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# From *Kontrollverlust* to *Kontrollgewinn*: Rediscovering a Meso-Level Normative Hierarchy for Integrated Water Management in England Using On-Line Activities

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## Abstract

This paper presents a unique study into how to identify a meso-level normative (i.e., institutional) hierarchy of procedures that aim to deliver the ecological status of waterbodies in the UK. Using traditional survey and workshop methods, the majority of recent studies concentrate on engagement practices between macro- (government bodies) and micro- (local residents) level structures, which can be potentially replicated elsewhere. Meso-level elements (middle-level structures of control) are often regarded as ‘subjective institutional change’, e.g., failures to implement programs locally or misinterpretations of reflexive dialogs with communities. Nevertheless, it is often only meso-level structures that are capable of promoting and replicating policies elsewhere. At the same time, there is increasing appeal by governmental departments for communities to ‘self-organize’ and take responsibility for prioritizing environmental tasks, which themselves might be instigated by local trusts and voluntary organizations, the existence of which remains largely unaccounted for by central offices. The recent proliferation of Twitter accounts, with the prominent themes of water, ecology and ecosystems, which include people, organizations, businesses and ‘bots’ of various types, presents new opportunities for digital methods to gain insights into structures and functions of these virtual communities. We hypothesize that our methods can produce invaluable insights into the ‘crafting’ of environmental institutions through approaches commonly ignored by traditional ‘analog’ meso-level mechanisms. We use the example of Integrated Catchment Management in the UK, and specifically the Tamar Catchment in southwest England, in order to demonstrate how well Twitter can capture this transitory meso-level environmental political system.

## Background

In the past decades, there has been considerable change regarding the governance of natural resources and how these are seen and valued by national and regional institutions (Ostrom 2011). More recently, the Millennium Ecosystem Assessment (MEA 2005) indicated that two thirds of the world’s resources are being depleted by human ac-

tivity. Many researchers and policy makers have started asking what needs to change in existing systems in order to enable them to incorporate new environmental issues, improve decision making and ensure their efficient implementation (Anderies and Jansson 2013). Several authors (Alexander 2006, Short 2015) have attempted to introduce scenarios demonstrating the efficient collaboration between institutions and social-ecological systems, which would enable a mutual synergy between the top- and the lower-tiers of the environmental political system.

Following a general trend in planning towards location-based integrative management, there has been a move away from an issue-based approach (e.g., flooding, water quality or agriculture) towards a place-based approach (e.g., catchment, or watershed); this started being implemented as part of Government policy in the mid-2000s (Scott et al. 2014). As a consequence, in March 2011 Defra (UK), launched the Integrated Catchment Management initiative, which was defined as a “more locally focused decision making and action framework to support improvements to the water environment and support river basin management planning as part of WFD activities” (Defra 2013).

Integrated Catchment Management (ICM) has also been defined elsewhere as “the coordinated planning and management of a river catchment by a group of stakeholders operating under agreed terms of engagement” (Grigg 2008, Bissett et al. 2009, Short 2015). Blackstock et al. (2009) identified good practices in collaborative catchment management and concluded that relationships and procedural aspects are key to its successful implementation. Alexander (2006), for the first time, introduced a classification framework for the actors of a normative hierarchy, which locates them into any of three levels, macro- (Government bodies), meso- (transitional relationships and procedures) and micro- (local residents, possessing unique knowledge about local environments and community micro-politics).

While this structural terminology has become relatively commonplace, the procedural strategies that follow are still to be agreed upon. Thus, several authors have identified the following implementation steps in the co-management of water catchments: (a) definition of the boundaries of the social-ecological systems (SES), (b) identification of structure, function and potential management of these SES from a local perspective, (c) analysis of the economic, social and environmental linkages, and (d) evaluation of the capacity needs among key groups and individuals (Shepherd 2004, Carlsson and Berkes 2005). Short (2015) also discusses the need to establish efficient communication mechanisms between local initiatives (micro-level) and governmental institutions (macro-level), in order to enable interconnection between the main compartments of the normative environmental system.

The prevailing assessment of institutional ‘crafting’ (Short 2015) at the micro-level echoes the general trend of promoting bottom-up initiatives; the Big Society movement reflects this, and is much discussed in recent literature on the self-organizing capacity of networked societies. Meso-level institutional design, as far as environmental management is concerned, is usually seen as an element of failure and underperformance within a normative hierarchy. Thus, Alexander (2006), Thiel et al. (2015) and several others, reduce its importance to at best “subjective institutional change”, where failures to implement programs locally or personal misinterpretations of the communal needs are amongst the few prominent examples of how it is being positioned. This attitude could be explained somewhat by the existing methods of analysis surrounding public engagement, consisting predominantly of small sample interviews and periodic workshops - both being valuable in highlighting emerging mesoscopic policy engagement indicators, but which are expensive methods to implement at larger scale.

