Accountability, Maps and Inter-Generational Equity: Evaluating the Nigerian Oil Spill Monitor.

Abstract

The Oil Spill Monitor (OSM) is an innovative public-sector accounting system intended to improve the regulation of oil pollution in the Niger Delta through greater transparency and stakeholder engagement. The Nigerian OSM, an online accounting and geographic information system, originated from NGOs before becoming part of the regulator's accountability system. Problems with data quality, regulatory enforcement and remediating practices have meant that improved accountability and stakeholder engagement were necessary but not sufficient in this case.

"if you go to the waterside, the children are taking their bath there; pregnant women are taking their bath inside the polluted water. We are drinking it. We are even eating the fish from the same polluted water. There is no other means. We are taking benzene. When you talk of benzene in water, we are taking 400 [times] above what we are supposed to consume in the UNEP report, and we are still drinking it for years. So, we are just like moving corpses." (Community Leader, Niger Delta)

1. Introduction

Weiss (1992, p.20) observed that "all generations are linked by their ongoing relationship with the earth," and it is difficult to conceive of social justice, within and between generations, in a natural environment damaged by anthropocentric pollution. Polluting nature is a violation of human rights (Ruggie, 2013) and a breach of the partnership between those who are living and those still to be born. The inability of humanity to meet its needs because of the unsustainable practices of corporations, public service organisations and governments is considered problematic (Siddiqui and Uddin, 2016; Sikka, 2011).

Grubnic *et al.,* (2015, p.245) argued that sustainable development creates new challenges "for governments and providers of public services to address social and environment aspects in policies and decision making", including inter-generational equity. The reflexive relationship between the social and natural worlds is reflected in Gray's observation that "sustainability emerges as planetary, morally engaged and as involving human arrangements and their impact on a natural and social environment and the resulting (in) justice. It concerns life, death, species, suffering and oppression" (Gray, 2010, p.53). Protecting the natural environment is linked to protecting intragenerational and intergenerational equity, particularly when damage to the natural environment persists over time (Lauwo and Otusanya, 2014).

Integrating sustainable development into public sector accountability and governing systems is deemed necessary to create social, economic, cultural, political and environmental wellbeing for present and future generations (Siddiqui and Uddin, 2016; Ruggie, 2013). Previous studies have argued that public service organisations (PSOs) should be accountable for the sustainability of their decisions, actions and policies (Guthrie and Farneti, 2008; Larrinaga-Gonzalez and Perez-Chamorro, 2008). Aligning public service accountability practices with sustainable development is critical for the governance of others to achieve an equitable redistribution of costs, risk, harm, resources and benefits across generations (Ball and Bebbington, 2008; Russell and Thomson, 2009).

In this paper, we explore the accountability expected of PSOs assigned the responsibility of protecting the natural environment and either, directly or indirectly, of protecting inter-generational and intra-generational equity. If PSOs are not held accountable for the social consequences of their activities, then this might negatively affect the distribution of social, economic and environmental rights, risks and resources between present and future generations (Unerman, 2011). Our central theme is whether enhanced accountability will drive changes in organisational practices associated with more sustainable ways of living.

This paper evaluates the Nigerian Oil Spill Monitor (OSM), an innovative public sector accounting-sustainability system created by a coalition of campaigning NGOs and the Nigerian National Oil Spill Detection and Response Agency (NOSDRA). Unusually for accounting-sustainability hybrids, the OSM is adapted from public participation geographic information system (PPGIS) (e.g. Kitchin and Dodge, 2007; Sieber, 2006). We explore the OSM's effectiveness in terms of enhanced accountability, stakeholder engagement and improved regulatory practices in preventing, stopping and remediating oil spills in the Niger Delta.

