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Effective risk governance for environmental policy making: A knowledge management perspective

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Abstract

Effective risk management within environmental policy making requires knowledge on natural, economic and social systems to be integrated; knowledge characterised by complexity, uncertainty and ambiguity. We describe a case study in a (UK) central government department exploring how risk governance supports and hinders this challenging integration of knowledge. Forty-five semi-structured interviews were completed over a two year period. We found that lateral knowledge transfer between teams working on different policy areas was widely viewed as a key source of knowledge. However, the process of lateral knowledge transfer was predominantly informal and unsupported by risk governance structures. We argue this made decision quality vulnerable to a loss of knowledge through staff turnover, and time and resource pressures. Our conclusion is that the predominant form of risk governance framework, with its focus on centralised decision-making and vertical knowledge transfer is insufficient to support risk-based, environmental policy making. We discuss how risk governance can better support environmental policy makers through systematic knowledge management practices.

Keywords: environmental policy; risk; enterprise risk management; knowledge management.

1. Introduction

Environmental policy-making is increasingly risk- and evidence -informed across the European Union's Member States and in Canada, Australia and the US (Holmes and Clark, 2008; Likens, 2010). Further, the move towards participatory policy-making that involves a wider range of stakeholders from an early stage is building momentum (Klinke and Renn, 2012; Stern and Fineberg, 1996). In the UK policy context, it is explicitly stated that risk relevant knowledge not only resides in scientific data, but in the "*in the minds of front line staff in departments, agencies and local authorities and those to whom the policy is directed*" (Cabinet Office, 1999). As a result, environmental policy making increasingly involves integration of knowledge (Figure 1) of a wide range of types (Alavi and Leidner, 2001) and from a wide range of sources (Prpich et al., 2011) that may be highly technical, value laden, ambiguous and/or contradictory (Gregory et al. 2006; Klinke and Renn, 2002; Tribbia and Moser, 2008).

[Please insert Figure 1 here]

For example, developing policy to manage flood risk requires knowledge of the effect of anthropogenic climate change and land use developments on river discharge, economic and demographic developments in river corridors and changing societal views on safety and the importance of natural and cultural landscape values (Collins et al., 2007; Hooijer et al., 2004). This required integration of knowledge from multiple disciplines, experts, organisations, industry groups and actors within civil society is not a one off exercise but rather part of a continuous knowledge acquisition process (Strutt et al., 2006) to manage dynamic and emerging risks (Walker et al., 2003; Wahlin and Grimvall, 2008).

53 The challenge for environmental risk governance is the daunting task of acquiring,
54 coordinating, analysing and utilising this knowledge base to inform risk management and
55 support organisational learning (Figure 1). This requires appropriate risk governance
56 structures and practices (Klinke and Renn, 2010). Risk governance is defined as the
57 organisational components (such as processes and policies) that support and sustain risk
58 management activities (such as risk identification and assessment) (ISO 3100). Many risk
59 governance framework used in the public sector are based on Enterprise risk management
60 (ERM) frameworks (for example, COSO, 2004). ERM principles underpin public sector risk
61 governance in Canada, Australia, the US (Victorian Auditor-General's Office, 2007; AON,
62 2011; Province of British Columbia, 2012; Hardy, 2010) and the UK (HM Treasury, 2004).
63 Key features of ERM are its emphasis on strategic decisions (Figure 2) and internal control
64 (Arena et al., 2010).
65
66 [Please insert Figure 2 here]
67
68 The risk governance of ERM frameworks are characterised by formal and vertical knowledge
69 transfer and aggregations that we are concerned may be inadequate for the scope and
70 complexity of knowledge required to develop effective environmental policy. Enterprise Risk
71 Management frameworks require that risk knowledge is made explicit through systematic
72 risk assessment and aggregated through formal risk reporting (COSO, 2004). Aggregated
73 risk knowledge, typically presented as qualitative or semi-qualitative information in risk
74 registers and matrixes, informs debates about risk appetite and risk management strategy at
75 Board and senior management levels which are them disseminated through the chain of
76 command (COSO, 2004). This emphasis on vertical transfer and aggregation of risk

77 knowledge and the top-down communication of risk appetite and risk ownership appears to
78 ignore the flow of knowledge at tactical, project and operational levels (Figure 2).

