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52	The authors declare that they have no conflict of interest		
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54			

55 Human Rights and Informed Consent

- 56 All procedures performed in studies involving human participants were in accordance with the
- ethical standards of the institutional and/or national research committee and with the European
  Commission 7<sup>th</sup> Framework Program ethical standards (2013):
- 59 http://ec.europa.eu/research/participants/data/ref/fp7/89888/ethics-for-researchers\_en.pdf.
- 60
- 61 Informed consent was obtained from all individual participants included in the study. Additional
- 62 informed consent was obtained from all individual participants for whom identifying information is 63 included in this article.
- 64

# The effects of public participation on multi-level water governance, lessons from Uganda

67

## 68 Abstract

69 Water governance occurs at multiple levels, from the local to the supra-national, which are often 70 highly fragmented. The interconnected nature of water requires interactions among these multiple 71 governance levels. Public participation may foster such interactions. Thus, many water management 72 reforms involved decentralization and public participation worldwide over the last decades. Yet, it is 73 not demonstrated how these reforms may improve water resources sustainability. Their analysis in 74 the literature does not show concretely how interactions among multiple levels materialize and are 75 influenced by participation. As such, the question addressed is how interactions among multiple 76 levels of water governance manifest over time in a participatory intervention. Using a case study in 77 the Rwenzori region in Uganda, this article compares the multi-level interactions before and during a 78 participatory process. The latter has been purposely implemented to bridge gaps between local and 79 provincial levels through a participatory planning process centered on the provincial level. Four types of flows were analyzed: information and knowledge, hydrosocial, financial and human. Our analysis 80 81 shows that using artefacts like the role-playing game and planning matrix fostered bi-directional 82 information and knowledge flows. Hydrosocial flows did not change in depth but the legitimacy of 83 the two organizations implementing the participatory process was reinforced. Project financial flows 84 were injected through a provincial academic institution, who is not a regular budget recipient. They 85 were therefore superimposed on existing budgeting process. We conclude by providing suggestions 86 for the engineering of participatory processes in order to foster more collaborative and effective 87 multi-level water governance.

# 88 Keywords

- 89 decentralization, engineering of participation, multi-level participation, planning, Rwenzori, scale,
- 90 Uganda

#### 91 **1. Introduction**

92

93 Both scale and governance have become important areas of study for social scientists engaged with 94 water issues in the past few decades (Norman, Bakker, & Cook, 2012). Water governance can be 95 defined as the set of rules, practices, and processes (formal and informal) through which decisions for 96 the management of water resources and services are taken and implemented, stakeholders articulate their interest and decision-makers are held accountable (OECD, 2015). Water governance occurs at 97 multiple levels (from local to supra-national), which are often highly fragmented. In parallel, the very 98 99 nature of water, a highly interconnected resource and interdependent with other sectors, requires 100 interactions among multiple levels (Moss & Newig, 2010; Norman et al., 2012). 101 102 We distinguish here "scale" from "level" as per Daniell & Barreteau (2014) where scale is "the relative size or extent of something" (Oxford Dictionary) and levels are a graduated range on each scale. Daniell 103 104 & Barreteau (2014) identify eight different scales (expanded and adapted from Cash et al., 2006): 105 spatial, temporal, administrative, institutional, management, networks, knowledge/information and 106 stakes/issues. According to this definition, the temporal scale, for example, may include the levels of 107 hours, days, weeks, years, centuries, etc. Many studies and papers tend to use the terms "scale" and 108 "level" interchangeably. As such, terms used by other authors are altered to match these definitions 109 where their terms do not fit the operational definitions but their use and intent do.

110

Daniell & Barreteau (2014) therefore distinguish *multi-level* from *cross-scale* interactions (Fig.1). The
former includes interactions that take place on a single scale while the latter includes interactions
which take place from one scale to another.





Fig.1 Distinction between multi-level and cross-scale interactions (based on Daniell & Barreteau,
2014)

118

We focus here on one specific part of governance: planning; and one specific scale: administrative,
including different levels, from local to supra national. We argue that many decisions about water go
through planning processes at different administrative levels, from supra-national to local. Hence,
investigating planning and the administrative scale is relevant for analyzing water governance (Newig
& Koontz, 2013).

124

125 It should be noted that Daniell & Barreteau's (2014) framework indicates that there is not just one 126 administrative scale: there are as many administrative scales as there are issues addressed by public 127 policies within a specific political organization. For example, one could look at the interactions between 128 the administrative provincial level dealing with water issues and the administrative provincial level 129 dealing with food or energy issues. This would bring us closer to nexus research which generates a 130 large amount of literature we do not deal with in this paper. Rather than these interactions across 131 different administrative scales, we are interested here in the interactions among the different levels 132 on the administrative scale that focuses on water issues in Uganda. We are therefore interested in the 133 structuring of the organization of public policies and the interactions between their different levels on 134 a particular issue: water. We argue that this aspect is important as well, in particular because the multi-135 level structuring of the organization of public policies is often similar from one issue to another and potentially generating inefficiencies and biases in public policies. This is at least the case in Uganda, 136 137 which is discussed in this paper.

138

The interconnected nature of water, and the fact that water governance occurs at multiple levels implies that governance is expected to create interactions among these different levels in order to take into account decision-making across a range of water issues and dynamics, from climate trends at a global level to the sharing of water between two neighbors at a local level.