Understanding accounting-sustainability hybrids

Thomson *et al.,* (2014) argued that accounting-sustainability hybrids practices should make visible and thinkable the sustainable governance of economic, ecological and social life. Sustainable governance systems are concerned with managing the social, economic and environmental risks emerging from unsustainable practices. Accounting possesses a powerful set of practices that can play a number of important roles in sustainable governance systems, in particular rendering visible and governable the risks of unsustainability (Gouldson and Bebbington, 2007; Power, 2004). Accounting can be used to evaluate the effectiveness of those institutions responsible for sustainable governance. At an operational level, accounts of actual or potential harm through regulatory breaches can trigger corrective actions or policy interventions by PSOs. Managing social, economic and environmental sustainability across generations requires accounts to challenge institutions to fully discharge their responsibilities by ensuring effective risk management policies and stakeholder engagement (Vosselman, 2016).

Given the importance of PSOs to sustainable governance, we argue that PSOs should integrate relevant aspects of sustainable development into their accounting and accountability systems. The absence of effective accounting-sustainability systems in PSOs, including environmental regulators, might limit the attainment of inter-generational equity (Gray, 2010; Russell and Thomson, 2009).

Other studies discussed how public-sector accounting practices evolved to meet demands for new information through a process of hybridisation (e.g. Kurunmäki *et al.*, 2003; Kurunmäki and Miller, 2006). Miller *et al.,* (2008) describe hybridisation as when two or more discrete elements combine to create a new hybrid object. Hybrid objects emerge in the interface between different organisations operating in common networks, particularly in periods where the future of some of these organisations is threatened (Beck and Wilms*,* 2004; Miller *et al.,* 2008; Power, 2004). However, in order to hybridise there is a need for a mutual acceptance of commonalities between organisations (Thomson *et al.,* 2014).

Thomson *et al.,* (2014) note that accounting-sustainability hybridisation typically occurred through the medium of local, sharable calculative practices. Hybridisation occurred at a local level and was

associated with organisational attempts to implement sustainable practices, for example waste reduction, reducing carbon emissions, energy accounting. Accounting hybridisation research suggests that shared calculative rationalities are a necessary condition for accounting-sustainability hybridisation. Accounting-sustainability practices are conceived as hybrids between accounting techniques, sustainability programmatic discourses and specific organisational practices (Khan, 2014; Kurunmäki *et al.,* 2011). This suggests that elements of sustainable development that have been or can be calculatively captured possess the greatest potential for hybridising with accounting.

However, accounting-sustainability hybridisation is not without its critics. Concerns have been raised that accounting can inappropriately capture sustainable development, suppressing fields of visibility, knowledge and techniques of governing deemed necessary for sustainable governance (e.g. Cooper, 1992; O'Dwyer, 2003). Another criticism relates to a disconnection between accounts of an organisation and their actions. Parker (2014) notes the importance of accountability through action and argues for a closer connection with actions and accounts (see also Roberts, 2009; Vosselman, 2016). Sustainable accountability through action involves supporting deliberative participation that educates, organises and supports environmental protection and intergenerational equity (Brown and Dillard, 2015; Gray *et al.,* 2014).

These criticisms emerged from studies into accounting-sustainability hybrids that were largely derived from accounting techniques. However, not all accounting-sustainability hybrids need to be derived from accounting (for example, Contrafatto *et al.,* 2015) and there is a gap in the literature in relation to accounting-sustainability hybrids that are not dominated by accounting logic and techniques.

We would like to challenge the assumption that shared calculability is the only medium through which accounting-sustainability hybridisation can occur. For example, one potential medium could be PPGIS (Khan, 2014; Kitchin and Dodge, 2007; Johnson *et al.,* 2006; Sieber, 2006; Peluso, 1995). PPGIS comprises techniques that address the absence of information on the social and environmental impact of the action of others. PPGIS use a combination of community engagement

practises and GIS to facilitate public participation in policy making, problematisation of the actions of others, supporting civic society groups, and reforming governance systems. PPGIS also incorporates activist practises such as counter mapping or maptivism and is often an integral part of citizen science programmes (e.g. Carver *et al.,* 2001; Ball, 2002; Brown *et al.,* 2011).

