounts of the project outcomes and the roles, involvement and motivations that concerned and involved stakeholders and institutions have played. PAR is an approach based on the principles that research and action should be done in collaboration with concerned stakeholders, in a joint effort to meaningfully transform practices, rather than researching only by observing and studying communities. It goes back to Lewin (1946) and has later on drawn inspiration from several disciplines, including among others education (Freire, 1970; Hall, 1975, and more recently Kasl & Yorks, 2002; Pine, 2008; Westfall et al., 2006) and citizen science (Cooper, 2007; Gaventa & Barrett, 2010).

PAR approaches recognize that there are a plurality of co-existing knowledges in a variety of institutions and locations (Kindon et al., 2007). Similarly, cognitive justice understands knowledge as partial and interested. Cognitive justice is concerned with who creates knowledge, for whom, and whose knowledge counts (Sousa Santos 2005, Visvanathan, 1997). For reaching a plurality of co-existing knowledges, there needs to be a form of inclusive science as a platform for dialogue between several forms of knowledge (Basham, 2012). As such, this project will employ the concept of cognitive justice in order to challenge hegemonic narratives on the environment and to allow the inclusion of diverse knowledges into the Participatory Curriculum Development (Taylor, 2003) process. Local ecological knowledge and specific local environmental conditions will be strongly considered and care will be taken not to merely replicate international experiences and ideas (although they will not be excluded).

Methods and steps for practical implementation of the KMEECS project:

1) Preliminary steps, analyses and selection of participants:

- Select 30 schools out of the 122 in Naryn province, which are well distributed across the regions within the province, contact teachers and present the pilot project and the role of schools
- Select 10 pilot schools upon reception of a motivation letter from interested teachers
- Content analysis of the Kyrgyz curricula (biology, geography, environmental science at secondary level)
- 10 participating schools (2 teachers and 2 students from each school) as well as additionally identified stakeholders will be invited to join the working group for the participatory curriculum development.

2) Participatory curriculum development and creation of resource packages for citizen science activities on water monitoring and/or climate monitoring through phenology:

- Participatory development of a locally adapted curriculum for citizen science based field teaching, with contributions from CAMP Alatoo, UCA, active local teachers, students, members of the Ministry for Education, partner organizations working on the integration of traditional environmental knowledge into development and education projects. The PCD process will include one roundtable discussion, two workshops and one field trip.
- Based on the training experience of CAMP Alatoo, development of a Teacher's training manual for capacity-building and as a field guide for teachers implementing citizen science activities.
- Composition of resource boxes for each school conducting the field activities
- 3 days training of teachers on the integration of citizen science based field activities into their teaching

3) Citizen science data collection, management, analysis and visualization:

- Analysis of existing environmental data and platforms (local, regional, global) for sharing open environmental data.
- Elaboration of a simple tool for management of collected data via tablets and mobile phones (in collaboration with the Mountain-EVO project, see analysis section)
- Installation of two small automatic weather stations for complementing and validating the collected data (these two weather stations will add to a network of other weather stations planned within partner projects, such as Mountain-EVO, see analysis section)
- Monitoring of implementation and data collection in schools (see M&E section)
- Integration of collected data into existing as well as project/partner created data pools and geographic visualization, as well as data analysis and feedback to communities (see analysis section)

4) Feedback loop for improving the curriculum after a first field season:

Participatory action research is also meant to involve (ideally several) feedback loops of self-reflection (Kemmis & McTaggart, 1982). As such, this project will include a planning phase, an action and observation phase, and a reflection phase, which will end up in a re-evaluation

of the process and outputs with the aim to improve the citizen science and environmental education activities based on the working group's and student's feedback and reflection (see M&E).

A potential limitation of the participatory approach is the fact that the two topics that will be considered for the citizen science activities are already defined (Water monitoring and/or plant phenology as an indicator for climate change). This is due to a number of reasons. First, during a previous project of UCA on access to information and knowledge in rural mountain areas of Naryn, the topics of water quality and climate variability have been identified as key environmental concerns where more information is needed. Second, these two topics present a broad array of options for implementing simple, low-cost and low-tech activities for combining environmental learning with data collection. Also, other topics of concern in Naryn such as pasture degradation are not easy to monitor in a walking distance of the school. However, the two selected topics are very broad and present a multitude of different options for data collection, own analyses and different sub-topics to be considered to introduce the background, theory and knowledge needed for the cases.