79 Given our research interest in how knowledge is utilised in the development of
80 environmental policy relating to environmental risks, we conducted this study to examine the
81 relationships between risk knowledge and policy design in the context of an environmental
82 risk governance framework. Our research aim was to examine the efficacy of knowledge
83 management practices supporting the integration of risk knowledge into environmental policy
84 and identify opportunities for improvement. Here integration is defined as the processes and
85 practices used to coordinate decision making involving multiple actors and groups that may
86 have different knowledge, expertise and perceptions relevant to the decision (Tsai, 2002).
87 Our objectives were to (i) access policy teams taking these decisions; (ii) describe sources of
88 knowledge used to inform their decisions; (iii) reference our findings to risk governance
89 systems and theoretical understandings of risk and knowledge management capability.

90 ***1.1 Case description***

91 The case study was selected as a good example of a government department developing
92 policy to manage complex environmental risks in the context of significant stakeholder
93 participation, top-down targets and state role back (Goldsmith and Eggers 2004; Klinke and
94 Renn 2010). These challenges are not unique to the UK or this case study department. They
95 have wide international significance for environment ministries that manage complex policy
96 portfolios and risks of widely diverging character (Prpich et al., 2011) with a need to share
97 costs and risk management accountabilities with a broader range of regulatees and civil
98 society (Bevir et al., 2003). Among the responsibilities of the case study department is
99 developing policy relating to risks to the natural environment. This includes risks to
100 biodiversity and ecosystem health caused by hazards such as exotic animal disease, industrial
101 pollution, anthropogenic climate change and emerging risks such as nanotechnology. The

case study department has implemented a risk governance system adopting official UK guidelines based on ERM principles (HM Treasury, 2004).

2. Methods

We employed a qualitative case study methodology (Locke, 2001; Yin, 2008) well suited to in-depth, inductive investigation of the factors informing decisions in organisations, including relevant institutional and cultural factors (Yanow, 2000; Lounsbury, 2008). The risk-based decisions of policy teams within the case study department formed the unit of analysis (Yin, 2008).

Semi structured interviews (n = 45) were conducted between August 2009 and March 2011. Interviews lasted one hour, were conducted one-to-one in private, with participants' identities kept anonymous in data analysis and use. Interviews were in two tranches to obtain an overview of risk and knowledge management across the department (tranche one) and then a detailed analysis of the sources of knowledge used by policy makers at a project and operational level (tranche two). Tranche one interviews (n = 23) captured a sample of individuals across a range of functional groups and hierarchical levels, including specialist advisors to policy teams. Tranche two interviews (n = 22) focused on eight policy teams that had not been involved in tranche one. Recognising the constraints of the small sample size (Denscombe, 2007) policy teams were selected to be as representative of the department as possible. They included small and large teams; teams working on new and extant policy areas; and teams working on high and lesser profile policies. Each policy team leader and one to three subordinates (depending on team size which ranged from three to over ten) were interviewed. Interview questions were developed through analysis of the departments risk policy and governance documents in coordination with the department's chief risk officer.

Qualitative codes (Bazeley, 2007) were developed using a grounded theory approach (Locke, 2001) and computer-assisted qualitative data analysis (CAQDAS) software (NVivo 9^{TM}; Figure 3). Interview transcripts were analysed using the following questions 'what knowledge is being used to inform risk behaviour?'; 'In what context is the knowledge informing risk behaviour?' and 'what factors are affecting use of knowledge to inform risk behaviour? Codes were interpreted employing relevant theory (Kelle, 2005). Credibility of data was established by triangulation between data sources, peer review and member checking (Yin, 2008; O'Leary, 2010). Following triangulation logic, only codes supported by multiple sources were used in the final analysis. To enable peer review, researchers FS, CM and MS coded the data independently before comparing and establishing final codes. Codes and results were refined through critical reflection by the case study department's chief risk officer and all interviewees given the chance to review the results.

[Please insert Figure 3 here]

3. Results

3.1 Risk-based decisions observed

Policy teams were responsible for risk-based decisions at project and operational levels and for informing risk-based decisions at programme and strategic levels (Figure 2). Policy teams typically comprise two to ten individuals led by a middle-ranking civil servant not reporting directly to the board. Each team was responsible for one stream of work within a policy area overseen by a senior civil servant (senior responsible owner) reporting directly to the board. Integration of risk into policy development at all levels was codified in the

149 department's 'policy cycle' (Figure 4) which identified the appropriate risk management
150 activities at each stage of policy-making.