From the perspective of accounting hybridisation, there are a number of common attributes associated with PPGIS. These include making invisible data visible, connecting high level concepts with specific geographic localities, presenting information from different sources, co-production, filling critical information gaps, stakeholder inclusion, and visualising complex relationships for intragenerational engagement and intergenerational equity (e.g. Sieber, 2006; Eades and Zheng, 2014; Johnson *et al.,* 2006; Kitchin and Dodge, 2007). PPGIS have also been observed as increasing the power of communities to demand greater accountability from institutions whose actions affect their ability to live sustainably (e.g. Khan, 2014; Peluso, 1995). Many of these attributes are shared with sustainable accounting and sustainable governance (Gray, 2010) offering an alternative pathway to accounting hybridisation.

Research Methods and Sources of Evidence

Our analysis is based on interviews conducted with representatives of NOSDRA, local and international advocacy NGOs, the indigenous people (IP), community leaders (CLs) and evidence from documents and websites on the subject of the OSM

TABLE 1: Overview of Interviewees

Interviewees	Role	Duration	Type of Interview
NOSDRAr1	Regulator	86 mins & 58 mins	In Person / Focus Group
NOSDRAr2	Regulator	77 mins	In Person
IP9	Community Member	42 mins	In Person
CLs2	Community Leader	75 mins	Focus group
iaNGOr5	Director	41 mins	Skype

iaNGOr6	Director	35mins	Telephone
laNGOr7	Director	107 mins	In Person
laNGOr11	Director	76mins	In Person

All the interviews were recorded after consent to record and publish findings had been agreed and the identities of interviewees were anonymised as shown in Table 1. In addition, we accessed the OSM website[1] to observe the mode of presentation, type of data disclosed, completeness of the information disclosed and the quality of evidence presented in the OSM.

Setting the Scene – Oil Pollution and Conflicts in the Niger Delta

> "I have worked on oil spill damage issues all over the world and I have never in my life and in my professional career seen an ecological habitat and human communities as damaged by oil spills." (iaNGOr5)

> "people living in the Niger Delta have experienced oil spills on par with the Exxon Valdez, every year, over the last 50 years." Amnesty International (2009, p.16)

Despite the oil industry's economic contribution to the development of Nigeria, the abject poverty, ecological damage, conflict, diseases and social inequity in the Niger Delta is well documented (e.g. UNEP, 2011; Okonta and Douglas, 2003). Unsustainable activities of oil companies, corruption, third party interference and sabotage in conjunction with ineffective regulators have led to Niger Delta being ranked as one of the worst petroleum damaged ecosystems in the world (UNEP, 2011). As far back as 1990, Shell and the Nigerian government were accused of waging an ecological war and practicing genocide on the indigenous communities of Ogoniland in the Niger Delta (Okonta and Douglas, 2003). The exposure of indigenous people to polluted land, rivers and air has caused enhanced levels of diseases such as typhoid, skin conditions, gastroenteritis and respiratory disorders (UNEP, 2011).

[1] (https://oilspillmonitor.ng/)

NOSDRA was established in 2006 as a PSO with the statutory obligation to protect current and future generations of Nigerians by creating, nurturing and sustaining a zero tolerance for oil spills. NOSDRA's Oil Spill Monitor (OSM) was introduced in 2014 and is considered a critical part of NOSDRA's attempt to deal with the catastrophic impact of oil pollution on present and future generations in the Niger Delta. In 2011, a report by UNEP estimated that the clean-up of oil pollution in Ogoniland alone could take up to 30 years. Unfortunately, evidence from a number of sources (Amnesty International, 2015; Social Action, 2014), including the Oil Spill Monitor, suggested that this systematic remediation programme is yet to begin in earnest.