143

However, both the literature and practice show that there are still a number of operational difficulties
in creating effective interactions among these different levels (Cash et al., 2006; Lovell, Mandondo, &
Moriarty, 2002; OECD, 2011).

147

One of the solutions that was put forward to foster coordination among multiple levels of water governance is public participation (Dore & Lebel, 2010; Newig & Fritsch, 2009). Participation can in fact appear quite logically as a potential coordination mechanism among different levels as soon as actors from these different levels or their legitimate representatives are gathered in the same arena. Thus many water management reforms across the world over recent decades entailed devolution of the implementation of water policies to lower levels of management and increased public participation (Boelens, Getches, & Guevara-Gil, 2010; UNECA, 2014). This has led, for example, to the creation of multi-stakeholder and multi-level platforms (e.g. Lebel & Garden, 2007), or to the implementation of
 role-playing games in multi-level arenas (e.g. Ducrot, 2009).

157

158 Despite the rapidly increasing academic interest in multi-level water governance and how different 159 forms of participation and stakeholder engagement have been enacted in case studies across the 160 world, there are relatively few that put a particular focus on the specific interactions created between multiple levels of governance. This is particularly the case if we look at studies with formal schemes of 161 162 representation that go beyond interpersonal relations and power (e.g. actor-networks, coalition-163 building and/or levels of participant decision-making control, and concepts such as legitimacy); social 164 learning (e.g. exchange of and development of collective knowledge); and mapping administrative levels of actors to participation structures (e.g. Maleki & Bots, 2013; Renn, Berghöfer, Wittmer, & 165 166 Rauschmayer, 2010). Those focusing on a range of scales, levels and dynamics concurrently, based on a number of flow types in the water governance system, such as finances, power, water, 167 168 information/knowledge and people are rarer (e.g. Edelenbos & Teisman, 2013). To make a small 169 contribution to this under-researched area of the participation and multi-level water governance 170 literature, we will focus on just the water administrative scale and a range of dynamics over the time. 171 Hence, the research question of this paper is: how interactions among multiple levels of water governance manifest over time in a participatory intervention? 172

173

To answer this question, this article analyses one case study: a participatory process implemented in the Rwenzori region in Uganda. The participatory process was developed as part of a European Union funded research project called AfroMaison<sup>1</sup>. The Rwenzori case is relevant to our research question because the participatory process was set up purposefully to catalyze multi-level participatory governance. The rationale of the intervention was based on the acknowledgement that the

<sup>&</sup>lt;sup>1</sup> AfroMaison project (2011-2014): "Africa at a meso-scale: Adaptive and integrated tools and strategies for natural resources management " funded by the 7th Framework Program of the European Union, theme " ENV.2010.2.1.1-1" [Integrated management of water and other natural resources in Africa].

179 implementation of decentralized water policies in Uganda was hindered by multi-level governance 180 gaps, notably a lack of resources and skills among district administrations, which are the ones 181 responsible for water planning and management (Ojambo, 2012). Hence, the intervention aimed to 182 bridge these gaps through the implementation of a multi-level participatory planning process. This 183 paper analyses multi-level interactions that existed in the case study before the participatory process 184 was implemented and those that were generated during the participatory process. The objective is to 185 compare both in order to analyze the extent to which the participatory process has modified these 186 multi-level interactions, even partially and temporarily.

187

Our analysis is based on a critical and reflexive posture. It is critical in that it does not magnify the 188 189 results of the participatory process but simply seeks to account for its apparent effects, while taking 190 into account the power plays and complexity of interactions among actors and levels. Our posture is 191 also reflexive in that it accounts for the fact that actors in the field, by their very actions, contribute 192 to the production of knowledge and, conversely, that researchers influenced actions in the field with 193 the results of their analyses. This posture is at the heart of debates within the sociologists' 194 community (Claeys-Mekdade, 2006). Without entering into these debates, our position is in line with 195 sociological research focusing on action-research and its implications for field activities and the 196 production of knowledge (Daré & Venot, 2016; Le Goff, 2012; Schwidt, 2017). The aim of the paper 197 based on this analysis is to present insights that may be applicable for the engineering of 198 participation processes in order to foster more collaborative and effective multi-level governance. 199 The limits of this approach are discussed at the end of the paper. 200

201 **2.** Materials and methods

202 2.1 The Ugandan case study203

204 The study area in Uganda is the Rwenzori mountain range located in western Uganda, at the border 205 with the Democratic Republic of Congo (Fig.2). The Rwenzori region covers 14,000 km<sup>2</sup> (AfroMaison, 206 2014) over seven districts and has a population of about 2,4 million. The region, which is part of the 207 White Nile basin, hosts several river systems, lakes, wetlands and crater lakes, as well as four 208 national parks. These features constitute major tourist attractions to the region. The tropical climate, 209 bimodal annual rainfall system (NEMA, 2004), as well as the past volcanic activity have made soils 210 fertile. The Rwenzori region is predominantly inhabited by smallholder farmers who engage in 211 subsistence farming. Major crops grown include coffee, cotton, banana, cassava, beans, maize, 212 groundnuts, sweet potatoes and Irish potatoes. Some farmers keep livestock such as poultry, goats and cattle. Some large-scale farmers are engaged in commercial farming, especially tea plantations. 213





215 Fig.2 Map of the case study site (Google 2014, adapted by Clive Hilliker)

216

217 Poor land use practices such as bush burning, fuel wood harvesting and unsustainable timber

218 harvesting have led to deforestation, soil erosion, landslides and floods (Plumptre, 2002). Land

219 degradation, amid climate change and high population growth rates, has also led to food shortages

and disease outbreaks (Migongo-Bake & Catactutan, 2012). This makes the region economically
vulnerable given that the majority of the people are below the poverty line (UBOS & ILRI, 2007).