151

152 [Please insert Figure 4 here]

153

154 The following risk management activities were delegated to policy teams: identifying
155 and assessing environmental risks associated with policies; developing and presenting options
156 to manage policy risks to senior decision makers; identifying and managing delivery risks
157 and evaluating the efficacy of the risk management of delivered policies. Examples of
158 hazards causing environmental risk assessed by policy teams interviewed include: exotic
159 animal disease; nitrates (impacting water quality) and greenhouse gas emissions. Delivery
160 risks are defined as risks to the successful implementation of chosen policy options; for
161 example, risks relating to the ability to deliver project goals; delivery bodies' (e.g.
162 regulators') capabilities to implement policy; and secondary risks such as public and media
163 responses to policies.

164 ***3.2 Lateral knowledge transfer and culture of collaboration***

165 Common across the majority of policy teams interviewed, colleagues working in other policy
166 teams were viewed as an important source of knowledge. This manifested as a pervasive
167 'culture of collaboration' that placed normative pressure on policy makers to utilise the
168 knowledge of peers and stakeholders in policy-making (Table 1, code: Culture of
169 collaboration). This lateral knowledge transfer between policy teams did not take place
170 through formal mechanisms but was informally encouraged through the widely held espoused
171 value (Schein, 1986) portraying an inclusive, collaborative approach to risk management as
172 desirable:

"There is expertise and you know if you don't use it then it's silly. And you are required to bring the experts on board. Even to the extent where you're encouraged if someone else has done something very similar to you go and have a chat with them, see what problems arose."

[Please insert Table 1 here]

In addition to this culture of collaboration, and serving their designed purpose of aggregating knowledge for senior decision makers, we observed that risk registers and the process of maintaining them also facilitated knowledge transfer within policy teams (Table 1, code: risk registers and team communication). Risk registers achieved this by requiring policy makers to make their knowledge of risks explicit and visible to others. Participants described increased participation within teams due to risk knowledge being made more explicit:

"We have a nice up to date risk register. So we've got the benefit of the entire team being aware of these risks, being able to update from their various areas, and to keep an eye on these risks. Whereas if you have a less well organised system you're essentially relying on possibly just the one individual, presumably a bit higher up, who'll be aware of it and is keeping an eye on things."

However, only seven of the twelve teams interviewed used a risk register.

3.3 Observed use of knowledge

The most widely used source of knowledge informing the risk-based decisions of policy team members was individual experience (Table 2, code: individual experience).

[Please insert Table 2 here]

Other sources of knowledge included; external stakeholders, other policy teams, specialist advisors (called evidence colleagues) and delivery bodies (Table 2). External stakeholders included: civil society groups, regulated industries, NGOs, pressure groups, media and any affected parties. Communication between policy teams was predominantly informal (Table 2, code: informal communication between policy teams). Communication with external stakeholders was formal and informal (Table 2) and often complex, involving negotiation, conflict resolution, and issue formulation, as illustrated:

"We've been having two, three meetings in the past month and every month the [regulated industry representative] don't agree, or somebody else doesn't agree with the findings that the [delivery body] have come up with. So at the last meeting we invited an expert in [XXXX]. And [regulated industry representative] are perfectly happy because he suggested 'Let's go back and let's find out if it's 1 milligram or 2 milligram'. So to find solutions we do involve other people who need to be at the meeting. We call them in."

The importance of communication with stakeholders in this case study is illustrated by one policy, developed by the department that arguably failed due to insufficient communication with key stakeholders during the policy's development. The inadequacy of efforts to consult with stakeholders during policy formulation was made apparent by the surprised response of key stakeholders and the public when the policy was formally announced. Tellingly, the consultation and impact assessment were published four months after the policy was announced. Subsequent protest from non-governmental organisations, faith leaders and newly founded single issue groups made effective use of social media to mobilise widespread condemnation of the policy. Indicative of the lack of communication between those

developing the policy and stakeholders, government advisors reported being shocked at stakeholders' negative response. As one senior government advisor was quoted as saying:

"I were so enamoured of this idea across the board. I love that kind of thinking ... it blinded us to the political implications."