Evaluating the potential of Oil Spill Monitor as an accounting-sustainability hybrid

The OSM was designed to improve the governance and accountability associated with oil pollution. There are two notable aspects of the OSM. First, OSM was not derived from accounting or related calculative practices. Second, the OSM's origin lie in activist campaigns against the actions of oil corporations and regulators using a range of tactics including PPGIS. Following years of campaigning against the oil spill regulatory regime, corporate practices and third-party sabotage; the OSM was developed by a coalition of NGOs in partnership with NOSDRA as a solution to the lack of reliable information from corporations and NOSDRA (SDN, 2016).

The OSM was intended to enable government agencies, oil corporations, civil society groups and communities' members to engage and share critical information. There was consensus from our interviews that the OSM was the most important accountability reform in the Niger Delta conflict.

> "I think the biggest success is probably the oil spill monitor, where you see collaboration between civil societies, the government, and the oil industry looking to create a public transparent platform to document every single oil spill that is happening in Nigeria." (iaNGOr6)

The OSM provides open access and makes visible oil spill data,[2] how oil corporations are fulfilling their legal duties, as well as, the impact of third party interference.

> "we have a platform called 'Oil Spill Monitor'. If you go into it, you will see the report of all of those things. You will see the causes and just take a check yourself." (NOSDRAr2)

Communities have full access to the OSM and can use it to report oil spills to NOSDRA. Oil spill data is uploaded when oil spills are confirmed by NOSDRA. OSM attempts to provide a detailed account of the cause, who is responsible, timing, location, quantity of pollutant, remediation activities of all oil spills since 2013. The OSM provides real-time information on the management of oil spills measured against NOSDRA's statutory responsibilities. It was perceived to be operationally useful as well as useful for external accountability and engagements. As with other PPGIS projects (Sieber, 2006; Johnson *et al.,* 2006; Peluso, 1995) the OSM facilitated partnership working and community engagement.

> "the collaboration we are having right now is that they now involve the agency and the agency sees them as partners in progress and then we value their contribution. They also volunteer their time and resources to ensure that we drive this message right into the ear drums of all those that need to hear them." (NOSDRAr1)

The OSM allows citizens, corporations and regulators to co-produce accounts of oil spillage, clean-up and remediation and related actions of NOSDRA, other PSOs, corporations and communities. There was evidence that the OSM allowed NGOs and communities to audit, verify and challenge the official accounts contained on the OSM and monitor NOSDRA's performance.

The OSM possessed many of the attributes associated with PPGIS and effective accounting-sustainability practices (Gray *et al.,* 2014; Bebbington and Larrinaga, 2014; Sieber, 2006). For example, it has changed how NOSDRA collaborated with stakeholders and oil corporations.

[2] Appendix One outlines the data specification for oil spills.

> "the whole essence of all these collaborations is to bridge the gap as far as possible between the knowledge that is usually released regarding the operations of the oil companies, and what the regulators are also doing. So, as far as we are concerned, that collaboration has been quite helpful" (NOSDRAr1)

Our analysis of the OSM suggested that this accounting-sustainability hybrid enhanced transparency and greater accountability, with the potential for constructive engagement between the regulator, corporations, NGOs and local communities (Sieber, 2006; Peluso, 1995).

The NGOs and community groups interviewed recognised that the OSM has improved the visibility of oil spills and regarded it as having contributed to more effective governance. The OSM has enhanced accountability and engagements among key actors, which interviewees agreed was essential for improving the governance of oil spills and promoting more sustainable development practices in the Niger Delta (see Sieber, 2006; Johnson *et al.,* 2006; Peluso, 1995). The disclosure of oil spill data facilitated greater dialogue among regulators, oil corporations, NGOs, communities and the general public. The OSM created a platform for local communities to act with others to protect their environment and way of life for present and future generations (Bebbington *et al.,* 2007; Johnson *et al.,* 2006).