With the increasing migration of public interactions ‘online’, opportunities arise as to how environmental policy engagement is represented in the digital sphere: Specifically how various normative levels interact, and what role is played in this process by the meso-scale as a potential policy implementation facilitator.

## Methodology

The aim of this research was to develop a workflow enabling subsequent automated policy implementation analysis. Given the recent proliferation of ‘environmental’ profiles on Twitter (e.g., @coolcanals, @froglifefers, @Thames21), we used this micro-blogging platform as the main digital input to our analysis.

The primary aim of the data mining exercise was to single out actors, belonging to different institutional levels,

e.g., micro-, meso- and macro-levels. The next step was to estimate their structure within a particular catchment, according to two parameters: (1) by proportion of actual actors, belonging to a particular user-tagged group and (2) by proportion of their followers, which indicate citizen-engaging capacity of the actors. Profile descriptions were predominantly used to confirm the geographical correctness of hydronym (e.g., the river Tamar is present in Cornwall, UK as well as in Australia) and for issue mining (e.g., tourism, artistic activity, pollution, fishing, etc.) (Fig 1).

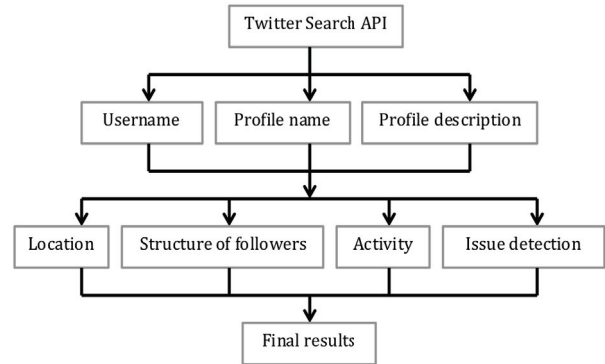


Fig 1. Structure of the data mining workflow

## Results and Discussion

In the framework of environmental policies river ecosystems are regarded as use-orientated objects. Depending on the particular use of a river it will require a certain level of environmental protection and need to be of a certain standard of water quality. This work introduces the pilot attempt to quantify these objectives with help of the data, available via social media platform APIs.

A Twitter Search API query, containing the name of the waterbody, returned a number of actor profiles. These required subsequent filtering for elimination of incorrect geographical entities (due to replication of identical toponyms and hydronyms in several English-speaking countries) and entries that provided no material for the subsequent issue of concern or real-world eco-activities (e.g., profiles without description).

Collected training profiles were subsequently tagged according to the following criteria: (a) their likeliness to belong to either macro-, meso- or micro-level in the institutional hierarchy and (b) their main purpose/interest (e.g., rowing, canoeing, art practices, fishing, conservation, etc.).

In the case of ‘hierarchical’ tagging, the following rules were applied: micro-level actors are likely to be people’s profiles with names and pictures, suggesting open profiles, which are possible to identify by triangulation to other Web data sources; macro-level actors are also relatively

easy to define by formally endorsed logotype branding elements (e.g., @ForestryCommEng). Macro-level actors are also likely to be represented by the employees of the governmental organizations (e.g., @GarethDDaviesEA) or their derivative organizations and departments (e.g., @WessexFishEA, @EnvAgencySW). Profiles, which did not fall into any of the above categories, were tagged as ‘meso-level actors’ (e.g., @thisisyourriver).