Following the negative stakeholder reaction, support for the policy, which had previously been high among senior officials, dwindled and the policy was abandoned. The highly public nature of the failed policy caused reputational damage to the department and those involved.

The department did have formal processes to facilitate knowledge transfer beyond vertical risk reporting, such as monthly open discussions chaired by a senior civil servant where risk issues could be raised outside of formal reporting channels, incorporating the widespread availability of internal consultants specialising in economics, legal and social affairs. The department had made considerable progress in defining how risk management should contribute to its policy making cycle (Figure 4) and followed best practice in providing risk management guidance on its intranet and training. However, training, best practice and guidance did not appear to be widely used among participants (Table 2). In particular, given the important of ***lateral*** knowledge transfer reported, it is significant that formal mechanisms for lateral knowledge transfer between teams, such as written reports of lessons learned, were viewed as important by only five (out of 45) interviewees (Table 2, code: codified lessons learned).

3.4 Factors limiting knowledge transfer

The most widely reported factor limiting knowledge available for risk-based decisions was a lack of formal processes and mechanisms to capture and disseminate knowledge, particularly the knowledge of employees when they changed roles or left the organisations (Table 3, codes: lack of knowledge retention).

243

244 [Please insert Table 3 here]

245

246 Related to a lack of knowledge retention was a paucity of formal processes to transfer
247 knowledge between policy teams (Table 3, code: lack of formal knowledge sharing). As a
248 result, the context-specific knowledge of risks in a policy area, such as in-depth knowledge of
249 how best to engage with key stakeholders, was felt to be particularly prone to being lost
250 through staff turnover:

251 *"The corporate memory seems to consist of people working there currently and how long*
252 *they've been there, rather than actually, you know, further back, and learning from other*
253 *policy areas I wouldn't say happens much at all, certainly not at my level."*

254 This problem was seen to be accentuated by the relatively rapid rotation of staff between
255 roles:

256 "*We're moving away from the situation where people got to know their subject areas and*
257 *were familiar with them, to a culture where we're going to dip in and out of projects much*
258 *more frequently. So there's a big risk as people move from one project to another, you don't*
259 *actually capture the experience they gain, before they move on."*

260 Participants reported that lack of resources limited their ability to transfer and utilise
261 knowledge. This included a lack of financial resources and of time (Table 3, codes: lack of
262 human capital; lack of time). For example, limited financial resources sometimes meant that
263 participants could not consult with stakeholders or scientific experts as much as they liked.
264 Five interviewees cited lack of time and resources as the main reason that evaluations of risk
265 management performance were not carried out:

"…because resource and money are always a problem, I suspect that when you get to that part of the cycle, there are other things to be done…and doing a proper evaluation is going to take time and money and often I think the pressure is to use that time and money to do something new. And I think that's a kind of institutional problem really."

4. Discussion

This study has identified two aspects of how knowledge informs environmental policy-making that have environmental risk governance implications.

- First, managing risks in environmental policy-making at a project and operational level was informed by a complex network of informal communication encompassing a wide range of internal and external stakeholders (Table 2).
- Second, while this informal communication was a valuable source of knowledge, it was vulnerable to a loss of knowledge through staff turnover, and to time and resources pressures (Table 3).

With regards the first aspect, while the importance of intellectual capital (the knowledge and expertise of employees) to risk management capacity in the private sector has been recognised (Neef, 2005), our study reveals that the intellectual capital required for effective environmental policy making is particularly diverse. For example, in additional to quantitative risk assessments provided by experts, policy teams must communicate with civil society groups and regulated industries to gain knowledge of how stakeholders perceived risks and how they might respond to policy options. Thus, the network of communication critical to gaining the specific and contextual knowledge (Jensen and Meckling, 1995) required to effectively manage risk within the environmental policy context is likely to be relatively complex. Given that an organisation cannot manage its risks effectively if it cannot

manage its knowledge (Neef 2005), the implication for organisations responsible for environmental risk and policy is that their risk governance framework must place significant effort into managing and supporting this extensive network of lateral knowledge transfer.