The OSM as a form of accounting-sustainability practice appeared to be a necessary part of NOSDRA's systems of internal and external accountability and governance. There was evidence to support claims that the OSM had the potential to help eradicate inequalities and drive sustainable change across generations (Eades and Zheng, 2014; Parker, 2014; Peluso, 1995). However, these changes also required *'accountability through action(s)'* and engagement within and outwith PSOs to educate, organise and support sustainable transformation (Parker, 2014; Vosselman, 2016). For example, simply knowing inestimable barrels of oil have been spilled, sometimes attributed to sabotage and that none of the leaks have been adequately remediated, was regarded as a pyrrhic victory (SDN, 2016). The OSM could facilitate accountability through action by allowing NGOs to

partner with PSOs and corporations to prevent social and environmental harm associated with oil spillage (Tregidga *et al.,* 2015; Sieber, 2006). Concerns were raised that the OSM did not address the underlying social and environmental problems associated with historic oil spills, prevent future oil spills or ineffective remediation. Accountability practices need to be embedded within robust governance systems in order to change policies or practices to protect the environment and human rights in the context of sustainable wealth creation and its distribution across generations (e.g. Gray, 2010; Roberts, 2009; Parker, 2014).

Effective accountability processes should also be based on reliable, complete and relevant information provided by all key stakeholders. There was recognition by NOSDRA and others that the OSM data was incomplete and potentially unreliable due to problems with data gathering. Whilst there appeared to be potential for the co-production of accounts, power relationships were a major obstruction to this potential being achieved. For example, NOSDRA was reliant on oil corporations providing logistics, resources and scientific analysis in an operating environment fraught with security and logistical difficulties.

As discussed earlier, improved accountability does not necessarily lead to improved performance. Reasons for this lack of improvement in the Niger Delta included conflicts of interest, inadequate resourcing of regulators, lack of political will for action and a lack of capacity in local communities to enact their legal rights. The ability and capacity to act, as well as improved accountability, was required for PSOs to prevent environmental and human rights violations harm or risk on the present and the future generations (Siddiqui and Uddin, 2016; Sikka, 2011). The next section will provide evidence that despite OSM's enhanced transparency, this had not reformed the problematic regulatory system, prevented oil spills or effectively remediated the damaged natural environment or the lives of the communities.

Accountability, Actions and Improved Governance of Oil Spills

In this section, we explore the reasons that prevented the potential benefits of OSM from being realised in the Niger Delta. These were inadequate resourcing of NOSDRA, difficulties in gathering information, conflicts of interest and lack of capacity in the local communities.

Inadequate Resourcing of NOSDRA

Oil pollution had affected the lives of the indigenous people and damaged the natural environment of the Niger Delta, since the 1950s and was expected to continue.

> "It is a well-known fact that we may not completely eradicate oil spills, even in some western countries [where] the level of oil spill is very low, when you compare it with what we have here, I think our own is the worst in the whole world." (NOSDRAr1)

NGOs have long argued that the Nigerian regulatory system was ineffective in enforcing oil spill regulations. Evidence gathered from our study revealed that the regulators lacked the necessary funding, equipment and legitimacy (SDN, 2016; Amnesty International, 2009).

> "the agency is poorly funded and this no doubt hampers our operation and performance." (NOSDRAr1)

NOSDRA were dependent on co-operation and support from the oil corporations to gather information and enforce regulations.

> "The tragedy about the federal and state governments that they have not financed this regulatory bodies and agencies to do the work they are supposed to do. …He [the regulator] has no car or way of transporting himself. It is only if Shell, Chevron, or any other oil companies come to him and say 'there is a spill, we want to take you to see what is happening'" (laNGOr1).

Disclosing a spill on the OSM did not automatically stop, contain the spill or remediate the environment. For example;

> "when there is any spill, they just manage to clamp their equipment and that is all. No proper clean-up is done to preserve the environment, to make it productive for the people.

So, you discover that from time to time, fewer people go to the farm and when fewer people go to the farm, the harvest is not still good." (IP9)

The OSM created greater visibility of problems with the regulatory system, but to date this visibility had not addressed the inability of NOSDRA to fully implement its standards, enforce its rules and visit polluted sites.