Stakeholder and network analysis:

The stakeholder analysis will be conducted within the framework provided by Zimmermann & Maennling (2007). Some initial steps will be conducted at the beginning of the project in order to identify key stakeholders (including stakeholder mapping), others will be implemented along the meetings of the working group and at the end of the project. These analyses are expected to generate insights into involvement and non-involvement, resources, attitudes, relationships and interactions.

Additional qualitative research methods for making sense of motivations, impacts and experiences will include focus group discussions, Participatory observation, field notes, participatory visualization of linkages and semi-structured interviews.

Analysis & Synthesis

WORD LIMIT: 1,000. Describe how you intend to organize, examine and model data to arrive at conclusions and insights.

There will be three levels of data analysis and synthesis:

1. Environmental data collected through citizen science:

The data collected through a combined citizen science and environmental education approach will be integrated into local, regional and global environmental data pools and integrated e.g. with open climate data available from other development and research projects operating weather stations in the Naryn region (e.g. open weather map, or with water analyses conducted by researchers and industrial companies in the region). This combination of data sources allows a contextualization of the collected data as well as its

publication within the framework of other projects and thus an increased outreach and networking opportunity. As far as possible data processing and analysis will be done collaboratively with ongoing projects, such as the Central Asian Atlas project starting this year at UCA, within which possibilities for generating meaningful and simple visualized feedback information for the local level will also be explored. UCA also implements the Mountain-EVO project for Kyrgyzstan on Environmental Virtual Observatories for mountain environmental services and poverty alleviation, which will install 4 complementary regional weather stations and develop a web-based as well as offline tablet-based application for data management.

Additionally the KMEECS will evaluate several available open source tools such as the OpenDataKit (www.opendatakit.org), EpiCollect (www.epicollect.net), GeoKey (http://geokey.org.uk/), or Sapelli (www.ucl.ac.uk/excites/software/sapelli). A platform will be chosen based on the criteria of adaptability to the Kyrgyz context, offline operability, visualization tools, simplicity, and adequacy for the data to be collected. Ideally one tool will be able to cover both data types (water and phenology).

Connections to existing international citizen science projects will be built, such as the open water project of the public lab (www.publiclab.org/wiki/open-water) or the citizen science project for streamlet monitoring with schools in Armenia for water monitoring. For Phenology and climate, the project BudBurst (www.budburst.org/) will be consulted. The Global Learning and Observations to Benefit the Environment (GLOBE) program (www.globe.gov/home) as a worldwide hands-on, primary and secondary school-based science and education program including water as well as phenology components will be a primary source of information to ensure that lessons learnt on data analysis and visualization will be integrated into our project.

A strong focus will be laid on simple and effective visualization and mapping, but specific needs and effective communication for schools and communities will be discussed during the working group sessions.

2. Learning outcomes regarding knowledge on water and/or climate:

The learning outcomes of involved children and teachers will be assessed with concept maps before and after the field activities. For the teachers, the maps will be part of the teachers' training, and for the children it will be part of the preparatory and wrap-up activities conducted with their teachers. These concept maps will be analysed and compared, with a focus on "complexity", "interrelations between concepts", "theoretical knowledge: concepts", "mentioning of practical knowledge learnt during citizen science" etc.

3. Stakeholder analysis and mapping:

Based on the tools provided by Zimmermann & Maennling (2007), different analyses of the stakeholder landscape will be conducted, each leading to different insights related to the research questions. Results from *stakeholder identification and mapping, stakeholder profiles, analysis of power, resources, interests and scope for action, influence, involvement, exclusion and empowerment* will be visualized and interpreted along with the qualitative analyses.

Protocols from focus group discussions, participatory observation, field notes and semi-

structured interviews will be analysed and coded based on content analysis. The specific information will be attributed to key words based on the research questions, enabling a categorization into “motivations”, “resources”, “roles”, “power relations”, “level of involvement”, “impact – positive”, “impact – negative”, “obstacles” etc.

The results will be put into context with country-specific background information.

Outcomes & Outputs

WORD LIMIT: 700. Describe the major project outputs and intended outcomes. Your project outputs should creatively reflect the principles of open and collaborative science.