- Uganda has a considerable number of natural resources management legislation and policies. From 1992, natural resources management, including water, was devolved to the local governments (Onyach-Olaa, 2003), shaped by a five-tier structure (district/county/subcounty/parish/village, see Table 1). Environment committees and officers are responsible for community engagement and implementation of water laws. However, lack of governmental funds, heavy workloads and corruption impede adequate implementation of this legal framework. For a detailed description of the Rwenzori case context, see Hassenforder, Ferrand, Pittock, Daniell, & Barreteau (2015).
- 230
- 231

Levels within the	Correspondence in Ugandan Five-	Correspondence in
administrative scale in	tier structure specific to the	Ugandan water
Daniell &Barreteau's	Rwenzori region	management structures
typology		
Supranational		
National	Republic of Uganda	Ministry of Water and
		Environment
Regional	<b>Region</b> = Western region	
Provincial	<b>District</b> (LC5) = 9 districts: Kabarole,	Environment committee
	Kasese, Bundibugyo, Kyenjojo,	Environment Officer
	Kamwenge, Kyegegwa, Ntoroko,	Community Development
	Bunyangabu, and Kitagwenda	Officer
		Catchment Management
		Committee

Local	<b>County / municipality</b> (LC4) = ty	WO
	municipalities: Fort Portal and	
	Kasese	
	Sub-county / town (LC3)	Environment committee
		Environment Officer
	Ward or parish (LC2)	
	Village (LC1)	Village water user
		committee
		Secretary for environment
		on LC1 committee
		Environment committee

Table 1.Correspondence between levels within the administrative scale in Daniell & Barreteau's
(2014) typology and levels in Ugandan decentralized administrative and water management
structures (LC = Local Council; In grey: level of focus of the participatory process developed in the
frame of the AfroMaison project°. As an illustration, Kabarole district includes 12 subcounties and 4
town councils (LC3), 67 parishes/wards (LC2) and 503 villages (LC1) (Kabarole District Planning
Division, 2020).

# 239 2.2 The participatory planning process in the Ugandan case

240

The participatory process was developed as part of a European Union funded research project called AfroMaison. AfroMaison's objective was to "contribute to bringing the concept of Integrated Natural Resources Management into practice at the meso-scale" (AfroMaison, 2010, p.6), or what we call here provincial level. The main output of the project was a "toolbox" comprising a series of tools and approaches to support practical implementation of integrated natural resources management. One of these approaches was a participatory planning process set up at several levels (Hassenforder,

247 2015): provincial, local and to a lesser extent national. At each of these levels, one or more groups of

actors developed natural resource management plans through different workshops. The

249 development of these management plans involved six phases (Fig.3):

- 250 1. The agreement on how the participatory process would take place,
- 251 2. the identification of the focal issue,
- 3. the proposal of actions likely to address the focal issue (using an action template, Fig.6),
- 4. the selection and organization of actions in time, space and levels (using the COOPLAN

254 matrix as per Ferrand, Hassenforder, Abrami, & Aquae-Gaudi, 2015 and Fig.6),

5. the test of the plan using a role-playing game (based on Wat-A-Game toolkit; Abrami et al.

256 2012; Ferrand et al. 2009) and

257 6. an agreement on plan implementation.

At some key moments, the groups of the different levels would meet and share their respectiveresults.

260

At the provincial level, this planning process was implemented through a series of four two-to-three 261 262 day-long workshops with a group of 29 to 68 provincial participants. The process lasted 16 months, 263 from April 2012 to July 2013 (workshops 1 to 4 in Figure 3). Concerning the local-level process, 35 264 communities were involved with an average of 17 participants per group, mainly farmers and 265 pastoralists. They were invited using a pre-existing agricultural extension network. One to seven 266 workshops were held in each community between January and June 2013. In total, the process 267 involved 125 participants at the provincial level and 597 at the local level (Fig.4). Involvement of 268 actors at the national level failed: two meetings were planned with the Minister of Water and 269 Environment in 2013 but were cancelled by the Minister. The three members of the national 270 parliament representing the Rwenzori region were invited to attend the provincial meetings, in 271 January and July 2013, but only one attended.



#### 273 Fig.3 The multi-level participatory planning process in the Ugandan case

274

275 The resulting three provincial plans and 27 local plans were merged during a final workshop held in 276 July 2013. After this, one last workshop was held in each community between July and December 2013 for them to make their own local implementation plan and provide their feedback on the 277 278 provincial plan. At the end of the process, a coalition of local stakeholders called the Rwenzori 279 Regional Development Framework (RRDF, 2011) endorsed the plan. The coalition took over the 280 coordination and monitoring of plan implementation. Members of the RRDF agreed to implement parts of the plan depending on their scope of work, such as agriculture, water, community 281 282 organizations or education.