Broadly, our results support the assertions of Vince (2000) that there is insufficient focus on the communal aspects of learning in the public sector; and illustrate the value of a broad, participatory approach to risk management by government bodies, reaffirming the 'analytic-deliberative process' (Stern and Fineberg, 1996). However, our findings suggest the importance and benefit on knowledge management goes beyond the analytic-deliberative processes' integrating technical assessment and social values to produce legitimate policy design and outcomes (Klinke and Renn, 2012). Our results show that an internal knowledge management across organisational silos (policy teams in our case) is also critical and that a participatory approach that engages with external stakeholders does not necessary result in better internal knowledge management. This is evidenced our observations that while engagement with external stakeholders was prevalent in our case study (Table 2, code: external stakeholders), engagement between policy teams was less prevalent (Table 2, code: informal communication between policy teams). We offer evidence for promoting, perhaps more firmly than has historically been the case, the knowledge management components of environmental risk governance and policy-making (Stern and Fineberg, 1996, Figure 1-2, p.28). With this in mind, below we address the question: how can the integration of risk-relevant knowledge across multiple individuals and stakeholders be better supported by an enterprise-wide risk governance framework?

4.1 Supporting risk management through knowledge management

We observed the important role the department's culture of collaboration (Table 1, code: culture of collaboration) played in supporting the extensive network of lateral communication so important to informing risk-based decisions. While this cultural driver was important and

a credit to the department, our findings indicate that relying on culture alone for knowledge management has its limitations (Table 3). Sole reliance on informal processes to support risk knowledge management is neither a systematic nor a controlled form of risk governance (MacGillivray et al., 2007). Here we discuss more formal mechanisms that could be used to mitigate the weaknesses observed (Table3) in the case study department's predominantly informal knowledge management.

Addressing the first weakness, loss of knowledge through staff turnover (Table 3, code: Lack of knowledge retention), requires a systematic approach to managing the intellectual capital residing with employees. Key steps towards achieving this include 'knowledge mapping' and 'hard-tagging experts'. Knowledge mapping involves establishing 'who knows what' in an organisation (Neef, 2005). Individuals with key knowledge, experience and skills can then be made available throughout the company as a database sometimes known as a 'knowledge yellow pages' (Davenport, 1998). Such an exercise would support internal consultation beyond the current focus on economic and legal expertise evident in this case study. Further, this would be valuable in guarding against knowledge loss if coupled with an assessment of 'knowledge at risk': identifying critical knowledge held only by a limited number of individuals and/or individual likely to leave the organisation (McBriar et al., 2003). Hard tagging (McGee and Prusak, 1993) combines knowledge mapping with a formal mentoring system. In addition to identifying (hard-tagged) experts available for internal consultation, 'soft tagged' employees who are interested in building specialist knowledge and skills are identified and partnered with hard-tagged experts for mentoring and knowledge sharing (McGee and Prusak, 1993), thus ensuring key knowledge is not lost.

The second weakness, vulnerability to time and resource pressure (Table 3, codes: lack of financial resources and lack of time), could be mitigated by making lateral knowledge transfer easier and less time and resource intensive. Here, we offer insight into how this

might be achieved. The use of risk registers increased knowledge transfer within policy teams (Table 1 code: 'risk registers and team communication'). By requiring team members to make risk management knowledge explicit as numbers or text, risk registers facilitated knowledge transfer by a) creating a common language for risk knowledge (Grant, 1996); and b) an accessible space where that knowledge could be aggregated and shared (Moynihan and Landuyt, 2009). Not all the policy teams sampled (seven out of twelve) used risk registers. A first step towards enriching communication in the case study department would be to increase the use of risk registers. However, the greater challenge and one with wider benefit, would be to develop tools that achieve the same effect between teams and the wide range of experts and stakeholders they interact with. Such a tool would capture the risk relevant knowledge of risk managers and stakeholders and make it widely accessible, both in the language used and the format of the knowledge. Research in this area, for example, the development of interactive models and 'games', might contribute to supporting the risk management capability of public sector organisations by increasing the range of knowledge that can be effectively used to develop risk management interventions, increasing the quality and legitimacy of risk-based decisions therein. While research into risk communication has explored the use of 'games' (McGill et al., 2011) this has been in the context of the dominant risk communication paradigms of informing, persuading and supporting dialogue between values and information (Demeritt and Nobert, 2011). In contrast, we suggest the use of risk communication tools to facilitate knowledge transfer for the benefit of policy makers.