Project Outputs

Outputs related to objective 1 (contribute to filling environmental data gaps):

- Adapted and simple application(s) for data collection, management, sharing and visualization for citizen science data (see analysis and synthesis).
- Environmental data and visualization gained through citizen science openly available on at least one existing online platform and one project-specific platform.
- 10 locally relevant processed and aggregated data packages as feedback to individual schools and communities (available offline)

Outputs related to objectives 2 (Contribute to improving environmental education and awareness) and 3 (Improve the access to environmental knowledge and information):

- This project will produce valuable outputs for fostering environmental education in Kyrgyzstan in the form of a locally adapted curriculum (including textbook, information materials and a toolbox, based on the priorities and focus set during the participatory curriculum development sessions), which fits into the teaching plans, involves a citizen science approach and includes traditional ecological knowledge.
- Training of science teachers from 10 schools in Naryn province, including teacher training materials and field testing of activities
- 4 working group sessions during the participatory curriculum development process and one feedback session for integrating recommendations and lessons learnt from all levels into the teaching resources.
- A photo competition and exhibition on the citizen science activities and environmental challenges in the participating villages as part of the networking between participating schools and awareness raising (to be coordinated with other OCSDNet projects planning photography-based activities and outputs).
- One final workshop presenting the developed resources as well as the outcomes of the project at national level, highlighting pathways to inform country-wide educational policies in Kyrgyzstan and promote OCSD principles and citizen science as innovative education methods across the country.

Outputs related to objective 4 (analysis of stakeholder network):

- Analytical report documenting the project and particularly the stakeholder network, including network visualizations and audio-visual resources as well as evaluation of

learning outcomes through concept mapping.
- At least one presentation at a regional/international conference or workshop
- One journal article

Outputs related to objective 5 (promotion of innovative, participatory and open principles in Central Asia):
- One workshop on OCSD for young researchers from Kyrgyzstan, Tajikistan and Afghanistan during a research capacity development training in the framework of the CAARF (Central Asia and Afghanistan Research Fellowship) program at UCA.
- Working group sessions on participatory curriculum development (see outputs for objective 2 and 3)
- Photo exhibition and final workshop (see outputs for objective 2 and 3)

Intended project outcomes:
- Increased environmental awareness and environmental knowledge among involved school children and teachers.
- Increased interest in environmental learning through experiential citizen science.
- Increased vertical and horizontal networking and collaboration capacities within science education in Kyrgyzstan and increased advocacy for innovative, participatory and citizen science.
- Improved access to local-level environmental information.
- Enhanced understanding of the stakeholders, dynamics, barriers and opportunities for the adoption of OCS for contributing to the development of remote mountain regions in Central Asia.
- Increased visibility and advocacy of environmental challenges and actions in remote mountain regions of Kyrgyzstan.

Contribution to long-term development impacts:
- *Contribution towards increased environmental agency, networking and leadership:* Today's youth will hold a great responsibility in the sustainable management of their environment as well as their communities. Early exposure to and involvement in open and collaborative processes will strengthen students' perceptions of themselves as active stakeholders in shaping their local environment. Linking up with other students across Naryn province and possibly in other parts of the world through their involvement in a network will further encourage the students to think across boundaries.
- *Establishment of a culture of sharing, collaboration and communication to reach a more informed society and better knowledge about the socio-ecological environment in Kyrgyzstan:* The project will advocate the principles of OCS for Development among other involved stakeholders, such as government officials and scholars who do not yet implement participatory and open research, nor value its methods and data. Especially in environmental sciences the active contribution of community members and non-researchers is not yet seen as a valid source of information, although it can greatly increase the reach and understanding of research among the population of countries in the global south.

Knowledge Translation & Dissemination

WORD LIMIT: 700. Describe how you will disseminate your outputs. To ensure that the results of your study are applied to address development challenges, explain how you intend to package, disseminate and promote the application of your findings amongst relevant stakeholder groups.

We intend to disseminate our outputs through different channels, which will be suited to the different audiences the project reaches out to, including the local, national and international levels. A logistical challenge will be the handling of languages, since Kyrgyz, Russian and English will all be important throughout the project, although at different levels (local, national and international). The team will manage this challenge by identifying strategic outputs and communication channels for every level. Thus, not all the outputs and resources will be available in all three languages, but rather a tailored set adapted to the audiences at each level.