#### 284 Fig.4 Participants in the local and provincial participatory processes: gender, occupational

- 285 categories and geographical provenance
- 286

# 287 2.3 Data collection and analysis

- 288
- We argue that most of the research reviewed and presented in the introduction does not explain concretely how interactions among multiple levels materialize in a dynamic manner, and therefore how participation may affect these interactions.
- 292

293	We have therefore decided to use the framework developed by Daniell & Barreteau (2014) in
294	order to investigate our research question. They build on the assumption that interactions among
295	multiple levels materialize through various flows. Their framework is composed of a typology including
296	six types of flows. Analyzing these flows allows thorough investigation of interactions among multiple
297	levels of participatory water governance and how participation may affect them. The six types of flows
298	are:
299	• Physical or material flows (e.g. water, pollution, food, concrete, ecology). We will focus here
300	on water flows;
301	<ul> <li>Information and knowledge flows that could create cognitive changes;</li> </ul>
302	• Political and social control flows, also called hydrosocial flows, that influence who has
303	decision-making power over water. Daniell & Barreteau (2014) mention that these "include
304	primarily the issue of legitimacy of actors that are supposed to control the use and
305	movement of water and how governance structures and actor coalitions shape water
306	management decisions and outcomes";
307	• Financial flows that can be generated by any entity with access to a bank account or other
308	financial system for exchange;
309	• Human flows, such as people travelling between spatial or administrative levels; and the
310	• Irreversibility effect: flows, such as that of time passing, which lead to cumulative effects that
311	are difficult or impossible to reverse, transforming the environment of action.
312	
313	Our analysis focuses on four of the six flows identified by Daniell & Barreteau (2014). Both physical
314	flows and irreversible effects are by definition not directly modifiable by the participatory process
315	and therefore less relevant for our analysis. In addition, "irreversibility effects" are not mediated by
316	any flow per se. They correspond to processes which are difficult to change and require an analysis
317	over time. Hence we are not able to populate this category in this analysis.

319 As mentioned before, we focus in this article on the analysis of:

- One specific scale: the *administrative scale* regarding water issues (Fig.1). We therefore
   analyze the flows taking place among the five levels within this scale (supranational, national,
   regional, provincial and local); and
- One specific process: *planning*. We argue that decisions about water often go through
   planning processes at different administrative levels (from supra-national to local). Hence,
   investigating planning and the administrative scale is relevant for analyzing water
   governance.
- 327

In addition, we focus on a specific time frame: that is the flows taking place before the beginning of 328 329 the AfroMaison participatory process (in 2012), and the flows that were generated by the 330 participatory process (Apr. 2012 - Dec. 2013). We therefore seek to establish a picture of the flows 331 taking place in the institutional decision-making processes before the beginning of the participatory 332 process. Then, we picture the flows generated by the participatory process, to see to what extent 333 these were different and have (even in a limited time and partially) modified pre-existing flows. We also focus on actors involved, directly or indirectly, in the participatory process. Since the AfroMaison 334 project targeted the provincial level, we focus our analysis on flows coming in and going out of this 335 336 specific level or impacting it. For example, we included information flows that took place among local 337 actors and had repercussions on the provincial level because they impacted the way provincial 338 policies were implemented. Conversely, we did not include flows taking place between the supra-339 national and the national levels without directly impacting the provincial level.

340

These boundaries in our analysis therefore incur limits in the potential conclusions that can be drawn. However, we felt it was necessary to narrow the scope of our analysis in order to understand in detail the changes in flows that had taken place before and during the participatory process. A reader looking for an in-depth analysis of the complexity of each of the flows, in the long term or

among all the actors in the region, will have to look for complementary analyses in the field of
information and communication science (for information and knowledge flows), development
economy (for financial flows), political ecology (for hydrosocial flows), and anthropology (for human
flows), among others. On the other hand, the present analysis sheds light on the interactions
between these different flows on the one hand and on the role of the participatory process in the
change in flow dynamics on the other.

351

Several methods were used to inform this analysis. For assessing the flows prior to the beginning of 352 the participatory process, the main documentary source is a baseline study of the social-353 354 environmental context and water governance made in 2012 in the case study site (Migongo-Bake & 355 Catactutan, 2012). This pre-analysis was based on a literature review, eight key informant interviews 356 and one focus group with actors at the provincial level; and seven individual interviews, four transect 357 walks and one focus-group discussion with farmers. Right after this initial data collection, we carried 358 out ten supplementary interviews of stakeholders at the provincial and local levels to gather 359 additional information about operational planning practices and relationships with stakeholders at various administrative levels<sup>2</sup>. Monitoring of the process during the intervention was undertaken by 360 361 a group of five local evaluators, appointed and working under the supervision of a chief evaluator, a 362 co-author here. Various methods were used to record observation and analysis. They filled a "logbook" (Bousquet, Etienne, & D'Aquino, 2011) on a daily basis recording all interactions, events 363 364 and other external factors taking place in the area. Each workshop was monitored using attendance 365 lists, participants' expectations, pictures, videos, participant observation and individual 366 questionnaires filled by the participants, facilitators and evaluators at the end of the workshops. 367 Interviews of facilitators, participants and non-participants were also undertaken by evaluators at

<sup>&</sup>lt;sup>2</sup> The questionnaires used in the baseline study were common to the five cases of the AfroMaison project (the Oum Zessar watershed in Tunisia, the Inner Niger Delta in Mali, the Fogera woreda in Ethiopia, the Rwenzori region in Uganda and the Drakensberg in South Africa). The complementary interviews therefore allowed understanding of the Ugandan case specifically.