4.2. Relevance and generalizability of findings

Many governments, their departments and agencies globally are engaged in redefining how they relate to business and society, and the structures and processes required by new models of governance (Bevir et al., 2003; Rhodes, 1996). A significant element of this change is a move away from being direct service providers to protecting public interests and values

365 through regulation and procurement of third party services (Goldsmith and Eggers, 2004). In
366 response to this change, there is an increasing use of private sector practices, for example
367 ERM, in the public sector (Edwards, 2002). While this offers many benefits, there are
368 questions as to whether private sector governance structures are appropriate for the
369 institutional and political realities of the public sector (Edwards, 2002)? We believe that this
370 study offers timely and relevant insight from a government department at the forefront of
371 global changes in public sector governance into some of the opportunities of applying
372 enterprise risk management to the governance of environmental policy making. While a
373 single case study offers rich insight into organisational behaviour it cannot be directly
374 generalized, our core finding 'that lateral communication is a vital process supporting risk-
375 based decision making' is of interest to other organisations seeking to employ risk
376 governance frameworks to support environmental policy and risk management. Our findings
377 also uncover some of the weaknesses of a predominantly informal and *ad hoc* approach to
378 lateral communication. Further research to explore how these weaknesses could be addressed
379 is critical.

380

381 **5. Conclusions**

382 Our core finding is that despite being widely accepted as important to developing effective
383 environmental policy (Table 1, code: culture of collaboration), lateral knowledge transfer
384 between policy teams was limited (Table 2, code: informal communication between policy
385 teams). Instead we found that environmental policy was largely informed by individual
386 expertise and through engagement with external stakeholders (Table 2, codes: individual
387 expertise; external stakeholders). The main factors explaining this observation were time and
388 resource pressures (Table 3, codes: lack of financial resources; lack of time) together with a
389 lack of mechanisms to support knowledge sharing (Table 3, code: of formal knowledge

390 sharing). The lateral knowledge transfer observed between policy teams was predominantly
391 informal and *ad hoc* (Table 2) making it vulnerable to loss of knowledge through staff
392 turnover (Table 3, code: lack of knowledge retention).

393 In light of this, we argue that the vertical knowledge transfer and aggregation prominent
394 in well-established risk governance frameworks (for example, COSO, 2004) are necessary
395 but insufficient to support the risk-based decision making informing development of
396 environmental policy. To overcome this shortcoming we propose that environmental risk
397 governance frameworks must engage in a wider range of knowledge management activities
398 that support and enable utilisation of the varied and dynamic body of knowledge, distributed
399 across employees and stakeholders, necessary to develop effective, risk informed,
400 environmental policy. As potential areas of future research we have identified a number of
401 means that could support such lateral knowledge transfer:

402 • Establish a culture that encourages communication and collaboration;

403 • Actively management risk management knowledge through knowledge mapping,
404 identifying critical knowledge at risk, succession planning and mentoring;

405 • Facilitate informal knowledge transfer through open forums or social media type
406 applications;

407 • Creation of a knowledge 'yellow pages' to support identification of internal experts
408 for consultation;

409 • Extend the elements of formal risk management processes that facilitate knowledge
410 sharing within teams, such as common terminologies and formats for risk knowledge,
411 to support inter-team communication and communication with external stakeholders.

412 The core contribution of our research is establishing an empirically grounded understanding
413 of the knowledge transfer processes underpinning effective environmental risk governance.

414 This in turn begins to establish the empirical and theoretical basis for developing knowledge
415 management tools and processes to benefit environmental risk governance. The strength of
416 our case study approach is that it facilitated an in-depth and rich investigation of an
417 organisation playing a key role in environmental risk governance in the UK. The
418 corresponding weakness of this methodology is a limited basis for generalizability (Yin,
419 2008). Case studies of other organisations will be required to provide the comparisons and
420 counterfactuals necessary to develop a robust understanding of what good environmental risk
421 governance entails. The time and effort required to conduct in-depth case studies, as well as
422 issues of access, will be challenges. However, we view this as necessary if environmental risk
423 governance is to move from merely borrowing risk governance structures developed in the
424 financial sectors (for example, COSO, 2004).

425

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431

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