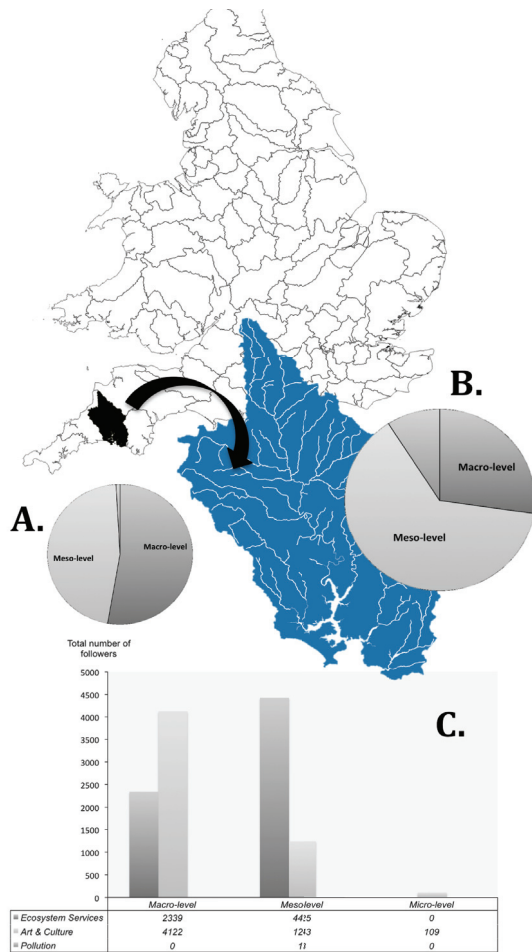


Fig 2. Interpretation of data mining results: (A): Identification of macro-, meso- and micro-level actors within output Twitter profiles (total count), (B): Weighting of macro-, meso- and micro-level actors by their number of followers, (C): Issue detection in the actor profiles and its weighting by the total number of followers (Case study: Tamar Catchment in southwest England)

From the ‘Tamar’ training dataset, we extracted one micro-level profile (@yehyehyeh), which belongs to a person named ‘Phil Rushworth’, who has a well-described profile, hyperlinked to other Twitter profiles with the simi-

lar thematic activity (@TamarProject and @AllAboutRiver).

@TamarRiver, @CornwallMuseums and @CoteheleNT were tagged as macro-levels actors because of their belonging to the higher institutional branches: e.g., @CoteheleNT specifically indicates its belonging to the National Trust and @CornwallMuseums is a sub-department of the @Cornwall\_Museum. @TamarRiver was almost un-identifiable instance, which, however, is both a follower and a followee of such high-profile environmental institutions, as MetOffice, Environment Agency, The Rivers Trust and The Royal Society of Bird Protection. On this occasion it was classified as ‘a macro-level actor’, profile of which is likely to be run by one of the institutional employee (quite possibly from the regional office).

Our issue-mining exercise revealed three main activity themes within the actors’ profiles: Ecosystem Services (ecological indicators of the water quality), Art & Culture (aesthetics of the riverine environments) and Pollution (chemical water quality indicators).

The least numerous group, Pollution, comprised only one actor @NuclearTamar, which published its environmental statement on the profile directly (“Stop the discharging of radioactive waste into the River Tamar”). The next group, Art & Culture, was represented by the mix of macro-, meso- and micro-level actors, such as artists, filmmakers (@yehyehyeh), performative industries (@TamarProject), exhibitions (@CornwallMuseums) and events (@AllAboutRiver). They usually have detailed description and activities’ timetable published on their profiles. Finally, Ecosystem Services groups consist predominantly of meso-level actors (@Devilspointpark, @TamarTourism, @PlymBoatTrips) and one macro-actor: @TamarRiver. Within the (ES) group it was possible to single out such sub-groups as: Water-related activities (e.g., Rowing, Cruise and Fishing) and Green Tourism.

Composite results (Fig 2) demonstrate an initial structure of the training analysis outputs. Preliminary results demonstrate that the majority of the so-called ‘eco-profiles’ on Twitter can be classified as meso-level actors in the normative hierarchy of water management in the UK. Hypothetically, we can argue that these structures can be used to gain better understanding of the environmental policy translation mechanisms, for example, which thematic component (or work package) has the most engaging power and what are the nature, structure and longevity of such engagements. In order to be able to address these questions, we therefore identify a considerable scope for high performance text analysis, which can help to detect contexts, isolate relevant eco-topics and identify principal actors in the volume of water-related profiles on Twitter. This type of complex analytics have already found numerous applications in market research, information science



and sociological analysis, however no studies exist to our knowledge which utilize potential of the digital micro-blogging platforms for tracking how spatial policies are being implemented; it can be argued that apart from the surveillance purposes, this approach can also help to design better (or more socially adapted) policy milestones and deadlines.

Although mesoscopic focus of this study primarily motivated by existing theoretical developments in the water management literature, from the computer science perspective the novelty of this analysis lies in the capacity to automatically differentiate between actors, which are likely to proliferate in the digital sphere *exclusively* and the ones which also maintain some kind of real-world activity. It has become a relatively commonplace practice for communities to self-organize into so-called ‘river trusts’ or other voluntary organizations, and to maintain both analog and digital presence in the water management domain. From the policy implementation perspective, values of such profiles, which are digitally active, but do not hold any real-world authority is still uncertain: they can be potentially valuable when transformed into a real-world organization, but might as well hold ‘void’ presence in the functional meso-scale hierarchy of water management. Accounting for these subtleties, when performing digital data mining for policy implementation can be crucial. There is therefore scope for a more detailed understanding of their structure, behaviour and networking activity, as well as how these indicators relate to the actual – measured – success of the waterbodies to achieve good ecological status by 2027.

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