368 various stages of the process. The data collected with these monitoring and evaluation methods 369 were transcribed by evaluators immediately after collection. The four code categories used were the 370 four flows as per the strict definitions provided above (information and knowledge, hydrosocial, 371 financial and human flows). An initial test of the reliability of the code was made on one document 372 and two interviews: data were coded separately by the chief evaluator and by two local evaluators. 373 Comparison of the results indicated that a change in code categories was not necessary. All the raw 374 data were read, listened to and summarized to identify meaningful units of text corresponding to the 375 four code categories. The direction of the flows was identified based on correspondences shown in 376 Table 1. No computerized data management program was used. Both coding and data extraction was 377 made manually, using Word and Excel documents. The following sections present the results of this 378 analysis.

# **379 3. Results**

380

381 Table 2 summarizes the main flows illustrated in Figure 5.

- **Table 2. Summary of the flows before and during the participatory process**
- 384 (NGOs = non-governmental organizations)
- 385

	Flows before the participatory process	Additional flows during the participatory
		process
Information	Local > local	<u>Local &gt; local</u>
and	Training and capacity-building by	Exchange of information among
knowledge	agricultural trainers and community	communities in game sessions
flows	based organizations	Local > provincial
	Radios	Integration of local plans into the Rwenzori
	Discourses of religious and tribal leaders	provincial management plan
		Public claims during meetings

	Discourses of village elders in local water	Provincial > local
	management committees	Feedback of the provincial plan to
	Provincial > local	communities
	Intervention of environment officers and	Provincial > national
	technicians	Solicitation of district stakeholders towards
	Training of local youth in schools &	the Minister of Water and Environment
	universities	Supra-national > provincial
	Supra-national > local	Intervention of international experts
	Awareness raising campaigns by NGOs	
Hydrosocial	Local > local	Local > provincial
flows	Role of local water management	Legitimacy of Mountains of the Moon
	committees in developing and	University and the Rwenzori Regional
	implementing local bye-laws	Development Framework - SATNET
	Influence of community based	Communities issuing their own water
	organizations, religious leaders, tribal	management plans
	leaders and kings in informal decision-	
	making processes regarding local water	
	management	
	Local > provincial	
	Lobby of NGOs and religious leaders to	
	sectoral district sectoral committees to	
	have their proposals funded by the plans	
	Provincial > provincial	
	Environment committees and officers who	
	are meant to implement ordinances	
Financial	Local > provincial	Provincial > local
flows		Logistic expenses for local workshops

	Decentralized participatory budgeting	Supra-national > provincial
	system	Funding from European project through
	Provincial > local	provincial rural extension networks,
	Allocation of the 5-year strategic budget to	ultimately acting locally
	villages	
	Allocation of budget to NGOs or religious	
	leaders which lobbying was successful	
	Supra-national > local	
	Financial inputs from international donors	
	Supra-national > provincial	
	Financial inputs from international donors	
Human flows	Local > local	Local > local
	Water users	Local facilitators and evaluators attending
	Local > provincial	local workshops
	Youth travelling to the provincial capital	Local > provincial
	where they study	Communities attending provincial
	Provincial > provincial	workshops
	Environment officers rarely going to the	Local facilitators and evaluators attending
	field	provincial workshops
	National > Provincial	Provincial > provincial
	Three parliamentarians travelling to Fort	District representative attending provincial
	Portal	workshops
		<u>National &gt; provincial</u>
		Parliamentarian attending provincial
		workshop
		Supra-national > provincial



398 water-preserving agricultural techniques and behaviors. Many messages about water preservation 399 are also conveyed through the radio, as well as by religious leaders, tribal leaders of the Bakonzo, the 400 Bamba and the Babwisi and Bunyoro and Toro kings (local > local). Beliefs linked to water are also 401 conveyed by village elders who often head local water management committees (Migongo-Bake & 402 Catactutan, 2012). For example, Bakonjo believe that if bamboo trees are grown on farmland, an 403 elder will die. This knowledge often supersedes government information, particularly in areas where 404 government officials are not able to intervene on a regular basis. Some information flows also go 405 from the provincial to the local level, through the intervention of governmental environment officers 406 and technicians. Finally, some flows, such as awareness-raising campaigns from international NGOs, 407 come from the supra national level (supra-national > local). In general, information flows are mainly 408 mediated by in-person interrelationships, except through provincial radio broadcast, a major media, 409 and rarely phone (oral or text) word-of-mouth. Internet means are rarely used for water information 410 and knowledge purposes outside academic or foreigner arenas.