Local level: Naryn and the pilot schools (in Kyrgyz):

- Teacher package for the 10 pilot schools: Toolbox, teacher's manual, textbook for students including field diaries and activity sheets
- Photo exhibition of children's perspective on climate and water in villages (result of a competition between the 10 schools), telling their stories during citizen science activities. The photo exhibition will tour all 10 schools in Naryn.
- Updates and news via locally used social media in Kyrgyz
- Data visualization package of collected data in every village, a presentation by the children during a community meeting will be strongly encouraged. A discussion on the best suitable format for the communities (e.g. poster, leaflet, map, tables, interactive computer-based map) will take place during the working group sessions.
- Capacity development through training of teachers

In Kyrgyzstan and Central Asia, national and regional levels (in Kyrgyz and/or Russian):

- An educational package including the textbook for students, teacher's manual, list of tools needed and teacher training plan will be available for key stakeholders for the outscaling process.
- Project report in Russian and English
- The photo exhibition will be presented in Bishkek after the schools in Naryn
- Final workshop for policy makers
- Social Media in Russian and Kyrgyz
- Data collected through citizen science will be available for viewing, visualising and using on the introduced online platform(s)
- Capacity development of two research assistants
- Presentations at conferences and workshops
- Training for CAARF research fellows on OCSD

International and OCSDNet (in English):

- As much as possible, the OCSDNet Forum will be fed with updates and information relevant to the network or specific forum groups.
- A project blog will be created to publish news, add outputs and collect relevant information.
- Experiment with videos, animations or podcasts for communicating results and updates.

- Data collected through citizen science will be available for viewing, visualising and using on the introduced online platform(s)
- Presentations at conferences and other events
- The webpages of the University of Central Asia and CAMP Alatoo will also be used as platforms for publishing results, news, and events. Both institutions also use social media and have a mailing list for newsletter, which will also be employed for dissemination of project updates and news.

Wherever possible the generated datasets, curricula, teaching resources, research outputs and online resources will be made available under a creative commons license.

Network Connections & Interactions

WORD LIMIT: 500. Illustrate how you will contribute to the overall OCSDNet framework and themes. Draw on other initiatives and approaches discussed at the OCSDNet workshop, if applicable.

The KMEECS project will contribute to the refinement of the Theory of Change by providing insights into the linkages between T1 Motivations, T3 Communities of Practice and T4 Potential impacts of OCS. In this case it is argued that the linkage between the three consists in the analysis of the stakeholders and the project implementation process. The project's contribution to T1 is it's mapping of the stakeholders regarding their motivations, interests and (also non-motivations and non-interests) to support, interact with, implement or participate in a citizen science based environmental education project for schools in mountain areas of Kyrgyzstan. It contributes to T3 through describing a specific community of practice bringing together stakeholders from a broad range of institutional settings, disciplines and localities. The contribution to T4 is again given through a stakeholder view, highlighting the (expected and unexpected) positive and negative impacts this OCSD project have had on participants and other actors who got in touch with the project.
The KMEECS project contributes to the OCSDNet with a perspective from a country with to date weak linkages to global academic networks and even weaker interactions with the open and collaborative science community. Despite logistical challenges, OCS principles offer tremendous opportunities for resource poor and poorly linked countries.

There are several fields of cooperation with projects from within the OCSD Network. Regarding technologies and tools, it will be very fruitful to exchange experiences with Hermes Huang's open source hardware project and with Najat Saliba's Green Map and environmental monitoring experiences in Lebanon. Notably, an exchange on hardware and monitoring tools with a higher level of technology will be beneficial for our project and could contribute to increasing local capacities for environmental analysis. On the other hand an insight into low-tech, low-cost and simple monitoring procedures might also be interesting for their contexts. Florence Piron's French African and Haiti project inspired us to include a focus on cognitive justice, and we also share the context-specific attribute of working in regions and language contexts that are off the map of hegemonic scientific knowledge. With

Catherine Traynor in South Africa and Josique Lorenzo in Costa Rica we have a common focus on climate change and community action. Also, we will explore the possibilities to jointly show-case the use of photography-based activities and outputs across Africa, Central America and Asia for visually reporting on community-based (environmental) research activities.

As projects evolve it will be highly beneficial to continue to map our activities, approaches and lessons learnt to allow for a targeted sharing within communities of practice. For example, from our project's perspective interesting clusters could evolve around environmental monitoring, participatory data generation, educational approaches, cognitive justice and marginalized science contexts or also stakeholder and network analysis.

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