"…every day there is spill… God forbid, if there is any catastrophe in the petroleum sector today. Except you go through the normal budgetary procedure, there is no quick money" (NOSDRAr2)

"NOSDRA does not have teeth. …It doesn't have the enabling laws to bite. For example, if they want to go and inspect any oil company, who provides the facilities for them to go? The oil company have to lift them… If they need certain equipment to conduct certain tests, they need to depend on the oil company to provide those things…They don't have what it takes to ensure that these oil companies operate according to the standards." (laNGOr11)

Our analysis of OSM data suggests that whilst there was a fall in reported oil spills, there were still 798 oil spills reported in 2015 and 152 spills in the first 6 months of 2016. It was not possible to use the OSM to evaluate the scale of the oil spilled due to incomplete and unreliable information, as will be developed in the following section.

Incomplete and unreliable information

If the underlying data is incomplete or unreliable, then any benefits accruing from greater accountability are unlikely to arise. There was evidence of incompleteness, corporate capture and bias in the data reported through the OSM. For example, our analysis revealed that only 54% of the oil spill records disclosed the volume of oil spilled and only 13% disclosed the volume of oil recovered. As will be discussed next, the reliability of these partial disclosures is questionable. A key part of NOSDRA's regulatory processes is the joint investigation visit (JIV) by a joint investigative team (JIT) after notification of an oil spill. The JIV is critical for the operation of the OSM as it creates

the initial account of the oil spill, which is then disclosed on OSM website. The JIT is responsible for verifying and quantifying the spill, establishing its location and related risks, cause determination, assigning responsibility and liability for stopping the spill, the clean-up, preventing future occurrence and ensuring appropriate remediation (SDN, 2016).

> "anywhere there is an oil spill incident, we will constitute what we refer to as joint investigative team, what we call the JIT. So, this joint investigation team will respond swiftly to anywhere we have oil spill incident and part of what the team actually seeks to determine are: - one, to find out the cause of the spill, determine the quantity spilled, and then the area of impact. It will also cause the oil operators to commence what we call clean-up activities." (NOSDRAr1)

All the documentation related to a JIV is uploaded onto the OSM. The OSM website acts as a public record of the processes and related outcome of the JIV as well as a valuable source of information for the accountability of NOSDRA.

Establishing the cause of oil spills is a contentious process as this determines responsibility for clean-up, compensating for any damage and remediating polluted sites. Our investigations revealed examples where corporations denied responsibility for spills or significantly underestimated the volume of oil and damage caused. For example, Amnesty International's secret film illustrated the control of JIVs by corporations. These practises were also exposed in a UK court case involving Shell (Amnesty International, 2014).

In this case, Shell initially argued that the oil spilled from its Trans-Niger Pipeline in 2008 and 2009 totalled 1640 and 4000 barrels respectively. However, in court Shell admitted its assessment was substantively under-estimated and agreed an out of court compensation of £55m. This case supports wider claims of the unreliability of oil corporation's accounts of oil spills. Our interviews revealed that this problem persisted. For instance,

> "[name of company] will quickly rush in, pay some people and the youths will be carried to that scene. They were busy serving them with take away packs. They will load them with big-big chicken and because of poverty and hunger; once they see food, chicken they will be there fighting to eat while [name of company] will take one or two persons and say, *"don't you see it this is sabotage."* The next thing, they will conclude that it is sabotage**.**" (CLs2)

Concluding Comments

Our evaluation of the OSM identified a number of positive contributions in terms of enhanced accountability, increased transparency and greater levels of stakeholder engagements in a highly-contested arena. However, we also identified that this accounting-sustainability hybrid was only part of the solution to the problems of environmental damage, social injustice and inter-generational inequity from oil spills. The OSM has exposed but not addressed structural problems associated with Nigerian regulatory systems, which relied heavily on voluntary support from those it seeks to regulate. Too much power and control over the underlying data quality was given to those at risk of sanction, which reduced the legitimacy of the OSM.