411

412 Regarding hydrosocial flows, water management decision-making is highly fragmented between the 413 provincial and the local level. Ordinances are issued at the provincial level (provincial > provincial) 414 that have to be in line with the national laws and acts. However, these are poorly implemented, 415 mainly due to a lack of governmental funds, low salaries and corruption. Environment committees 416 and officers in the region are generally active at the district level, sometimes at the sub-county level 417 and almost always inactive or nonexistent at the local level (hence the dotted green arrow in figure 418 5). One interviewee (interviewed in July 2012), who is an independent environment officer in Fort 419 Portal, mentioned: "most [local environment officers] don't know their roles, they lack knowledge, 420 money, transport. [...] The local environment officer is often a poor person, he will not go and discuss 421 environmental issues and penalties with a rich man who provides him with milk and other things". 422 This led to a certain remoteness of communities from the governmental regulations and suspicion 423 towards the capacity of the state to manage natural resources. As a result, many local communities

424 adopt local bye-laws for water management that generally are a combination of Local Council bye-425 laws, social norms and culture (local > local) (Hartter & Ryan, 2010; Hassenforder, Ferrand, Pittock, 426 Daniell, & Barreteau, 2015). In addition, as previously mentioned, community-based organizations, 427 religious leaders, tribal leaders and kings play a large role in informal decision-making processes 428 regarding local water management, i.e. customary governance. In villages where local water 429 management committees exist, the committee is generally in charge of making sure that water 430 resources (particularly wells) are properly utilized. They control the utilization and access rights of 431 resources. Financial or physical sanctions are applied to offenders who pollute water. Local 432 organizations or non-governmental organizations (NGOs) have played a role in implementing such 433 sanctioning systems, including "community policing" or "shame lists" against persons who did not 434 use sanitation facilities or who polluted or wasted water. In some places, open defecation was even 435 reported to lead to public ban (pillory).

436

437 Financial flows follow a similar pattern to hydrosocial flows since, to a certain extent, administrative 438 water budgets are linked to the decentralized water planning process. There is a budgeting cycle 439 every year which should be fueled by a participatory process. In each village (LC1), a LC1 chairman is 440 elected by villagers. The chairman selects a committee of 10 people approved by villagers. Each 441 committee gathers about every three months and writes down villagers' needs and expectations. 442 These are taken up to LC2, 3, 4 and then 5 levels (dotted purple arrow from local > provincial), each 443 level prioritizing the actions which are to be funded (see Table 1). At the subcounty and district 444 levels, 5-year strategic plans, revised at mid-term, aim at funding prioritized actions. These plans 445 attract financial inputs from international donors (supra-national > provincial) who also fund some 446 local projects directly (supra-national > local). Budget conferences at the subcounty and district levels 447 select actions to be funded through the 5-year strategic plans. Plans are then further scrutinized and 448 approved by district councils and district sectoral committees. Budget is then allocated to villages 449 (provincial > local). However, implementation of this decentralized participatory budgeting system

450 rarely goes as planned. Interviews revealed that many villagers have the feeling that their needs and 451 expectations are rarely funded: "even when it [proposals] goes up, it doesn't go down" (Interview : 452 program Officer, Rwenzori Information Centres Network 02/08/12). Several actors, including NGOs 453 and religious leaders, lobby district sectoral committees to have their proposals funded by the plans 454 (provincial > local). This formal structure is complemented by groups of "saving-and-credit", mainly 455 with women, who can indirectly contribute to natural resource management actions.

456

457 Human flows related to water management are also rather uni-level. Interviews with environment 458 officers revealed that they rarely go to the field to monitor water usage due to a lack of funds and 459 vehicles (hence the orange dotted arrow from provincial > local). The geographical remoteness of 460 local communities from decision making hubs along with the rugged terrain limit human flows from 461 local to provincial levels, even less to Kampala. The three members of the national parliament representing the Rwenzori region often travel to Fort Portal, the main city in the Rwenzori region, 462 463 since they originate from the region (national > provincial). However youth engaged in education, 464 especially in local university, are defacto carrying voices and perspectives of their own community 465 toward the provincial capital where they study (local > provincial).

466

#### 467 3.2 Flows of interactions among multiple levels during the participatory process

468

This section addresses flows that were identified during the participatory process, that is flows
observed throughout the period during which connected participatory events were organized (Apr.
2012-Dec.2013).

472

473 Since the participatory process targeted multi-level planning, the main focus was put to

474 multidirectional flows of **information and knowledge**. These included specific integration of local

475 plans into the Rwenzori provincial management plan (local > provincial) and feedback of the

provincial plan to communities (provincial > local), as well as exchange of information among
communities (local > local). District stakeholders solicited the Minister of Water and Environment
with the aim of creating a ministerial commission on integrated water management (provincial >
national). In addition, international experts, including an economist, a hydrologist, an ecologist and
agro-foresters were solicited to provide inputs at several occasions during the participatory planning
process (supra-national > provincial).

482

483 As mentioned earlier, hydrosocial flows concern how actor coalitions shape water management 484 decisions and outcomes. During the participatory process, the two actor coalitions that were 485 considered by participants as having the most legitimacy to implement the water management plan 486 were Mountains of the Moon University, the Rwenzori Regional Development Framework and 487 SATNET (local > provincial). Yet the project aimed at empowering communities to make decisions 488 over their water resources. And indeed, the fact that 27 communities issued their own water 489 management plans, and afterwards were able to defend their plan in front of provincial stakeholders 490 shows that participants gained capacities in managing their water resources (local > provincial). 491 Indeed, exchange of knowledge among communities was encouraged by the project and as a result 492 some community members who had knowledge about a specific technique organized trainings in 493 neighboring communities. As a result several local actions were implemented, such as building of 494 energy saving stoves or waste separation areas.

495

The main **financial flow** here is from the European project and it was provided to actors at the district level (supra-national > provincial). Secondary flows appeared dynamically in relation to logistic issues in communities, for local workshop expenditures (provincial > local). Evaluators were employed, not the facilitators.

500

Human flows took place mainly through provincial workshops, which explains the orange arrows pointing mainly towards the provincial level. Provincial workshops gathered participants from the communities (local > provincial), districts (provincial > provincial), one member of parliament (national > provincial) and international researchers (supra-national > provincial). Some foreign researchers interviewed local farmers and attended local workshops (supranational > local). Only major human flows are represented here.

507

3.3 Comparison of the flows of interactions before and during the participatory process

The main question that this paper sought to address is: how are the interactions among multiple levels of water governance manifested over time in a participatory intervention? A comparison of the flows before and during the participatory process in the Ugandan case provides some insights to answer this question.

514

Information and knowledge flows from provincial to local and from local to local levels did not 515 516 change much during the participatory process since the process used existing flows to communicate, 517 including the mobilization of agricultural trainers, radio, etc. However, the nature of information 518 exchange between community members was to some extent different. Using artefacts like the roleplaying game and the CooPlan matrix (Fig.6) gave community members the opportunity to discuss 519 520 certain topics that were not frequently discussed before. In particular, observations of the game 521 sessions highlighted the fact that the game led participants to discuss the effects of individual actions 522 on the environment and other stakeholders, whereas sessions with agricultural trainers usually 523 include discussions on specific agricultural practices and have less of a systemic approach. Getting 524 participants to explain their actions and management choices also led them to discuss some beliefs, 525 such as the kind of bamboo trees that can be planted when someone dies. Information exchange

- 526 also occurred among communities themselves, through posters summarizing results of neighboring
- 527 communities and through observers who could tell what was happening elsewhere.



Fig.6 Some of the artefacts used during the participatory process: top left (a): action template to be
filled by participants when proposing actions; top right (b): yellow pebbles materializing the financial
flows in the game; bottom (c): CooPlan matrix for organizing actions in time, space and levels.

532

533 The participatory process also sought as much as possible to make information and knowledge flows

534 bi-directional and not just top-down. For instance, communities could present their plans at the

535 provincial level. This information and knowledge flow from local to provincial must be analyzed in 536 conjunction with the human flow going in the same direction. Indeed, it is rare for community 537 representatives to sit in provincial decision-making arenas. The presence of these representatives 538 made it possible to set up speaking arrangements that encouraged provincial-level actors to listen to 539 the constraints and expectations of local-level actors. It is precisely this interaction that is often 540 missing in natural resource management in the Rwenzori region. This acknowledgement was the 541 rationale of the Afromaison project and indeed these interactions were reinforced in the timeframe 542 of the participatory process.

543

Finally, the participatory process sought to bring information from the provincial to the national
level, although attempts to establish a link with the parliamentary level have progressed very slowly.
Only one parliamentarian agreed to attend provincial workshops and the ministerial commission that
was supposed to be put in place has not, up to now, been constituted.

548

549 The participatory process was too restricted in time and space to have modified the hydrosocial 550 flows in depth. Nevertheless, final interviews with participants showed that the process contributed 551 to strengthen the legitimacy of Mountains of the Moon University and SATNET to carry bottom-up 552 approaches to natural resource management. In the final questionnaires, a majority of participants 553 indicated that they considered both organizations to be the most legitimate organizations to 554 implement the plans. The participatory process also contributed to highlighting and discussing the 555 role of environment officers whose absence, either physically or in terms of participation, was 556 pointed out during the first provincial level workshops.

557

In **financial** terms, **flows** occurring in the course of the participatory process came from the supranational level (i.e. the European project) and were superimposed on the existing budgeting process. Project financial flows were in the Ugandan case injected directly at the provincial level

through an academic institution, who is not a regular recipient of natural resource management budget and is not accustomed to managing such funds. Moreover, the financial flows during the participatory process do not go from local to provincial because even though AfroMaison project fostered a participatory planning approach, the project did not finance the implementation of the plans. The rationale of the project was to build capacities at different scales so that the plans could be financed locally. As a result, AfroMaison project did not contribute to the establishment of a participatory budgeting process.

568

569

## 4. Discussion and conclusion

570

This comparative analysis has several methodological limits that have to be highlighted. Firstly, this 571 comparison was made based on "pictures", or static schemes of the flows at specific times, before 572 573 and during the participatory process. A more dynamic representation of the evolution of these flows 574 over time would enrich the analysis. Secondly, our analysis focuses on one specific part of 575 governance, planning, one specific scale, administrative, and one specific natural resource, water. A 576 broader analysis of other parts of governance, multi-scale (and not only multi-level) interactions, and 577 of linkages with other natural resources would enrich the comprehension of the system at hand. 578 Thirdly, we fully cannot track the secondary impact of participation on the various flows, as the 579 enquiry would have been much too demanding for participants already hyper-engaged, and causal 580 imputation would have been very difficult, outside using a control group.