However, there was evidence of a substantive improvement in the level of inclusion and engagement by NGOs, civic society and communities in the governance of oil spills. Public participation was still affected by the power dynamics and politics of regulating multinational oil corporations in a developing country. The OSM is a substantive improvement on the past, but it did not tell the whole story of oil pollution in the Niger Delta and the everyday struggle of indigenous people to survive. The OSM allowed stakeholders to ask better informed questions and enabled evidence based challenges, but did not lead to the resolution or remediation of oil pollution.

The hybridisation of the PPGIS and NOSDRA's accounting and accountability systems appeared to be successful, but reflected, rather than reformed problems with the regulatory system (Khan, 2014; Thomson *et al.,* 2014). Whether the dramatically improved disclosures and stakeholder engagements will lead to future reforms of the social, economic and environmental governance of

the oil sector in the Niger Delta remains an open question. However, from our interviews there was considerable hope that the OSM would eventually lead to more effective regulation and remediation of oil spills.

One aim of this paper was to explore how the OSM could impact on NOSDRA's regulatory responses, stakeholder engagement and enhanced accountability. We presented evidence as to how the OSM could improve the visibility of the risks associated with oil spills and trigger action from NOSDRA and oil corporations to reduce the environmental damage and (intra)intergenerational equity. What was evident was a substantive improvement in how oil spills were accounted for and the potential for constructive engagement among regulators, NGOs, corporations and the communities.

Another aim of this paper was to evaluate the potential of accounting-sustainability hybridisation that does not depend on shared calculative practices, in particular PPGIS related techniques. Our evaluation demonstrated that PPGIS had considerable potential to hybridise with accounting, accountability and regulatory techniques and assist in sustainable accountability and governance of PSOs (Gray *et al.,* 2014; Roberts, 2009). However, how this hybridisation occurs in different contexts will impact on its effectiveness. Sieber (2006) identified the importance of respecting local cultural values and critical contextual factors when designing an effective PPGIS. This will enable the co-production of trusted accounts containing trusted and appropriate content that can be used effectively by local communities and key stakeholders (see also Brown *et al.,* 2011, Carver *et al.,* 2001; Contrafatto *et al.,* 2015; Johnson *et al.,* 2006).

This paper contributes to research into how PSOs' manage and account for inter-generational equity and sustainable development processes and outcomes. We acknowledge the potential of the OSM in making visible and closing accountability gaps and improving the quality of stakeholder engagements. However, there was limited evidence of corresponding *accountability through actions* that reduced the intergenerational impacts on biodiversity, pollution of land, water and air (Bebbington *and Larrinaga, 2014*; Parker, 2014; Vosselman, 2016). Accounting for sustainability through hybridisation with PPGIS-like practices offers an interesting pathway that merits further

research and experimentation. In the case of NOSDRA, their OSM appeared to be necessary but not sufficient to fulfil their goal of zero oil spills.

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Appendix 1 Specification of Data Fields for Each Oil Spill in OSM

Unique Spill ID	Spill Status	NOSDRA Verified Spill	Responsible Regulators Office	Company Involved
Incident Number & Date	Incident Report Date	Containment Methods Used	Estimated Quantity of Spill	Quantity of Spill Recovered
Spill Stop Date	Type of facility involved	Cause of Spill	Initial Containment Measures	Site Location
GIS co-ordinates, Local Govt area	Estimated Spill Area	Spill Area Habitat	Description of Impact	State affected
Forms A. B. C	Joint Investigation Visit (JIV) date	JIV Team composition	Clean up date	Clean up completed
Clean up methods	Post clean up inspection date	Post Impact assessment date	Remediation start date	Remediation type
Final Sample Date	Certificate date	Certificate Number	Last up-dated	