581

Indeed, there are several other elements that impact the participatory process and the four flows.
These include contextual elements (e.g. institutional dynamics, political economies in which local
processes unfold, tacit political values and power structures) and elements that are inherent to the
participatory process, including who is the convener, what is the role of the participatory process in
decision-making, who participated and who did not and who facilitated. In the Ugandan case study

for instance, one of the stated objectives of the AfroMaison project was to bridge the multi-level gap.
It is difficult to establish whether the flow changes would have been identical without this
intentionality. At the same time, the participatory planning process remained parallel to the
institutional natural resources planning process, which may partly explain why the changes caused
are unlikely to last over time. In addition, other contextual aspects required crisis management in
2012-2013 (Congolese refugee flows, Ebola epidemics and floods in Kasese region) that took
precedence over longer-term planning and caused a shift in the level of focus.

594

595 Despite these limits, this analysis has the merit of highlighting the nature of the flows that make up 596 part of the multi-level governance in the case study. It also points out the importance of the 597 engineering of the participatory process on the way it affects multi-level governance. Indeed, all 598 flows, be they informational, political, social, financial or human, can be affected by the type of 599 process chosen, the limits set for it, as well as the actors invited to it and the role they are given in it. 600 All these elements can limit the effectiveness of water governance, reduce the scope of decision-601 making or make it accessible only to certain people. Acknowledging this, the role of the participatory 602 process engineer then becomes to frame, for each modifiable flow, its origin, direction and 603 magnitude in order to limit such deviances of participation.

604

From the current analysis and our experience, we propose some ways to engineer participatoryprocesses in order to foster multi-level governance.

607

In the Ugandan process, the multi-directionality of information & knowledge flows was partly
generated by the use of various forms of participatory modelling and simulation, including a
combination of role-playing games and participatory planning. Indeed, the use of boundary objects
such as role-playing games, action templates or the CooPlan matrix (Fig.6) has made it possible to
elicit the four flows and to allow a dialogue on concrete elements. In the game for example, the

613 financial flows are materialized by yellow pebbles that are transferred from one player to another. In 614 the action template, the participants are asked to reflect and then to dialogue on the information 615 and knowledge resources needed to carry out a specific action. The four flows are thus concretely 616 represented in the boundary objects and discussed. If the causality between the use of these 617 boundary objects and the effects on multi-level governance in the Rwenzori region is difficult to 618 establish, our analysis shows that they have at least contributed to it. We therefore recommend the 619 use of such boundary objects in participatory processes in order to foster multi-level governance. 620 Additionally, one of the lessons we have learned from this experience is that the involvement of 621 specialized mediators for each type of flow might have fostered dialogue about the four flows and their interconnections. Such mediators would have been in charge of ensuring the specific address of 622 623 each flow and the connection with other flows.

624

625 Concerning political and social control, some facilitation methods can reduce power imbalances and 626 elite capture and adjust for cultural orientations. These include for example organizing the process 627 separately with the different categories of stakeholders and then merging the results, putting the 628 most powerful actors in the position of observers at certain times; switching roles in the role-playing 629 game (e.g. asking a farmer to play the role of a decision-maker and vice-versa) or using participatory 630 methods dedicated to conflict resolution (e.g. preference elicitation, consensus building, 631 deliberation). These are common facilitation methods which allow all participants, including the most 632 timid and marginalized, to express themselves. We also recommend the establishment of a participation charter and rules. These can be co-constructed with participants. They provide a 633 634 framework for speaking out, sharing knowledge and respecting others and the process. They are 635 more easily respected when they have been approved by participants in the early stages of the 636 participatory process.

637

638 For financial flows, investment committees or participatory budgeting may help to diversify the 639 stakeholder group in charge of administrating project finances. Regarding human flows, the variation 640 of places and the multiplication of physical exchanges seems to favor multi-level governance, for 641 example by encouraging decision-makers to come to the field or by offering lay stakeholders the 642 opportunity to observe or even participate in institutional decision-making arenas. In Uganda, tight 643 and multiplex social networks strongly enabled interactions among multiple levels of water 644 governance. The fact, for example, that the facilitator of the participatory process is also involved in 645 several regional civil society initiatives such as the Tooro Botanical Garden; or the fact that a member 646 of parliament has family living in the region are non- negligible factors of multi-level integration 647 which may need to be reconstructed elsewhere. 648 Having stressed the importance of the engineering of the participatory process, we advance the 649 650 hypothesis that including participants in this engineering phase would make the four flows visible 651 and allow their co-design with different actors, thus improving the effectiveness of multi-level 652 participatory water governance. Several research studies go in this direction, in the field of decision aiding (Daniell, 2012; Pluchinotta, Kazakçi, Giordano, & Tsoukiàs, 2019), political science (Floc'Hlay & 653 654 Plottu, 1998), and sociology (Barbier, 2005). Two of the authors of the paper have experimented 655 such participatory engineering of participation in Drôme river basin in France (Hassenforder, Girard, 656 Ferrand, Petitjean, & Fermond, n.d.) but further real-life experiments are still lacking.

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